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Culturally Responsive Mother Tongue Instruction: Enhancing Students' Retention of Mathematics Concepts Through Igbo-Based Teaching

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Abstract

This study examined the effectiveness of culturally responsive teaching (CRT) delivered in the Igbo language on senior secondary school students' retention of circle geometry concepts in Nsukka Local Government Area, Enugu State, Nigeria. A true experimental pretest-posttest control group design was employed, involving 80 students randomly assigned to experimental and control groups. The experimental group received mathematics instruction in Igbo, enriched with culturally relevant examples, while the control group was taught in English using general instructional content. The Geometry Achievement Test (GAT), with a reliability coefficient of $KR-20 = 0.81$, served as the data collection instrument. Data analysis was conducted using SPSS version 29, with descriptive statistics used to answer the research questions and ANCOVA applied to test hypotheses at the 0.05 significance level. Results showed that students exposed to Igbo-based CRT achieved significantly higher retention scores in circle geometry than their peers taught in English. While female students scored slightly higher than males under Igbo instruction, the difference was not statistically significant. These findings highlight the potential of mother-tongue-based CRT to enhance conceptual understanding and long-term retention in geometry, particularly in topics such as circle geometry. It is recommended that educators, curriculum planners, and policymakers promote the integration of indigenous languages, alongside culturally relevant examples, when teaching geometry, and where possible, extend this approach to other areas of mathematics to foster educational equity and improved learning outcomes.

Keywords: circle geometry, digital storytelling, mathematics performance, multimedia tools, retention, secondary school learners

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Introduction

Mathematics plays a central role in the scientific, technological, and socio-economic development of every nation. It equips learners with critical thinking, problem-solving, logical reasoning, and decision-making skills needed for everyday life and future careers (Eti et al., 2026; Nwoye et al., 2026). Consequently, mathematics is regarded as a core subject at both primary and secondary school levels in many countries, including Nigeria. Despite its recognized importance, students' achievement and retention in mathematics continue to remain a major concern among educators, researchers, curriculum planners, and policymakers (Mosia & Egara, 2024; Okeke et al., 2025).

Several factors have been identified as responsible for students' poor performance in mathematics. These include weak foundational knowledge, overcrowded classrooms, mathematics anxiety, negative attitudes toward mathematics, inadequate instructional materials, and poor teaching methods (Mosimege et al., 2024; Nzeadibe et al., 2025; Sarfo et al., 2020, 2022, 2025; Terry et al., 2023). However, one critical factor that has received growing scholarly attention is the dominance of English as the language of instruction in mathematics classrooms (Esuong et al., 2024; Popoola & Ayodeji, 2022). In multilingual societies such as Nigeria, many learners encounter difficulties understanding mathematical concepts when instruction is delivered solely in English, which is often not their first language. This language barrier may hinder meaningful comprehension, classroom participation, concept retention, and overall academic achievement (Igbojinwaekwu & Dorgu, 2015).

Studies have shown that students learn more effectively when instruction is delivered in a language that is familiar to them. Popoola and Ayodeji (2022) observed that the use of English as the dominant medium of instruction contributes significantly to low achievement and retention in mathematics among secondary school students. Similarly, UNESCO (2021) emphasized that mother tongue-based education promotes better understanding, improves participation, and strengthens learners' cognitive development. Esuong et al. (2024) further argued that the use of indigenous languages in mathematics instruction enhances communication and facilitates deeper conceptual understanding among learners.

Mother Tongue Instruction (MTI) refers to the use of learners' indigenous or first language as the medium of teaching and learning (Nyamekye, 2022). In mathematics education, MTI helps to simplify abstract concepts, make learning culturally meaningful, and connect classroom instruction to learners' everyday experiences. Research evidence indicates that mother tongue instruction enhances students' understanding, retention, engagement, and academic achievement in mathematics (Abegunde et al., 2018; Asanre et al., 2022; Esuong et al., 2024; Onyeka et al., 2023). Abegunde et al. (2018) reported that the use of indigenous language in mathematics teaching positively influenced students' achievement, while Asanre et al. (2022) and Onyeka et al. (2023) found that mother tongue teaching strategies improved students' academic achievement and interest in mathematics at the primary and junior secondary school levels.

Beyond improving achievement, culturally responsive mother tongue instruction also creates opportunities for learners to connect mathematical ideas with familiar cultural experiences. In the Igbo cultural context, geometry concepts such as circle, radius, tangent, arc, and chord can be related to indigenous objects and everyday practices. For example, a circular village meeting ground or market square may be used to explain the concept of a circle, while a stick placed across a clay pot can illustrate diameter and radius. Such culturally grounded instructional

examples make learning more relatable and meaningful for learners (Gay, 2018; Vygotsky, 1978).

Although previous studies have established the benefits of mother tongue instruction, existing literature reveals important gaps. Most studies have focused on primary and junior secondary school learners, with limited attention given to senior secondary school students (Asanre et al., 2022; Frederick-Jonah & Igbojinwaekwu, 2015). In addition, there is little empirical evidence on the effectiveness of mother tongue instruction in teaching geometry concepts in Nigeria, particularly within the Igbo cultural context. Furthermore, the influence of culturally responsive Igbo-based instruction on students' retention of mathematics concepts remains underexplored, while findings regarding gender differences are still inconclusive (Egara & Mosimege, 2024, 2023; Okafor et al., 2023; Osakwe et al., 2022). It is against this background that the present study aimed to investigate the effect of culturally responsive mother tongue instruction through the Igbo language on students' retention of geometry concepts among Senior Secondary School I (SS I) students in Nsukka Education Zone of Enugu State, Nigeria. The study also examined whether gender significantly influences students' retention when taught using culturally responsive Igbo-based instruction.

Specifically, the study sought to answer the following research questions:

1. What is the effect of culturally responsive teaching through the Igbo language on students' retention of geometry concepts?
2. Is there a significant difference in the retention of geometry concepts between male and female students exposed to culturally responsive Igbo-based instruction?

The following null hypotheses guided the study and were tested at 0.05 level of significance:

- H₀₁: There is no significant difference in the retention of geometry concepts between students taught using culturally responsive Igbo-based instruction and those taught using conventional English-based instruction.
- H₀₂: There is no significant difference in the retention of geometry concepts between male and female students taught using culturally responsive Igbo-based instruction.

Theoretical Framework

This study was anchored on two related theoretical frameworks: Culturally Responsive Pedagogy (CRP) propounded by Geneva Gay in 2018 and Sociocultural Theory (SCT) propounded by Lev Vygotsky in 1978. Culturally Responsive Pedagogy emphasizes the integration of learners' cultural backgrounds, experiences, and language into the teaching and learning process. According to Gay (2018), students learn more effectively when instruction reflects their cultural realities and lived experiences. In mathematics education, this involves the use of familiar cultural examples and indigenous language to explain abstract concepts. In the present study, the Igbo language and culturally relevant examples were used in teaching geometry concepts to make learning more meaningful and improve students' retention. Similarly, Sociocultural Theory by Vygotsky (1978) explains that learning occurs through social interaction and is mediated by language and culture. The theory views language as an important tool for cognitive development and knowledge construction. The use of the Igbo language as a medium of instruction therefore provided learners with opportunities to understand and discuss geometry concepts within a familiar linguistic and cultural context, thereby enhancing comprehension and retention. The two theories are relevant to this study because they justify the use of culturally responsive Igbo-based instruction in mathematics teaching. While Culturally Responsive Pedagogy supports the integration of learners' language

and culture into instruction, Sociocultural Theory explains how learning is enhanced through language-mediated interaction. Together, the frameworks guided the development of the lesson plans and instructional activities used in the study.

Methods

This study adopted a true experimental research design using a pretest–posttest control group structure to investigate the effect of culturally responsive mother tongue instruction through the Igbo language on students' retention of geometry concepts. The study was carried out in the Nsukka Education Zone of Enugu State, Nigeria. The population of the study comprised 2,492 Senior Secondary School I (SS I) students in public secondary schools within the study area. A sample of 80 students was selected using a multistage sampling procedure. Two boarding secondary schools were purposively selected, after which 40 students were randomly selected from each school. The students were further randomly assigned into experimental and control groups using a computer-generated randomisation procedure.

Data for the study were collected using the Geometry Achievement Test (GAT), a 20-item multiple-choice instrument developed to assess students' understanding and retention of circle geometry concepts. The test items were developed based on Bloom's taxonomy and aligned with the mathematics curriculum as well as WAEC and NECO examination standards. Two lesson plans were also developed for the experimental and control groups using the same curriculum content. The experimental group was taught geometry concepts using culturally responsive Igbo-based instruction, while the control group was taught using the conventional English-based instructional method. In the experimental group, geometry concepts were explained using the Igbo language and culturally familiar examples such as clay pots, village meeting huts, woven baskets, and local objects to simplify abstract concepts. Both groups were taught by qualified mathematics teachers who received prior training on the implementation of the lesson plans and culturally responsive teaching strategies. To ensure the validity of the instrument and lesson plans, three experts in Mathematics Education, Curriculum Studies, and Measurement and Evaluation validated the materials. A pilot study was conducted using students outside the study area, and the reliability of the GAT was established using the Kuder–Richardson Formula 20 (KR-20), which yielded a reliability coefficient of 0.81, indicating high internal consistency.

Before the commencement of the study, ethical approval and permission were obtained from the relevant school authorities, while informed consent was obtained from the students and their guardians. The experiment lasted for six weeks, during which both groups received instruction on circle geometry concepts. Data collection was conducted in three stages: pretest, posttest, and post-posttest (retention) stages. The pretest was administered before treatment to determine students' prior knowledge, while the posttest was conducted immediately after the treatment. A delayed posttest was later administered to determine students' retention of the geometry concepts taught. The data collected were analyzed using Statistical Package for the Social Sciences (SPSS) version 28. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at the 0.05 level of significance. Posttest scores were used as covariates during the retention analysis to control for initial differences among the students.

Results

The presentation of findings is in line with research questions and hypotheses.

Research Question One

What is the effect of culturally responsive teaching through the Igbo language on students' retention of geometry concepts?

The analysis reveals that students taught using culturally responsive Igbo-based instruction ($n = 40$) obtained a higher mean posttest score ($M = 65.23$, $SD = 7.98$) and retention score ($M = 68.83$, $SD = 5.71$), with a mean gain of 3.60. In contrast, students taught using the conventional English-based instructional method ($n = 40$) recorded lower posttest ($M = 59.58$, $SD = 6.29$) and retention scores ($M = 61.62$, $SD = 5.82$), with a mean gain of 2.04. This suggests that culturally responsive teaching through the Igbo language positively influenced students' retention of geometry concepts more than the conventional English-based instructional approach. The test of Hypothesis One further verified this finding.

Hypothesis One

There is no significant difference in the retention of geometry concepts between students taught using culturally responsive Igbo-based instruction and those taught using conventional English-based instruction.

The ANCOVA result revealed a significant difference in the retention scores of students taught geometry concepts using culturally responsive Igbo-based instruction and those taught using the conventional English-based method ($F(1, 75) = 18.453$, $p < .05$). This indicates that culturally responsive teaching through the Igbo language significantly improved students' retention of geometry concepts. With a moderate effect size (partial eta squared = .197), the instructional method accounted for approximately 19.7% of the variance in students' retention scores. Consequently, the null hypothesis was rejected, confirming that the instructional approach significantly influenced students' retention of geometry concepts.

Research Question Two

Is there a significant difference in the retention of geometry concepts between male and female students exposed to culturally responsive Igbo-based instruction?

Male students taught geometry concepts using culturally responsive Igbo-based instruction obtained a posttest mean score of 64.90 ($SD = 6.22$) and a retention mean score of 66.75 ($SD = 4.44$), resulting in a mean gain of 1.85. Female students recorded slightly higher scores, with a posttest mean of 65.55 ($SD = 9.58$) and a retention mean score of 70.90 ($SD = 6.17$), producing a mean gain of 5.35. Although both male and female students demonstrated improved retention of geometry concepts, female students showed a slightly greater improvement. The test of Hypothesis Two was conducted to determine whether this observed difference was statistically significant.

Hypothesis Two

There is no significant difference in the retention of geometry concepts between male and female students taught using culturally responsive Igbo-based instruction.

The ANCOVA analysis revealed no significant difference in the retention scores of male and female students taught geometry concepts through culturally responsive Igbo-based instruction ($F(1, 75) = 1.536, p = .219$). This implies that gender did not significantly influence students' retention of geometry concepts. Consequently, the null hypothesis was not rejected, indicating that retention scores were statistically similar for both male and female students exposed to culturally responsive Igbo-based instruction.

Discussion

The study examined the effect of culturally responsive teaching through the Igbo language on students' retention of geometry concepts compared to the conventional English-based instructional method. As revealed by the first hypothesis, students taught geometry concepts using culturally responsive Igbo-based instruction demonstrated significantly higher retention scores than those taught using the conventional English-based method. This finding indicates that culturally responsive mother tongue instruction effectively enhances students' retention of geometry concepts. The improved retention observed among students exposed to Igbo-based instruction may be attributed to the use of learners' familiar language and culturally relevant examples during instruction. Teaching geometry concepts through the Igbo language likely reduced the language barrier associated with English instruction and enabled students to connect abstract mathematical ideas with their lived experiences. Furthermore, the integration of culturally familiar illustrations such as clay pots, village meeting grounds, woven baskets, and market trays may have enhanced students' comprehension, engagement, and long-term memory of the concepts taught.

This finding agrees with previous studies which reported that mother tongue instruction improves students' retention and academic performance. For instance, Abegunde et al. (2018) found that the use of indigenous language positively influenced students' achievement in mathematics, while Asanre et al. (2022) reported that mother tongue teaching strategies enhanced students' retention and understanding of mathematics concepts. Similarly, Onyeka et al. (2023) observed that the use of indigenous language in mathematics instruction improved pupils' academic achievement and interest. Esuong et al. (2024) also emphasized that mother tongue instruction facilitates better communication and conceptual understanding in mathematics classrooms. These studies collectively support the effectiveness of culturally responsive mother tongue instruction in improving students' retention of mathematics concepts. The finding is further supported by the theoretical frameworks underpinning the study. Culturally Responsive Pedagogy by Geneva Gay (2018) emphasizes that students learn more effectively when instruction reflects their language, culture, and lived experiences. Likewise, Sociocultural Theory by Vygotsky (1978) posits that language and social interaction play important roles in cognitive development and knowledge construction. The use of the Igbo language during instruction therefore provided students with a familiar linguistic and cultural environment that enhanced understanding and retention of geometry concepts.

Regarding gender, the study found no significant difference in the retention scores of male and female students taught using culturally responsive Igbo-based instruction. Although female students recorded slightly higher mean retention scores than male students, the difference was

not statistically significant. This suggests that culturally responsive Igbo-based instruction is equally beneficial to both male and female students. The finding implies that when learners are taught using familiar language and culturally meaningful instructional approaches, gender differences in retention may become less pronounced. The finding aligns with the assumptions of Sociocultural Theory, which emphasizes that meaningful learning occurs when learners actively interact within culturally familiar contexts, regardless of gender. Similarly, Culturally Responsive Pedagogy supports inclusive instructional practices that promote equal learning opportunities for all students. Thus, the use of culturally responsive Igbo-based instruction created an engaging and supportive learning environment that enhanced retention among both male and female students.

Conclusion

The findings revealed that students taught geometry concepts using culturally responsive Igbo-based instruction retained the concepts significantly better than those taught using the conventional English-based instructional method. The study also found that gender did not significantly influence students' retention of geometry concepts, indicating that the instructional approach was effective for both male and female students. These findings highlight the importance of integrating indigenous languages and culturally responsive strategies into mathematics instruction, particularly in multilingual societies such as Nigeria. The study demonstrates that using learners' mother tongue and culturally familiar examples can improve students' understanding, engagement, and long-term retention of abstract mathematical concepts such as geometry. Although the findings provide important insights into the effectiveness of culturally responsive mother tongue instruction, caution should be exercised in generalizing the results because the study was limited to a specific geographical location and focused only on geometry concepts among SS I students.

Nevertheless, the study has important educational implications. Mathematics teachers should be encouraged to incorporate culturally responsive teaching practices and indigenous languages into classroom instruction where appropriate. Curriculum planners and educational policymakers should also consider integrating mother tongue-based instructional approaches into mathematics curricula to enhance students' learning outcomes. Furthermore, teacher training programmes should equip educators with the knowledge and skills required to implement culturally responsive instructional strategies effectively in multilingual classrooms. Future studies should examine the effectiveness of culturally responsive mother tongue instruction across other mathematics topics, educational levels, and cultural settings.

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Cross-Cultural Pedagogy and Interdisciplinarity Learning in the ESL Class: A Practice-Oriented Contribution in Middle and High School Levels

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Abstract

This narrative describes a practice-oriented contribution in the ESL resource class, specifically, the impact of a cross-cultural approach (Mouboua et al., 2024) and how it played a role in the plot design of a curricular model intended to help multilingual learners at public schools in the US to switch themselves from a passive role to a more active one in their second language acquisition process. It also provides an analysis of the challenges and benefits of incorporating the sociolinguistic needs of multilingual learners and the functionality of the second language to be learned (Garrido & Oliva, 2015). The methodological framework and scope of some of the interventions during the ESL sessions at the middle school and high school levels include the incorporation of student-centered approaches combined with the goals and aims in classes such as English Language Arts, Geometry, World Geography, and Writing Composition, in other words, the integration of interdisciplinary learning in the ESL class. The outcomes from this experience suggest the importance of adapting materials and activities bringing out the cultural component of different diverse groups of students in the classroom, exploring the role of teaching and learning strategies that include visual and auditory clues rather than promoting the use of continuous plain translations, and the relevance of advocating for more professional development practices that guide general education teachers to build those self-reflections to start the process of understanding the aims of a culturally responsive pedagogy (Auslander, 2018).

Keywords: multilingual learner (ML), cross-cultural studies, interdisciplinary learning, English as a second language (ESL), adapting materials

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Introduction

When assuming the role of helping others to become “intercultural competent” (Contreras, 2016) one must take into consideration the fact of having developed a full understanding of the role of cross-cultural classrooms (Auslander, 2018) towards the foreign or the second language to teach. That is why a profound analysis of how curricula, interdisciplinary learning, teaching didactics, and assessments combined in the ESL/EFL classroom need to be examined to give language learners, in this case English learners, the choice to take ownership of their learning experience.

This paper intends to review pertinent literature relevant to the field of ESL teaching impacting English learners or multilingual learners' education and performance in their everyday lives both inside and outside of the school context. In the first part, information is provided in regards to the theoretical findings about the components needed to teach multilingual learners to position them for success. Then, the impact of teachers' beliefs about what it implies to build a culturally responsive pedagogy in their classrooms, is presented. After that, the methodology implemented in a practice-oriented contribution in various scenarios of ESL classrooms in the areas of English Language Arts and Geometry (middle school) and World Geography I, Writing Composition (High school) is described. Finally, it concludes with a critical reflection and samples of lesson plannings regarding the pursuit of meaningful ways to foster interdisciplinary learning and cross-cultural understanding in multilingual students at public schools in the USA.

Literature Review

Multilingual Learners, Their Backgrounds and Their Needs Beyond the School Context

It is believed that learning a language in a second language environment brings greater advantages to the learner because it facilitates the acquisition process of the new language, as long as the individual remains committed and shows dedication and willingness to learn (Kozhevnikova, 2018). But it is also true that there exist some factors that impact this second language acquisition process (Krashen, 1982) such as the environment for learning, the level of anxiety that an individual might experience and the new cultural norms and clues from the new place. All those factors surround our English learners or multilingual learners, every day. According to the National Center for Education Statistics (2021) the term multilingual learner carries out characteristics such as first language traits and backgrounds that might impact the performance in the new second language school environment. So, multilingual learners can be classified as newcomers, limited English proficiency, dual language learner, long term experienced multilingual, among others. All of them come with different backgrounds and prior educational experiences that have been building them through their lives.

For instance, Heineke and Vera (2022) carried out a study in teacher education programs that educate preservice teachers. During the study, one of the surveys the researchers conducted was for different groups of students. This step allowed them to identify perceptions of students regarding strategies applied by teachers to scaffold and modify content area instruction. When reading the results from the students' surveys (Heineke & Vera, 2022) there are two main insights that attracted the attention of the researchers: 1. Students talked about the fact of having teachers who do not understand their cultures and their backgrounds and teachers using complex words when explaining content. In addition, they are not providing resources that

allow them to build definitions for such words which has resulted in frustration and anxiety when students were trying to concentrate during instructional time.

Garrido and Oliva (2015) worked on a program proposal for multilingual adult learners that tackles their social needs and functional usage in society of the second language they were intended to learn, in this case, the Catalan language. The authors carried out a three-month pedagogical project for 8 adult multilingual learners from different nationalities. The design aimed at helping multilingual learners to accommodate to their new environment in a new country. According to the authors, the foundation for this pedagogical intervention came after careful observations of multilingual learners' needs to discover meaningful approaches to teach them the second language. The proposal suggests four main components: *1. The identification of sociolinguistics needs from multilingual learners. 2. The materials proposed oral and visual clues, as much as possible. 3. The units created are written in Catalan (the second language) but translated into different languages.* An example unit they talked about in their experience presents learners with everything they need to learn to be competent at the time of a doctor's visit and legal requirements to apply for a health card in the public or private health system. *4. The activities followed formative and summative assessments.* The students' final aim is to get an Intermediate level certificate (B) which in other words translates to a B2 level from the Common European Framework of Reference for Languages, (CEFR, 2020). So, in other words, they need approaches and methodologies to facilitate social language and academic learning because, as any other individual, they need to be able to learn how to perform in the school context and beyond.

Interdisciplinary Learning, Academic Content, SIOP Model of Instruction and More Resources for ELLs

Wei (2021) carried out a pedagogical experience in teaching academic vocabulary to multilingual learners that intended to help the academic community to elaborate on common grounds when teaching content area subjects to English learners. The study also reports on how convenient it is to have them on sheltered instruction (Shi et al., 2021) to support their content area learning. In this work, Wei (2021) stressed the importance of guiding learners in the process of acquiring the academic vocabulary they will need to engage in content learning. To do this, the author walks them through the different categories of academic vocabulary and provides emphasis on the relevance of knowing about these categories before planning on integrating interdisciplinary learning in an ESL class. The categories described in Wei's article (2021) talks about 1. Generally academic vocabulary, 2. Content vocabulary and 3. Word parts such as "roots and affixes" (p. 1512). It is important to recognize the three of them to be able to know how to integrate them in the English as a second language lesson plan. Apart from that, another important thing is to know the different tiers of vocabulary (Beck et al., 2013) "Tier 1 high frequency words such as verbs, nouns and sight words. Tier 2 high frequency words across the curriculum such as vary, formulate and specify" (Beck et al., 2013, pp. 1508-1509). As for Tier 3, the authors refer to those particular words that are pertinent to the content area domain. For example, if we talk about a geometry class we can identify "Tier 3 low frequency words" (Beck et al., 2013, pp. 1508-1509) such as integers and obtuse angles. By finding this information in each unit or module English learners would develop the capacity to classify the content area and the academic vocabulary. This will also be helpful at the time of elaborating their own understanding in every lesson.

On the other hand, recognizing the differences between BICS and CALP presented by Sepe (2018) gives a better view of the big picture when identifying strategies to take multilingual

learners to a starting or a higher level in CALP. CALP is understood as the comprehension and usage of concepts that are not easily identified and comprehended by second language learners, (Cummins, 2000). For example, the author mentions that BICS can recognize familiar settings with the help of visual aids while CALPs are more literate and able to apply punctuation rules in their narratives. Sepe (2018) also highlights the benefits of learning to recognize if your multilingual learners are BICS or CALPs will better outline the path that you, as the teacher, should follow to help your student get closer to developing into CALP. Nowadays, one-way multilingual students could be brought into CALPs through the integration of technology during instructional time. Klimova (2021) carried out a study in which the author intended to find out the benefits of integrating virtual reality into the teaching and learning of multilingual students. The study describes the three types of virtual reality environments we are nowadays seeing and that are involved in any subject, and of course, in language learning: 1. Non-immersive (e.g. learning experiences enhanced through high resolution monitors/platform), 2. Semi-immersive (e.g. simulators) and 3. Immersive virtual environments (e.g. 3D, Head-Mounted Displays (HMDs)). According to the findings from this research, all of them facilitate a real use of the second language in different backgrounds and promote autonomous learning, but at times these tools do not reach everyone because they will depend on the institution's policies and resources for it. Nevertheless, this study reveals how beneficial it would be for English learners to be exposed to these kinds of resources in second language learning. These interactions would help students get into CALP levels.

Teachers and the Urgent Need for a Culturally Responsive Pedagogy in Their Classrooms

Acknowledging others' cultures is not an easy task. Hoffman (2018) states that a culturally responsive teacher portrays a mix of considerations starting by being fully aware of his/her culturally diverse students and making decisions about how to present content in a way that multilingual learners feel acknowledged in their cultural roots and that their realities and their worlds are brought into the curriculum. Baron (2007) talks about the eight developmental stages in a cultural proficiency continuum. One of those stages, the Monocultural Education, highlights the emphasis on the concept of cultural competence in a unidirectional way where school personnel are more into finding ways where multilingual learners can fit into their own culture. In this stage the concern is to mold students from other backgrounds into the school policies and classroom practices already established for everyone. Secondly, Baron (2007) also identifies the cultural ineptitude stage, as stated by the author "the drill, kill and endless remediation are the curricular norms" (Baron, 2007, p. 47). Teachers need to understand that exposing English learners to drilling practices at the same level of their English speakers' peers, without any modifications or adaptations to learning materials will leave them at a disadvantage. And then, "the remediation worksheets" (Baron, 2007, p. 48).

Parker (2019) presents five dimensions to guide educators in the process of making their classrooms safe spaces for multicultural learners and for multicultural learning. Those 5 dimensions are: "1. *Knowledge Construction Process*, 2. *Content Integration*, 3. *Prejudice Reduction*, 4. *Equity Pedagogy* and 5. *Empowering School Culture*" (Parker, 2019, p. 27). The author discusses here, how by implementing these 5 dimensions in the curriculum, educators could have an opportunity "to change their curriculums as well as students' lives" (p. 12). In particular, the Content Integration dimension allows multilingual learners to see different examples from different cultures, and this allows meaningful learning to happen and connect (Banks, 2016, 2019). Following this train of thought, there is an urgent need for teachers to understand that the role of educators is beyond lecturing and training. Even though, with or without English learners in the class, educators are called to bring an understanding of what

living in community means because that is what human beings do every day. We live in communities, and communities are composed of people of different beliefs, thoughts, cultural backgrounds and languages.

Methodology and Discussion

The following section presents the methodology implemented as a practice-oriented contribution in the form of lesson planning adaptations in the areas of English Language Arts and Geometry (middle school) and World Geography I and Writing Composition (High school) with multilingual learners. The classes had their own teachers, experts or long-term substitutes. The adaptations came because of the ESL teachers' observation journal (Appendix A) in her collabo classes, the ESL students' scores on their summative assessments (quizzes, midterm tests, e.g.), and the previous literature review mentioned in this paper. The interventions were done during the ESL class, and, at times, I was asked by the general education teachers to pull out the students to be able to work with them for about 40 minutes. In some other opportunities the general education teacher was willing to allow me to collaborate/co-teach with her (Figure 1). The High school classes did have a teacher-student participating in interaction with the whole class, including the multilingual learners.

Figure 1

ESL / English Language Arts Class at the Middle School Level – 7th Grade



A survey was also sent to the general academic community worldwide using social media in hopes of gathering input from different educators in different roles. For instance, the survey was conducted by general core class teachers in different subjects such as math, social studies, biology, ESL, SPED, e.g. (Figure 2).

Figure 2*General Academic Community Teachers' Input – Survey – Demographic Data*

Participants responded to 5 questions (Appendix B). 15 teachers were willing to participate in the survey. As we can see in Figure 2, 50% of the participants were active ESOL/ ESL teachers, 33,3% were general education teachers from different core classes, electives, or CTE courses. Only 16,7% were SPED teachers working with at least one English learner in the classroom. The outcomes from this survey helped inform this classroom experience about the current level of awareness of culturally responsive pedagogies and initiatives during class activities and the type of approaches used when working with multilingual learners.

Lesson Plan Sample I

Krashen's hypothesis (1982) distinguishes between the acquisition part and the learning hypothesis part. During the acquisition part, individuals' interaction with the natural environment of the second language, subsequently, allows the second language learners to naturally acquire the language while individuals that must face the learning process will require the help of an adequate learning environment, the adaptation of materials and the emphasis on the second language rules. According to Krashen and Terrell (1983) the older a person starts the process of second language acquisition is when the most support this person is most likely to need. In this practice-oriented contribution a lesson plan template introduced by the American College of Education (2020) as part of the course Materials and Methods for Teaching second language learners was adapted for an ESL class for 7th graders with the content areas of Geometry and English Language Arts. The template integrates Krashen's hypotheses (1982) and Virginia Collier's prism model (2007). The adaptations made to the lesson plan template included adding can do statements, one per each content area, the description of focus activities per each content area and the addition of a cross-cultural component with a focus explicit activity. In addition to that, the guiding questions suggested by the template were carefully designed and thought by the ESL teacher. They were also aligned to the educational principles of the experts (Table 1 and 2).

The connection between instruction and the cultural component adapted in this lesson plan led to the promotion of students' confidence. The dressing like a Valentines' character using polygons shapes activity allowed students to have fun while trying to make connections in their brains regarding how to identify the characters, the setting, and the theme in a narrative. They were also learning about the reasons behind the celebration of Valentines' Day at their new school and the differences from the Friendships' Day celebration in their own cultures.

On top of that, this lesson gave them the chance to put into practice the polygon shapes they had been struggling to identify. And of course, second language learning.

In the same way, Ramirez (2015) conducted a qualitative study of undergraduate students to examine how the inclusion of the concept of formative research and classroom projects in an Anglophone cultural course could have an impact in the way teachers connect to language learning and awareness of cultural backgrounds. Firstly, Ramirez (2015) identified the concept of “formative research” in her study, and how it helped to shape her learners from being passive learners in the Anglophone cultural course to be independent learners taking care of their own learning process (p. 77). From Ramirez’s (2015) research experience it was identified that through the implementation of formative research oriented to learners’ projects, students were able to realize the importance of developing an “appropriateness of the topics and relation with other fields of knowledge in the Anglophone cultural course” (p. 83). This experience serves as a mirror about the importance of not only connecting the concepts of assessment and learning, but also the relevance of making students aware of their own learning process (Table 1. Content areas 1 and 2 can do statements and focus activities).

Table 1

Content Areas 1 and 2 Can Do Statements and Focus Activities From the ESL Lesson Plan Template Practice-Oriented Contribution Sample 1

Content area 1: English Language Arts	Can do: I can identify the parts of a short narrative (characters, setting and a theme) Focus activity: Write a Valentines’ Day short story of maximum 8 lines. The narrative should have characters, a setting , a theme and a conflict that can be easily identified by the reader. Vocabulary: Flowers, heart, chocolates, cake, rose, cards, e.g.	Content area 2: Geometry	Can do: Learners can identify, classify polygons and find their missing angles Focus activity: Dressing like a Valentine character using polygons shapes Vocabulary: circle, square, triangle, octagon, pentagon, decagon, heptagon
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It also makes me realize that instruction and assessment go together. We must be on the lookout for the assessments we want to direct our instruction towards the outcomes we need, or we want our learners to achieve. To do that, we, the teachers, should start seeing our lesson plans as the platform we use to write those key questions (Table 2. Guiding questions throughout the lesson plan) that will help us organize the content area along with the conditions to promote student-centered learning for all types of learners.

Table 2*Guiding Questions Throughout the Lesson Plan From the ESL Lesson Plan Template*

Theme: Valentines' Day or Friendship's Day: What is the shape of your heart?	Cross-cultural component: Learners can understand and differentiate the celebration of Valentines' Day in their new school vs. the Friendships' Day celebration they used to celebrate in their hometown	Resources: Copies Bristol paper Tape Scissors Construction paper different colors	Collier's Prism Model - Social and Cultural Process Guiding question: How can I make my learners feel their cultural backgrounds are appreciated/valued?
	Focus activity: Reading workshop about Valentines' Day origin and filling out a compare and contrast list between Valentines' celebration in the US and Friendships' Day in most Hispanic countries Vocabulary: February the 14th, September the 15th, Valentino, a priest, love couples, e.g.		

Lesson Plan Sample 2

Teaching multilingual learners implies not only knowing how to adapt materials to their English proficiency levels but also how to create diverse opportunities for learning and meaningful assessments. Grapin et al. (2021) carried out a pedagogical experience in which they wanted to explore strategies to teach ELLs in their science curricula. They found out the use of three main strategies that could grant benefits when working with multilingual learners although they need to be rethought. Those strategies were: 1. *pre-teaching vocabulary*, 2. *providing sentence frames and starters* and 3. *using visual aids*. The following lesson planning gives account of the adaptation for the use of these three strategies in an ESL class.

Table 3

Day 1, 2 and 3 From a One-Week Lesson Plan Template Taken and Adapted From Methods and Materials for Teaching English as a Second Language (American College of Education, 2023)

Day 1 Lesson Plan		
Time Requirement	Strategy/Activity	Resources
25 min	1. Individual warming task/Activating knowledge 1. Students will be asked to watch a 9-minute YouTube short video. 2. Students will listen to a speaker talking about Natural, Human and Capital Resources. 3. Students will take notes about simple words they can recognize, either from the video or by listening to the speaker. (Notes can be taken in the students' first language). 4. Students will be asked to go over the word bank section and select 5 words from the previous notes section of the YouTube short video. 5. Students will represent each word with a drawing, to start creating the flashcards for the next activity.	9 min YouTube short video Three Kinds of Resources - Natural, Human, and Capital Resources Warming up Task worksheet: Video comprehension Colors and pencils
45 min	2. Group game/ Pictionary 1. Divide the class into three groups: Group A: Human Resources, Group B: Capital Resources and Group C: Natural Resources. 2. The Teacher collects the word bank part from each student's individual warming task. These will be used as the words	White board, markers and eraser Word bank Flashcards

	that learners will be drawing and guessing during the Pictionary game. 3.The teacher can allow learners to guess the words in their native language, but the use of the second language will be encouraged. 4.Students guessing the word can spell the word or write the word on a piece of paper. 5.Groups will take turns to go over the words.	
20 min	3.Cooperative Exit ticket/ The Resources posters 1. The teacher divides the class again into three new different groups. 2. The teacher gives each group a set of words that contains different types of resources from all the words discussed today about Capital, Human and Natural resources. 3. Students have 3 minutes to go around the classroom and stick their cards on the corresponding poster: either Capital, Human or Natural Resources. They will have different words that can go into different categories. 4. The Teacher goes over each poster, checks for understanding of the categories and examples, takes the time to read the words aloud and asks students to repeat.	Vocabulary cards - three different colors (could be sticky notes with the words on them) 3 posters stuck on the classroom walls with the following titles: Poster 1: Human Resources Poster 2: Capital Resources Poster 3: Natural Resources

Day 2 Lesson Plan		
Time Requirement	Strategy/Activity	Resources
25 min	1. Pair work/Review Activity 1.Students will write down all the words that come to their minds in 5 minutes about the following resources: 1. Human Resources 2. Capital Resources 3. Natural Resources 4. Energy Resources 5. Renewable Resources and 6. Non-renewable Resources. 2.Teacher will start asking students to participate by reading some of their answers aloud or coming to the board to write the words. 3.Teacher will write the words on the board and use the board to check on students' answers.	-Review worksheet: Writing Section -White board, markers and eraser
30 min	2.Individual work/ Sentence Frames 1.Students will answer 3 questions: a. Why do you think Natural resources matter to you? b. Why do you think Capital and Human resources should matter to you? c. Why do you think Renewable and Non-renewable resources should matter to people?	Critical thinking worksheet Part 2: Why do you think ...? <u>Sentence Frames Box</u> 1. _____ resources matter to me because ... 2. Because _____ resources are... 3. These resources matter to people because...

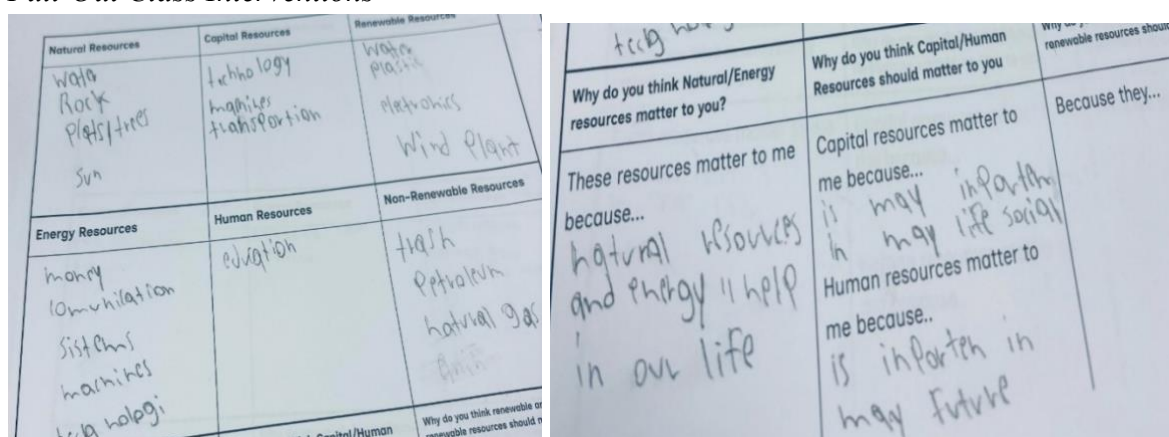
	2.Students will have some sentence frames they will be asked to follow to complete their opinion sentences.	
35 min	3.Pair work/ Conversation Corners 1. The teacher can start by sharing his/her opinion on the board by using the same sentence frames in the students' worksheet, read it slowly and start the discussion. 2.The teacher pairs up students again and asks them to share their opinions. To make it more interesting, the teacher can use an attention grabber of his/her preference such as snapping fingers, playing 20 seconds of an English song that is on trend among teens to ask students to switch partners and continue sharing with their new partners their opinions regarding the 3 questions proposed above.	Oral performance Worksheet Part 3: Why do you think ...? Oral performance part: Student 1: "Natural and Human resources matter to me because..." Student 2: "Capital resources matter to me because..."
Day 3 Lesson Plan		
Time Requirement	Strategy/Activity	Resources
15 min	1.Warming up/ Matching interactive activity 1. Students will be asked to go to their Canvas and click on QUIZLET: Energy resources and problems match activity.	Student laptops /Wifi https://quizlet.com/1155466288/match?funnelUUID=929ac397-6b67-4b48-94f5-35b17f3608cf

	2. The teacher plays this activity live with the whole group. The activity can be played 2 times. Rationale: This 15-minute interactive warming up activity will be beneficial for learners to appreciate different modes of learning and methodologies.	
50 min	2.Small Group / Reading Comprehension 1. Students will receive an independent reading package about the key new academic vocabulary to learn: Deforestation, Air Pollution, Pollution, Radioactive Waste and Solar, Wind and Hydroelectric Power 2. Students will work on the comprehension part of the package part 1 -3. 3. The teacher circulates around the classroom providing feedback to each small group and checking on students' comprehension of the content academic vocabulary.	Reading Comprehension Package (Sheltered instruction activity) Part 1: Reading passages 1 and 2 Part 2: Cause and Effect: Match the scenario to the result Part 3: Compare and contrast: What is worse, deforestation or radioactive waste?
25 min	3.Exit Ticket/ Self-reflection word-to-sentence 1. Students will take a self-reflection quiz about the environmental problems discussed in class today by using the words from the word bank to complete each sentence about energy resources and environmental problems	Self-reflection worksheet Pencils

The lesson plan sample for this experience shows a remediation lesson for a one-week lesson plan for an-English as a resource class, 9th–12th graders. It is a plan that integrates a lot of opportunities for learners to get acquainted with the general theme of the lesson which is to understand the world of international trade between countries and the importance of resources worldwide. This is just 3 days of planning. The strategies combined here go from individual warming ups, pair and small group, cooperative groups tasks and exit tickets to give learners different scenarios for learning. I also integrated review assignments, the sheltered instruction model (Shi et al., 2021) and different kinds of formative assessments (Table 3). For instance, in Figure 3, *Artifacts from students' written work* can be seeing how the sentence frames provided in this worksheet helped the multilingual students to complete the individual task while building confidence and autonomy in their learning process.

Figure 3

Artifacts From Students' Written Work During the Remediation Sessions in Days 2–3 ESL Pull-Out Class Interventions



The Quizlet activity (Reyes, [teachinginglesuni], 2026) which is an online environment task aims at helping learners to make connections with the facts about which environmental problems might arise from some energy resources. In general, the goal of the lesson is to support learners in their understanding of all these complex terminologies as well as their English language proficiency. After the remediation sessions were over, students took the summative assessment in the form of an online quiz. They took the alternative quiz version after failing the first one. They passed the second one.

Conclusion and Recommendations

In very broad descriptive terms, one thing that could be done to meet English learners' needs in their content area classes, is to carefully look at the accurate pedagogical approaches, methods for English Learners. In other words, there is a lack of target instruction (Watkins & Lindahl, 2010) for them. According to Watkins and Lindahl (2010) target instruction is defined as that layer of support that should be offered to our English learners. This layer of support will allow them to start manipulating the content area learning required by core classes. General education/content area teachers should receive adequate support for them to plan their lessons guided by the stages of the literacy development (Wolf, 2007) of the students they serve. This is where the mismatch comes from. Instead, the emphasis for lesson planning is on the content area itself and the skills required to be considered proficient in that specific area.

Teachers working with English learners need to transform their approaches for a methodology that tackles both language proficiency skills as well as the skills they will be needing to succeed in the content area. The pedagogical experts and their theories that were merged in these practice-oriented contributions with two different populations of students, middle and high school, attempted to approach English learners to interdisciplinary learning by considering their literacy development stages. For example, the reading activity proposed in the lesson plan sample 1 (Table 2) provides them with word banks, visual clues and the connection between a topic they might already recognize some similar cultural practices from their own backgrounds (e.g. the celebration of the Friendship's Day in their home countries). This is proper of The *Early stage* (Wolf, 2007) characterised as the stage of literacy development where English learners will be able to follow narratives that showcase familiar vocabulary to them. They are also able to recognize spelling patterns that have been continuously used.

The activities proposed in the lesson are planned sample 2 in Table 1. The activities proposed for days 2 and 3 exposed learners to more challenging tasks where they needed to use their critical thinking skills to elaborate written dialogues and extract information to complete their ideas. These are skills English learners also need in their worlds outside where they might need to write a complaint about a service in just one main idea or fill out an opinion survey about a product or service.

Lastly, the ultimate goal of this classroom-oriented experience aimed at raising awareness in the academic community to advocate for more professional development opportunities for teachers to build those self-reflections and start transforming their curriculums and dynamics for one that allows the world to read English learners as citizens of the world and not as individuals belonging to just one culture, one nationality and one country; speaking a foreign language in a foreign land.

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.

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Appendices

Appendix A

ESL Teachers' Observation Journal Transcripts

September 25th, 2024

Class: English Language Arts

Observations: The general education teacher is not in the classroom yet. The students have assigned work for the day. The librarian brings the copies for students to work. The ESL teacher is asked to cover for the class. After 20 minutes, the ESL teacher circulates around the classroom checking on students' worksheets. Then, the ESL teacher asked students to work on their school laptops. An interactive game to check on students' understanding of authors' purpose in a narrative and principal characters in a story is suggested. The ESL teacher starts by reviewing the vocabulary needed for students to participate in the activity.

January 15th, 2025

Class: Geometry

Observations: Students are placed in collaborative tables. All of them are working on different I- ready exercises. I-ready is a school platform widely used by school districts around the US in public education. Students are not allowed to talk. They are constantly directed by the core class teacher to remain in their seats, working on their specific assignments from the I-ready platform. The ESL teacher circulates around the classroom checking on students' work /doubts. Almost at the end of the session the general education teacher starts reviewing students' answers by asking students for their own individual participation based on their individual time work on the I-ready platform. Students are silent. One student, the one with the best math skills, tries to participate. The rest of the class stayed silent. The teacher asked couple of students to participate. Some students called the ESL teacher to ask for language support for them to be available to participate. The class finished with the math teacher telling students to work on their homework as much as they can before the closing period ends.

December 3rd, 2025

Class: WG

Observations: The general education teacher presents the agenda for the session. The student-teacher and the ESL teacher are directed to pass out the note's worksheets for the session. The general education teacher prepares notes for the whole class and prints notes translated in Spanish for the multilingual learners in this group. Most multilingual learners in this class mother tongue is Spanish. Students need to remain attentive to the general education teacher's lecture to be able to fill out their notes package. After finishing notes, students are given some worksheets to continue working individually in a coloring-activity. The ESL teacher circulates around the class checking on multilingual learners' work/doubts. The student- teacher also circulates around the classroom mostly checking on the English-speaking students work/doubts. The general education teacher circulates around the classroom checking on the whole group of students' work/doubts. Multilingual students spent more time during this task since they needed to go multiple times to the google translator to be able to work on the assignment. Some English-speaking students finished the assignment in class. Multilingual

students might need to work during the English as a second language resource class to complete this assignment.

Appendix B

General Academic Community Teachers' Input – Survey

A. Select the one that applies to your experience in the teaching field:

- 1.I am a General Education teacher (Any core, elective or CTE course)
- 2.I am an ESOL Teacher
- 3.Former General Education teacher (Any core, elective or CTE course)
- 4.Former ESOL teacher
- 5.I am a SPED teacher working with at least one multilingual learner in the classroom
- 6.Former SPED teacher with experience of at least one year and at least one multilingual learner in the classroom
- 7.Other

Question 1: What is your understanding of culturally responsive pedagogy?

Please select one or elaborate on your own concept.

- 1.an approach to teaching that helps teachers implement activities to teach students from different backgrounds
2. an approach to teaching that recognizes, values and uses students' cultural backgrounds, languages and lived experiences as assets for learning
- 3.Other

Question 2: In what ways do you/did you incorporate or have you incorporated students' cultural backgrounds, languages, and lived experiences into your instructional planning or classroom activities? Can you provide a short example of that?

Question 3: How do you adapt, or have you adapted materials/ instructional practices to support multilingual learners in linguistically and culturally diverse classrooms? Can you provide a short example of that?

Question 4: What challenges and/or supports do you/did you experience or have you experienced when implementing technology resources for multilingual learners in your sessions?

Question 5: What teaching strategies do you/did you intentionally use or have you intentionally used to engage multilingual learners and promote equitable participation from all the students in your class?

Any additional comments or concerns regarding this topic will be very welcomed.

A Corpus-Based Typology of English Culture-Bound Idioms

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Abstract

Idioms present a well-known challenge in language description, translation, and language learning because their interpretation often depends on culturally specific knowledge. A particularly important subset are culture-bound idioms, whose meanings rely on references to historically and culturally salient entities such as places, persons, institutions, or events. Despite extensive research on idioms and phraseology, relatively little work has systematically examined how such culturally anchored expressions can be classified and empirically investigated using large corpora. This study proposes a preliminary typology of cultural anchors and domains for English culture-bound idioms and examines their distribution in contemporary language use. In the first stage of the project, approximately one hundred idioms were collected from major idiom dictionaries and encoded in a structured lexicographic dataset. Each idiom was classified according to its cultural anchor (e.g., toponym, anthroponym, institution, historical event, or mythological figure) and its associated cultural domain. In a second stage, currently in progress, representative idioms from each domain were checked for attestation in the Corpus of Contemporary American English (COCA) and the British National Corpus (BNC). Preliminary results indicate that culture-bound idioms cluster in several dominant domains, particularly historical, social, and political contexts. The proposed typology provides a foundation for future corpus-based analyses of idiom usage and for applications in translation studies and language pedagogy.

Keywords: idioms, phraseology, corpus linguistics, idiom classification, cultural semantics

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Introduction

Idioms are widely recognized as a key challenge in language description, learning, and translation, not only because of their figurative meanings but also because of the cultural knowledge they presuppose. A particularly important subset are culture-bound idioms, i.e., expressions such as *the Big Apple*, *Boston Tea Party spirit*, *Achilles' heel*, or *loose cannon*, whose interpretation relies on familiarity with culturally salient places, historical events, institutions, and social practices embedded in the Anglophone linguistic tradition. For language learners and translators, such idioms are lexically opaque because they encapsulate compressed cultural narratives that may not be shared outside the source culture.

Although there is now a substantial body of work on idioms, phraseology, and corpus-based description, less attention has been paid to developing a systematic typology of culture-bound idioms that is empirically grounded in large corpora. Existing studies tend either to treat idioms as a single undifferentiated category or to discuss culture-specific expressions qualitatively in individual texts. Consequently, the distribution of culture-bound idioms across cultural domains and their anchoring in specific people, places, and institutions has received only limited corpus-based investigation. A systematic classification of these idioms is important as it makes it possible to examine how cultural knowledge is encoded in phraseology, how different types of cultural references structure idiomatic meaning, and how frequently such expressions occur in contemporary language use.

The ongoing project addresses this gap by combining lexicographic and corpus-based approaches. In the first stage, culture-bound idioms are harvested from major idiom dictionaries and classified according to their cultural anchors (e.g., toponyms, anthroponyms, institutions, events, mythological figures) and associated cultural domains. This yields a typology of anchors and domains and a structured lexicographic dataset. In a second stage, currently in progress, the idioms are being validated in large contemporary corpora such as the Corpus of Contemporary American English (COCA) (COCA; Davies, 2008–) and the British National Corpus (BNC) (BNC Consortium, 2007), and preliminary domain-level corpus results are summarized.

The present paper reports on the design and early outcomes of this project. It introduces the typology of cultural anchors and domains, illustrates the structure of the lexicographic dataset, and presents initial corpus-based evidence in the form of domain-wise attestation rates. More detailed cross-classification matrices and idiom-level corpus profiles are planned for the subsequent stages of the research project.

The study looks at the following research questions:

- RQ1. How can English culture-bound idioms be systematically classified in terms of their cultural anchors (e.g., place, person, institution, event, myth) and cultural domains (e.g., historical, social, political, mythological)?
- RQ2. What is the distribution of culture-bound idioms across these domains in a dictionary-based inventory, and to what extent are idioms in each domain attested in contemporary corpora?

By addressing these questions, the study aims to lay the groundwork for a corpus-informed typology of English culture-bound idioms that can be extended in future work to detailed corpus profiles, semantic prosody, and implications for translation and language pedagogy.

Literature Review

Research on idioms has approached the phenomenon from several complementary perspectives, focusing on structural properties of idiomatic expressions, their cognitive motivation, and their distribution in actual language use. Phraseological studies have long emphasized that idioms constitute a heterogeneous category whose meaning cannot be reduced to a simple combination of their lexical components. Classifications proposed in phraseological research distinguish between different degrees of semantic transparency and compositionality, demonstrating that idioms range from fully opaque expressions to constructions that preserve partial literal meaning (Fernando, 1996). More recent attempts to systematize phraseological units continue to refine these classifications by considering both semantic and structural criteria. For example, work on the semantic and structural taxonomy of phraseological units highlights the need for multidimensional classification systems capable of capturing variation in meaning, structure, and degree of figurativeness (Alisoy, 2025). These approaches demonstrate the importance of systematic typologies for describing idioms, although they tend to focus primarily on internal linguistic properties rather than on the cultural sources of idiomatic meaning.

Corpus linguistics has expanded this perspective by shifting attention from the internal structure of idioms to their patterning in authentic language use. The formulation of the idiom principle (Sinclair, 1991) highlighted the extent to which speakers rely on recurring phraseological units rather than generating utterances solely through grammatical rules. Subsequent research on formulaic language has reinforced this observation, showing that many multiword expressions are stored and processed as prefabricated units (Wray, 2002). Corpus-based approaches therefore situate idioms within broader systems of phraseological patterning, allowing researchers to examine their frequency, distribution, and variation across registers.

A different but related line of research examines idioms in relation to conceptual and cultural structures. Cognitive linguistic approaches have shown that many idioms are motivated by underlying conceptual metaphors that organize human thought (Lakoff & Johnson, 1980). Expressions such as *defend a position* or *attack an argument*, for example, reflect the conceptual metaphor *argument is war*, one of the most frequently cited examples in “Metaphors We Live By” (Lakoff & Johnson, 1980), illustrating how figurative language may arise from systematic conceptual mappings. At the same time, studies in cultural linguistics emphasize that idiomatic meaning may depend not only on general cognitive metaphors but also on culturally shared knowledge. Work on cultural semantics demonstrates that linguistic expressions frequently encode culturally specific conceptualizations that are not immediately accessible outside the relevant cultural context (Wierzbicka, 1997).

The relationship between idioms and cultural knowledge has been explored more explicitly in cross-cultural phraseological research. Analyses of figurative language across languages show that many idioms incorporate references to culturally salient practices, historical events, or symbolic objects (Dobrovol'skij & Piirainen, 2005). Expressions such as *carry coals to Newcastle*, for instance, presuppose knowledge of Newcastle's historical association with coal mining. Such idioms therefore illustrate how phraseological units can function as condensed carriers of cultural information, linking linguistic meaning to historically and culturally grounded knowledge.

Recent corpus-based studies have begun to investigate how idioms appear in contemporary language use. Analyses of idioms drawn from idiom dictionaries and examined in large corpora reveal considerable variation in frequency and thematic distribution, indicating that not all idioms listed in dictionaries occur with equal prominence in actual discourse (Rafatbakhsh & Ahmadi, 2019). At the same time, the development of large idiom datasets and computational resources has opened new possibilities for analyzing figurative expressions on a larger scale. Surveys of idiom datasets highlight how corpus resources and annotated databases can support empirical research on idiomatic meaning, usage, and variability (Flor et al., 2025).

Although these strands of research have addressed the structure, conceptual motivation, and usage patterns of idioms, the intersection between cultural anchoring and corpus-based analysis remains relatively underexplored. There has been limited systematic investigation of idioms whose interpretation depends on culturally specific references to people, places, institutions, or historical events. Developing a classification of such culture-bound idioms and examining their distribution in contemporary corpora therefore offers a way to connect phraseological description with empirical corpus analysis. The present study contributes to this area by proposing a typology of cultural anchors and domains and by investigating the distribution and corpus attestation of English culture-bound idioms.

Methodology

Research Design

This study adopts a two-stage design combining lexicographic analysis with corpus validation. In the first stage, culture-bound idioms are identified in major idiom dictionaries, classified according to their cultural anchors and domains, and encoded in a structured dataset. This stage yields a typological overview of anchors and domains (Table 1) and a lexicographic dataset of approximately 100 idioms (Table 2). In the second stage, which is currently ongoing, the idioms are checked against large contemporary corpora in order to assess their attestation and to obtain preliminary distributional information. A domain-level summary of these initial corpus findings is presented in Table 3. More fine-grained cross-classification and idiom-level corpus profiles are planned for a subsequent journal article.

Data Sources and Selection of Culture-Bound Idioms

The lexicographic phase draws on several major idiom dictionaries, including the *Oxford Dictionary of Idioms*, the *Cambridge Idioms Dictionary*, and the *Collins COBUILD Dictionary of Idioms*. These works provide canonical idiom forms, glosses, and example sentences and serve as the primary source from which candidate items are identified and extracted.

From these dictionaries, an expression is treated as a culture-bound idiom if it satisfies four conditions. First, it must be recognized as an idiom or fixed expression in at least one of the dictionaries and realized as a multiword unit rather than a single lexical item. Second, it must have a conventional figurative meaning that cannot be straightforwardly derived from a literal reading (for instance, *spill the beans* meaning “reveal a secret”). Third, successful interpretation must presuppose culturally specific knowledge embedded in the Anglophone linguistic tradition, such as familiarity with particular places (*Newcastle, the Big Apple*), persons (*Hobson, Uncle Sam*), institutions and cultural references (*red tape, Kool-Aid*), or

historically salient events (*Waterloo*). Finally, the idiom should be expected to occur in present-day English; items that are clearly archaic, purely literary, or extremely obscure are excluded at this stage, although their status may be revisited in the corpus phase. Transparent collocations and literal culture labels (e.g., country adjectives plus concrete nouns) are not included, as the focus is on expressions whose cultural anchoring contributes to their idiomaticity and potential opacity for speakers unfamiliar with the relevant cultural context.

Corpus Validation Procedure

To introduce a genuinely corpus-based dimension, preliminary validation was conducted using COCA and BNC. For each cultural domain represented in the dataset, a set of representative idioms was selected and queried in both corpora. Searches targeted canonical idiom forms and, where appropriate, simple variants (for example, *meet one's Waterloo and met his Waterloo*). The aim at this stage was not to obtain definitive frequency estimates, but to determine, for each domain, how many of the idioms in the lexicographic inventory are attested at least once in contemporary usage. These domain-level attestation figures form the basis of the summary presented in Table 3 and serve as a starting point for more detailed corpus analysis in the next phase of the project.

Preliminary Findings

Typology of Cultural Anchors and Domains

The first set of findings concerns the typology of cultural anchors and domains developed for the approximately 100 idioms examined in the study. Each idiom was analyzed in terms of its cultural anchor, i.e., the specific entity, such as a place, person, institution, event, mythological figure, or culturally salient object, to which it alludes, and its cultural domain, i.e., the broader field of experience in which that anchor is embedded (e.g., historical, social, political, mythological, religious, cultural/artistic, economic, ecological, technological, or national identity).

Table 1

Typology of Cultural Anchors and Domains

Anchor Type	Representative Idioms	Typical Cultural Domain(s)
Toponyms (Places / Landmarks)	carry coals to Newcastle; all roads lead to Rome; meet one's Waterloo; the Big Apple	Historical, geographical, national identity
Anthroponyms (People / Characters)	Hobson's choice; Uncle Sam; John Bull; Jack Sprat	Social, historical, national identity
Institutions and Organizations	red tape; the third rail of politics; ivory tower	Political, institutional
Historical Events and Customs	cross the Rubicon; Boston Tea Party spirit; Black Friday	Historical, social, political
Mythological or	Achilles' heel; Pandora's box;	Mythological, religious,

Religious Figures	forbidden fruit; doubting Thomas	moral
Material Objects and Everyday Culture	hot potato; the full Monty	Social, cultural
Military and Warfare References	loose cannon; baptism by fire; on the warpath	Military, historical
Scientific and Technological Concepts	quantum leap; push the envelope; reboot one's life	Technological, scientific, metaphorical
Literary and Cultural Works	jump the shark; drop the mic; Brave New World	Cultural, artistic, literary
Food and Culinary Culture	spill the beans; bring home the bacon; bad apple	Social, cultural
National Symbols and Ideologies	American Dream; British Bulldog spirit	National identity, political

Based on these distinctions, a set of anchor types was established, including toponyms (places), anthroponyms (people), institutions and organizations, historical events and customs, mythological or religious figures, material objects and everyday culture, military and warfare references, scientific and technological concepts, literary and cultural works, food and culinary culture, and national symbols and ideologies. Table 1 presents this typology at a conceptual level: for each anchor type, it lists illustrative idioms and the cultural domains with which they are most closely associated. For example, toponyms such as *carry coals to Newcastle*, *all roads lead to Rome*, *meet one's Waterloo*, and *the Big Apple* are linked to historical, geographical, and national identity domains, while anthroponyms such as *Hobson's choice*, *Uncle Sam*, *John Bull*, and *Jack Sprat* chiefly occupy social, historical, and national identity domains.

Institutions and organizations (e.g., *red tape*, *the third rail of politics*, *ivory tower*) are primarily associated with political and institutional domains. The table thus provides an overview of the categorical space within which culture-bound idioms in English can be situated.

Lexicographic Dataset of Culture-Bound Idioms

The typology is implemented in a lexicographic dataset in which each idiom occupies a single row. For each item, the dataset records the canonical idiom form, a concise gloss of its figurative meaning, the primary and secondary cultural domains, the cultural anchor to which the expression refers, and the corresponding anchor type. Table 2 presents an excerpt from this dataset and illustrates how the coding scheme is applied. Each idiom was assigned a single primary cultural domain and anchor type, while additional associations were recorded as secondary domains where relevant.

Table 2*Excerpt From the Lexicographic Dataset*

Idiom	Gloss	Primary Domain	Secondary Domain(s)	Cultural Anchor	Anchor Type	Example
meet one's Waterloo	Experience final defeat or failure	Historical	Military, Political	Waterloo (Napoleonic battle site)	Toponym	"After years of success, the company finally met its Waterloo."
Hobson's choice	Take what is offered or nothing	Historical	Social	Thomas Hobson (Cambridge stable owner)	Anthroponym	"Customers faced a Hobson's choice between the two plans."
the third rail of politics	A highly sensitive political issue best avoided	Political	Institutional	U.S. political discourse / electrified rail metaphor	Political concept	"For many candidates, tax reform remains the third rail of politics."
Achilles' heel	Critical weakness or vulnerability	Mythological	Moral, Cultural	Achilles (Greek hero)	Mythological figure	"Arrogance proved to be his Achilles' heel."
baptism by fire	A difficult first experience	Religious	Military	Christian metaphor of trial by ordeal	Religious metaphor	"Her first interview was a baptism by fire."

Domain-Level Summary and Attestation

Table 3 summarizes the resulting domain-level pattern. For each domain (e.g., Historical, Mythological/Religious, Social/Domestic, Political/Institutional, Cultural/Artistic/Pop-Cultural, Ecological/Natural, Economic/Commercial, Technological/Scientific), the table reports the number and percentage of idioms in the approximately 100-item dataset, identifies the anchor types most commonly associated with that domain, and lists representative idioms such as *carry coals to Newcastle* and *meet one's Waterloo* (Historical), *Achilles' heel* and *Pandora's box* (Mythological/Religious), or *keep up with the Joneses* and *storm in a teacup* (Social/Domestic). Where available from the pilot searches, the table also indicates how many idioms per domain have at least one attested token in the two corpora. Because some idioms may be associated with more than one cultural domain, the totals across domains exceed the number of idioms in the dataset. Table 3 thus provides an overview of how culture-bound idioms are distributed across domains and how frequently they appear in contemporary corpora.

Table 3

Distribution of Culture-Bound Idioms Across Cultural Domains and Their Attestation in COCA and BNC

Cultural Domain	No. of Idioms	% of Dataset	Most Common Anchor Type(s)	Idioms Attested in COCA or BNC	Representative Idioms
Historical	32	21.3%	Toponyms; historical events	28	carry coals to Newcastle; meet one's Waterloo
Mythological / Religious	24	16.0%	Mythological figures; religious figures	22	Achilles' heel; Pandora's box
Social / Domestic	29	19.3%	Anthroponyms; social practices	26	keep up with the Joneses; storm in a teacup
Political / Institutional	22	14.7%	Institutions; political concepts	19	red tape; the third rail of politics
Cultural / Artistic / Pop-Cultural	18	12.0%	Cultural works; media references	15	jump the shark; the full Monty
Ecological / Natural	10	6.7%	Natural phenomena; animals	8	mad as a March hare; wild-geese chase
Economic / Commercial	9	6.0%	Commercial practices; economic concepts	7	cash cow; blank cheque
Technological / Scientific	6	4.0%	Scientific concepts; technological metaphors	5	quantum leap; push the envelope

Discussion

The findings of the present study contribute to several strands of research discussed in the literature review, including phraseological classification, cognitive and cultural approaches to idioms, and corpus-based investigations of multiword expressions. With regard to the first research question, i.e., how English culture-bound idioms can be systematically classified in terms of their cultural anchors and domains, the typology developed here suggests that idioms

can be organized according to a relatively limited set of culturally motivated anchor types. While earlier phraseological research has primarily concentrated on the semantic and structural properties of idioms (Alisoy, 2025; Fernando, 1996), the present analysis shows that idioms can also be systematically categorized according to the cultural references embedded in them. The distribution of anchor types in the dataset suggests that many idioms are associated with culturally prominent entities, including historically significant locations, named individuals, and recognizable institutions.

At the same time, the range of anchor types identified in the dataset indicates that culture-bound idioms draw on diverse experiential sources, including historical events, religious narratives, mythological figures, everyday objects, and institutional practices. This diversity reflects the broader observation that phraseological units often function as condensed carriers of cultural knowledge. In this respect, the findings resonate with research emphasizing the cultural dimension of figurative language (Dobrovol'skij & Piirainen, 2005; Wierzbicka, 1997). While cognitive linguistic approaches have shown that many idioms are motivated by conceptual metaphors that structure human thought (Lakoff & Johnson, 1980), the present analysis suggests that historically and culturally specific references also play an important role in shaping idiomatic meaning. Expressions such as *meet one's Waterloo* or *Hobson's choice*, for example, presuppose knowledge of particular historical events or individuals, illustrating how idioms may encode culturally shared narratives rather than only abstract conceptual mappings.

The distribution of idioms across domains, summarized in Table 3, further supports this interpretation. The largest groups in the dataset are Historical and Social/Domestic idioms, indicating that national history and everyday social life constitute particularly productive sources of idiomatic reference. Mythological/Religious and Political/Institutional idioms also represent substantial portions of the dataset, reflecting the enduring influence of classical mythology, biblical traditions, and modern political discourse in English-speaking cultures. By contrast, Ecological/Natural, Economic/Commercial, and Technological/Scientific domains contain fewer idioms in the present inventory, although several expressions in these domains remain highly salient. Examples such as *mad as a March hare*, *cash cow*, and *quantum leap* illustrate how idioms may incorporate references to natural phenomena, economic practices, or scientific terminology.

Another important pattern emerging from the dataset is the multi-domain character of many culture-bound idioms. The examples presented in Table 2 illustrate that idioms rarely belong exclusively to a single cultural domain. *Baptism by fire*, for instance, combines religious imagery with military metaphor, while *Achilles' heel* draws on classical mythology to describe a moral or psychological vulnerability. Such cases demonstrate that idioms frequently intersect multiple cultural frames. This observation supports the view that idiomatic meaning is often constructed through the interaction of several cultural references rather than through a single isolated domain.

Turning to the second research question – the distribution and corpus attestation of culture-bound idioms – the preliminary corpus check indicates that many idioms identified lexicographically continue to appear in contemporary English. A substantial proportion of idioms in the larger domains, particularly Historical, Social/Domestic, and Political/Institutional categories, show at least one attested token in COCA or BNC. This finding is consistent with corpus-based research demonstrating that idioms form part of broader systems of phraseological patterning in authentic language use (Sinclair, 1991; Wray,

2002). At the same time, the existence of idioms that appear rarely or not at all in the corpora highlights the importance of corpus-based validation when constructing idiom inventories. Similar discrepancies between dictionary listings and actual usage have been observed in recent corpus studies of idioms (Rafatbakhsh & Ahmadi, 2019).

The study also points toward several directions for future research. A more detailed cross-classification of anchor types and cultural domains could reveal how different types of cultural reference interact in the formation of idiomatic meaning. In addition, idiom-level corpus profiles incorporating frequency, dispersion, collocation, and semantic prosody would allow a more precise assessment of which culture-bound idioms remain central in contemporary English and which may be becoming marginal or obsolete. Such analyses would be particularly valuable for translation studies and language pedagogy, where understanding not only the meaning but also the pragmatic and evaluative functions of idioms is essential. Finally, expanding the dataset and integrating larger annotated idiom resources may enable broader corpus-driven analyses of culture-bound phraseology in English.

Conclusion

The present study has proposed an initial typology of cultural anchors and domains for English culture-bound idioms and illustrated how such expressions can be organized within a structured lexicographic dataset. The analysis suggests that a relatively limited set of anchor types account for a substantial portion of the cultural references embedded in idiomatic expressions. The preliminary corpus validation further indicates that many of the idioms identified in dictionaries continue to appear in contemporary English, although their distribution varies across cultural domains.

At the same time, the study has several limitations. First, the dataset is intentionally limited to an initial inventory of approximately one hundred idioms extracted from major idiom dictionaries, and therefore cannot represent the full range of culture-bound phraseology in English. Second, the corpus analysis presented here is exploratory and limited to domain-level attestation rather than detailed frequency and distributional patterns. The results should therefore be interpreted as preliminary observations rather than definitive quantitative findings.

Future stages of the project will expand the idiom inventory and conduct more detailed corpus analyses using larger datasets and additional corpora. Thus, further research will examine idiom-level frequency, dispersion across registers, collocational patterns, and semantic prosody. A more systematic cross-classification of cultural anchors and domains will also allow a clearer understanding of how different types of cultural references interact in the formation of idiomatic meaning. Such analyses may contribute not only to phraseological research but also to practical applications in translation studies and language pedagogy, where understanding the cultural grounding of idioms remains essential.

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. The authors further declare 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.

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Texting for Persistence: Leveraging Text Messages and Near-Peer Mentoring to Build Student Self-Efficacy

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Abstract

Online undergraduate programs battle the ongoing challenges of undergraduate students' low self-efficacy, academic disengagement, and perceived lack of belonging and isolation. To directly address this problem, The Chicago School's College of Undergraduate Studies implemented a near-peer mentoring program that connects undergraduate students with graduate student mentors from similar backgrounds with the aim of enhancing self-efficacy and fostering a sense of belonging. This research focuses on the impact that text messaging had on improving the mentoring relationship, thereby strengthening the students' perception of self-efficacy and belonging. Text messages provide a tool to boost student engagement and support the organic development of the near-peer mentoring relationship in a just-in-time format. Continuous program evaluation is completed through a mixed-methods approach that includes analysis of text message transcripts, written mentor meeting summaries, surveys, GPA tracking, and one-on-one interviews. In its first year, the program showed a fall-to-spring student persistence rate of 70% significantly outpacing the university's prior three-year average of 55.9%. While the data did not indicate a relationship between text message frequency and academic performance, it did identify a relationship between text message frequency and student persistence. On average, students who had higher text message frequencies ($M = 101$) were more likely to remain enrolled in their degree program. These results suggest that a near-peer mentoring program supported by text message communication can support student retention by nurturing personalized guidance and strengthening the students' sense of community. These findings suggest that accessible and direct communication positively impacts student engagement and builds students' sense of self-efficacy by fostering consistent, positive interactions and easily accessible mentorship. These findings offer valuable insights into best practices for student retention programs that could be applicable across various disciplines and contribute to understanding social learning, self-determination, and student retention theories.

Keywords: near-peer mentoring, student retention, text-messaging, academic persistence, higher education

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Introduction

Online college students battle the ongoing challenges of undergraduate students' low self-efficacy, academic disengagement, and perceived lack of belonging and isolation (Betz & Rottinghaus, 2006; Chemers et al., 2001; Hackett & Betz, 1981; Tinto, 1994, 2017; Vuong et al., 2010). Research indicates that when students experience feelings of isolation and disconnection, these environmental impacts directly hinder their academic persistence and ability to achieve their educational and professional goals (Betz & Rottinghaus, 2006; Chemers et al., 2001; Hackett & Betz, 1981; Vuong et al., 2010). However, targeted support can reduce dropout rates, impact individual success, and broaden their mobility and equity. The purpose of this research was to evaluate the impact of a targeted text messaging-based near-peer mentorship program on undergraduate students' persistence and sense of self efficacy in the online learning environment.

To better understand the impact of text-messaging, this project specifically evaluated the text messaging program used within a near-peer mentorship program. The North Star Project was designed to address the challenges encountered by online undergraduate students at The Chicago School. The Chicago School's College of Undergraduate Studies (CoUS) houses three main undergraduate programs that are primarily delivered in an online, distance learning format. Prior research indicated that online students frequently experience low self-efficacy and a lack of belonging in academic environments (Tinto, 1994, 2017). The core problem identified was that these students often feel isolated and disconnected, hindering their academic persistence (Betz & Schifano, 2000; Tinto, 2017).

The purpose of this research is to evaluate the impact that text messaging had on the near-peer mentorship relationship. The study was guided by the following overarching research questions:

1. To what extent does the use of text messaging as a primary communication tool influence the strength of the near-peer relationship and the academic performance of the mentees?
2. In what ways does the use of text messaging as a primary communication tool influence the strength of the near-peer relationship and the academic persistence of the mentees?

It also seeks to answer the following quantitative and qualitative sub questions:

- I. How does the frequency of text message interactions correlate with mentees' GPA at the end of the term?
- II. How does the frequency of text message interactions correlate with mentee's persistence?
- III. Qualitative
 - i. In what ways do the themes of self-efficacy and sense of belonging manifest differently in the text message exchanges of mentees who persist compared to those who withdraw?

This research aims to better understand the impact of text-messaging on undergraduate student retention in online programs. This project specifically evaluated the text messaging program used within a near-peer mentorship program. The North Star Project was designed to address the challenges encountered by online undergraduate students at The Chicago School. This research hypothesizes that there is a positive correlation between the frequency of text messages and students' GPA and student persistence into the next term. The following sections will briefly discuss the foundational theories that guided this study's development, the methods

used to evaluate its effectiveness, and an overview of the preliminary results from year one. It will conclude by discussing the implications of preliminary results, their limitations, and future directions.

Literature Review

This study was grounded in the theoretical framework of student persistence. According to Tinto (1994, 2017), students are motivated to persist in their academic careers when integrated into formal and informal academic systems, activities, and social systems. Tinto asserted that student motivation is comprised of three elements: student self-efficacy, a sense of belonging, and perceived value of the curriculum. The central tenets of this theory are the concepts of student perception and self-efficacy. Bandura (1977) defined self-efficacy as an individual's belief that they can accomplish a task. Research on self-efficacy has revealed that it is an important indicator of students' ability to overcome barriers and persist in their academic and career environments (Betz & Rottinghaus, 2006; Hackett & Betz, 1981). Students with high levels of self-efficacy are more likely to persist and reach their goals even when difficulties are encountered, while students with low self-efficacy are more likely to withdraw and become discouraged (Chemers et al., 2001; Vuong et al., 2010). However, self-efficacy is not fixed; research indicates it is malleable and influenced by environmental factors (Falk et al., 2022).

Dasgupta (2011) found that contact with successful experts or peers of the same race or gender can function as a "social vaccine" and protect students from self-doubt. Similarly, Betz and Schifano (2000) identified that group interventions, such as workshops and social events, increased STEM confidence in student groups (Betz & Schifano, 2000). However, to achieve connection, students must become engaged and see themselves as a part of the academic community (Tinto, 2017). Research has found that institutions can encourage this process through extracurricular and social activities. Similarly, peer-to-peer text message-based peer mentor programs have proven to be effective ways to provide just in time support and social connection (Brandt et al., 2023; Bussu & Burton, 2023; Edwards et al., 2025; Werntz et al., 2023). However, these interventions were limited in scope and most focused on graduate students; they did not include quantitative analysis or connection to grades which suggests that this study could add to the literature (Brandt et al., 2023; Bussu & Burton, 2023; Edwards et al., 2025; Tippetts et al., 2022; Werntz et al., 2023).

This research seeks to add to the limited research on the effectiveness of text message near-peer mentoring on online undergraduate students through a mixed methods analysis. The North Star Project was designed to match online undergraduate students enrolled at CoUS with near-peer graduate mentors with similar interests and experiences. Brandt et al. (2023) found causal evidence that supports implementation of a low-cost, just-in-time text messaging program enhances higher academic achievement for participants in near-peer mentoring programs. Similarly, a study by Tippetts et al. (2022) determined that personalized texting fostered student persistence and advising engagement.

This study addressed a clear gap in research on text-based near-peer mentoring for online undergraduate students. While prior studies demonstrate that just-in-time messaging and mobile-based peer support can enhance engagement, community, and short-term academic outcomes, most have been limited to graduate populations, single-site qualitative designs, or lacked quantitative links to performance and persistence (Brandt et al., 2023; Bussu & Burton, 2023; Edwards et al., 2025; Tippetts et al., 2022; Werntz et al., 2023). By employing a mixed methods approach within an online undergraduate context, this study extends existing evidence

by examining both the mechanisms and measurable academic impacts of near-peer mentoring delivered through text messaging. Ultimately, the findings have the potential to deepen understanding of how low-cost, scalable interventions can foster self-efficacy, promote connection, and support persistence for online learners.

Methodology

To evaluate the impact of a text message based near peer mentor program on student persistence, this study employed an explanatory sequential mixed-methods design. The quantitative phase examined whether the frequency of text message interactions between mentors and mentees correlated with student GPA and persistence to the following term. The qualitative phase explored how themes of self-efficacy and sense of belonging manifested within text message exchanges and how these differed between students who persisted and those who withdrew. Integrating both phases allowed for triangulation of findings to assess convergence, complementarity, and divergence across data sources.

The study was guided by the following overarching research question:

1. To what extent does the use of text messaging as a primary communication tool influence the strength of the near-peer relationship and the academic performance of the mentees?
2. In what ways does the use of text messaging as a primary communication tool influence the strength of the near-peer relationship and the academic persistence of the mentees?

Sub-questions examined:

- Quantitative:
 - How does the frequency of text message interactions correlate with mentees' GPA at the end of the term?
 - H₁: A positive correlation exists between text message frequency and GPA.
 - How does the frequency of text message interactions correlate with mentee persistence?
 - H₁: More frequent text message interactions predict higher likelihood of persistence.
- Qualitative:
 - In what ways do the themes of self-efficacy and sense of belonging manifest differently in the text message exchanges of mentees who persist compared to those who withdraw?

Participants

The study took place within The CoUS and recruited nine mentors and a total of 28 mentees across the first semester in the 2024–2025 academic year. Eighteen mentors were recruited for the 2025–2026 school year. Thirty-eight mentees from year 1 returned to the program in year 2. An additional 47 Mentees were recruited at the start of the fall term, bringing the total number of student mentees participating in the program to 85. Mentors were assigned up to five mentees based on matching surveys that collected information about background, interests, and academic/career goals. This matching process followed evidence-based practices that support stronger mentoring relationships (Tenenbaum et al., 2014).

During their onboarding, all mentors completed a specialized mentorship training program to enhance their skills in supporting and guiding students. They also gained professional

development by leading workshops for mentees and attending webinars and sessions with the National Society for Leadership and Success, improving their leadership, communication, and presentation abilities. Monthly one-on-one and team meetings further served as ongoing skill-building sessions, fostering continuous growth for the mentors. Mentors used the skills learned in their training to establish rapport and schedule subsequent mentoring sessions for the term.

At their first meeting, mentors review The North Star Mentorship contract, which clearly discusses the responsibilities and expectations for the program. The contract includes requirements for meeting frequency and outlines goals and expectations (Zaniewski & Reinholz, 2016). This agreement also provides a checklist of items to be discussed and an opportunity to collect qualitative feedback on the mentor's guidance. This feedback was used for formative and summative project evaluation. Previous research demonstrates the need to take exceptional care in the wording of the qualitative questions to capture accurate measures of self-efficacy and sense of belonging metrics (Burrell et al., 2018).

Data Collection

Mentors and mentees met weekly, synchronously over Zoom or asynchronously by text or email, with mentors who provided guidance throughout their partnership. These sessions are conducted via the school's Zoom or Microsoft Teams platform, or asynchronously over email or text messaging. The secure text messaging platform subscription was purchased with project funds and permitted for safe communication (personal cellphone numbers are not shared) for scheduling Zoom sessions, "check-ins," and support between sessions. The platform records the mentor and mentee frequency of contact and content of messages, which is used in project evaluation. Additionally, mentors write meeting summary reports, and the project director invites all mentees to participate in a one-on-one session to gain feedback. Notes from mentors' monthly check-ins are also used in the project evaluation.

Additionally, all incoming mentees were invited to complete an assessment designed based on the General Self-Efficacy Scale (GSE) and the college student's sense of belonging survey (Hoffman et al., 2002). The survey was constructed to incorporate CoUS-specific questions containing "certain...capable of" and "confident...can" that are proven effective measures of self-efficacy (Burrell et al., 2018). The initial results served as benchmark levels of self-efficacy and sense of belonging. Extensive research has been completed on the GSE's reliability to measure the level of self-efficacy (Kiuru et al., 2008; Schwarzer & Jerusalem, 1995; Williams & Rhodes, 2014; Williams & Williams, 2010).

The effectiveness of the mentor-mentee relationship has been rigorously evaluated through various measures, including mentor meeting summaries, analysis of text message conversations, surveys, GPA tracking, and mentee interviews. Additional quantitative data was collected via surveys administered to the mentee population each semester and institutional reporting measures (GPA, student registration, and student withdrawals) Once a year, the data from the pre- and post-assessments, institutional data on academic performance, and persistence outcomes for both mentors and mentees are triangulated with the qualitative data collected from interviews with mentees, mentor meeting notes, and the text message program to identify the effectiveness of the program.

Data Analysis

Quantitative data analysis was conducted using Microsoft Excel. Descriptive statistics were used to summarize text message frequency, GPA, and persistence rates. Pearson's correlation coefficient was used to examine the relationship between text message frequency and GPA and student persistence. Hypotheses were tested at the 0.05 significance level.

Microsoft Copilot was used as a collaborative analytical support tool throughout the data analysis process. Copilot assisted with data cleaning verification, descriptive statistical computation, correlation analyses, effect size estimation, and interpretation of results across enrollment groups. It also supported the synthesis of findings into manuscript-ready narrative sections, including results, limitations, and future directions. Importantly, all analyses were conducted using researcher-provided datasets, with Copilot facilitating transparent, reproducible workflows while leaving interpretive decisions and substantive conclusions to the research team.

Qualitative data was analyzed using thematic analysis on text message transcripts using priori codes from the literature on self-efficacy and belonging (Bandura; 1977; Hoffman et al., 2022). Initial coding was completed by two researchers independently, and then focused coding was completed by grouping in higher-order categories. The themes were compared between students who persisted, and those who withdrew to determine differences in message patterns, tone, and indicators of belonging and self-efficacy.

Results from quantitative and qualitative analyses were triangulated to examine the data in terms of convergence, complementarity, and divergence. The data were analyzed to determine if message patterns and themes aligned with the observed trends, if they explained or contextualized quantitative findings, and to identify discrepancies between the two data types. This integrative approach strengthens the internal validity of the research and strengthens the conclusion about the impact on text messaging shapes mentoring relationships and students' academic outcomes.

Results

Descriptive statistics and correlations for enrolled and withdrawn mentees are presented in Table 1. The enrolled group ($n = 48$) demonstrated higher levels of engagement, as measured by total number of messages ($M = 101.02$, $SD = 108.23$), and substantially higher academic performance ($M \text{ GPA} = 3.02$, $SD = 0.98$) compared with the withdrawn group ($n = 50$), which showed lower engagement ($M = 67.48$, $SD = 99.06$) and lower academic performance ($M \text{ GPA} = 1.46$, $SD = 1.47$) (Microsoft, 2026).

Within-group Pearson correlations indicated no meaningful linear relationship between engagement and academic performance in either group. For enrolled mentees, the correlation between messages and GPA was effectively zero ($r = -.01$), and a similarly negligible association was observed among withdrawn mentees ($r = -.03$). These findings suggest that message volume alone was not associated with academic outcomes within either enrollment group.

Table 1*Descriptive Statistics*

Group	<i>n</i>	Messages, <i>M</i> (SD)	GPA, <i>M</i> (SD)	<i>r</i> (Messages–GPA)
Enrolled	48	101.02 (108.23)	3.02 (0.98)	–.01
Withdrawn	50	67.48 (99.06)	1.46 (1.47)	–.03
Total	98			

Note. *M* = mean; *SD* = standard deviation; *r* = Pearson correlation coefficient. Correlations are Pearson product–moment correlations.

Between-group differences were further examined using Cohen’s *d* (Table 2). Engagement differed modestly between groups ($d = 0.33$), indicating a small-to-moderate effect. In contrast, academic performance differed markedly, with a large effect size for GPA ($d = 1.25$), indicating that enrolled mentees substantially outperformed withdrawn mentees academically (Microsoft, 2026).

Table 2*Between-Group Effect Sizes (Enrolled vs. Withdrawn)*

Outcome Variable	Cohen’s <i>d</i>	Magnitude
Total Messages	0.33	Small–moderate
GPA	1.25	Large

Note. Positive values indicate higher means for the enrolled group. Effect size interpretations follow conventional guidelines.

Table 3*Average Message Frequency by Enrollment Status*

Enrollment Status	Mean Messages	Median Messages
Enrolled	101 messages	67
Withdrawn	67 messages	26.5

Qualitative

9,398 messages were exchanged between mentors and mentees. Of those messages, 31% included reminder conversations between mentors and mentees to participate in events or activities. 24% were weekly check-in conversations. Those topics covered reflections on workloads, feelings of achievement, and discussions of goals. The check-in conversations also included requests for support navigating school offices and identifying the appropriate campus resources, and how to contact IT. 15% of conversations were focused on assignments and coursework. Mentees shared struggles while mentors offered encouragement and advice.

Discussion

In its first year, the North Star program showed a fall-to-spring student persistence rate of 70%, significantly outpacing the university's prior three-year average of 55.9%. These initial results suggest that the text-message-based near-peer mentoring program supports student retention by nurturing personalized guidance and strengthening the students' sense of community. Enrolled mentees ($n = 48$) tend to be both more engaged ($M = 101.02$) and higher performing academically ($M = 3.02$) than withdrawn mentees; however, the results revealed that engagement quantity itself does not explain academic performance within either group. Academic performance appears to be a stronger distinguishing factor between enrolled and withdrawn mentees than overall message volume. Therefore, the initial hypothesis that there

would be a positive correlation between academic performance and text message frequency must be rejected.

While the data did not indicate a relationship between text message frequency and academic performance, it did identify a relationship between text message frequency and student persistence. On average, students who had higher text message frequencies ($M = 101$) were more likely to remain enrolled in their degree program. These results are supported by prior research that identified that to remain engaged; students must see themselves as a part of the academic community (Tinto, 2017). Research has found that text-based programs provide just in time support and social connection; these programs connect students to extracurricular and social activities (Brandt et al., 2023; Busu & Burton, 2023; Edwards et al., 2025; Fernandes et al., 2017; Werntz et al., 2023).

Qualitative data analysis enriched quantitative data. The text messages revealed that mentors were able to provide support and were able to provide specific feedback to assignments. Mentees often shared gratitude. The mentors were engaging and encouraging and responded to the specific needs of their mentees by providing things like citation help and time management tips. They were also able to share contact information for specific university offices or points of contact. Mentees reported feeling confident, completing course work, and gratitude for being able to interact with peers.

In summary, the first-year results suggest that the text-based near-peer mentoring program supports student retention by nurturing personalized guidance and strengthening the students' sense of community. These findings suggest that accessible and direct communication positively impacts student engagement and builds students' sense of self-efficacy by fostering consistent, positive interactions and easily accessible mentorship. These initial findings offer valuable insights into best practices for student retention programs that could be applicable across various disciplines and contribute to understanding social learning, self-determination, and student retention theories.

Limitations

Several limitations should be considered when interpreting the findings of this study. First, engagement was operationalized exclusively as the total number of text messages sent between mentors and mentees, which captures quantity but not the quality, content, or timing of interactions. Qualitative research was collected after the quantitative phase to build upon the results. As a result, the absence of a relationship between message count and GPA should not be interpreted as evidence that engagement is inconsequential, but rather that message volume is an imprecise proxy for meaningful support.

Second, the study relied on cross-sectional data which limits causal inference. Although enrolled mentees demonstrated higher GPA and engagement than withdrawn mentees, it is not possible to determine whether engagement solely contributed to persistence. It is possible that academically stronger students were more likely to remain enrolled or chose to participate in the optional peer mentor support program which could have influenced both engagement and academic outcomes. Longitudinal analyses would be necessary to disentangle these temporal and causal relationships.

Third, GPA data, particularly within the withdrawn group, showed a substantial number of zero values, which may reflect incomplete coursework, institutional grading policies, or timing of

withdrawal rather than true academic performance. Although data cleaning was performed, residual ambiguity remains regarding what a GPA of 0.0 represents for withdrawn students. This limits precision in interpreting the magnitude of academic differences between groups.

In addition, the sample size, while adequate for descriptive and correlational analyses, limits statistical power for detecting small effects and precludes more complex multivariable modeling. Additionally, the dataset represents a single program context, which may constrain generalizability to other mentoring models, institutions, or student populations with different demographic or academic characteristics. It is also important to note that the analysis did not incorporate potentially important covariates such as demographic characteristics, enrollment length, prior GPA, or external risk factors. Without these controls, the observed group differences should be interpreted as descriptive associations rather than definitive explanatory relationships.

Future Directions

This research project completed its second year at the end of March 2026 and will conclude in March 2027. Year two analysis will consider engagement metrics beyond message counts to include qualitative indicators, such as message length, topical coding (academic, administrative, psychosocial), mentor response latency, and interaction patterns over time. Mentor or mentee interviews and content analysis of communication logs will also be included in the final program evaluation, which will also provide a richer contextual understanding of how engagement is experienced and perceived. Combining quantitative outcomes with qualitative insights would strengthen both theoretical interpretation and practical application.

Future studies should consider longitudinal designs to examine how early engagement trajectories relate to academic performance and persistence. Analyzing engagement during the first weeks of enrollment may be particularly valuable for identifying students at elevated risk of withdrawal and for assessing whether timely intervention alters academic or retention outcomes. In addition, subgroup analyses may yield important insights. For example, examining highly engaged withdrawn students separately could help identify structural or academic barriers that persist despite frequent contact. Similarly, stratifying by baseline academic preparedness or course load may clarify for whom mentoring engagement is most beneficial. These refinements may better capture which mentoring support influences student outcomes.

Conclusion

This research aimed to better understand the impact of text-messaging on undergraduate student retention in online programs. It specifically evaluated the text messaging program used within a near-peer mentorship program. The North Star Project was designed to address the challenges encountered by online undergraduate students at CoUS. This research hypothesized that there was a positive correlation between the frequency of text messages and students' GPA and student persistence into the next term. While the data did not indicate a relationship between text message frequency and academic performance, it did identify a relationship between text message frequency and student persistence. Qualitative data analysis revealed that mentors were able to provide support and were able to provide specific feedback to assignments. Mentees reported feeling confident, completing course work, and gratitude for being able to interact with peers.

In summary, the first-year results suggest that the text-based near-peer mentoring program supported student retention by nurturing personalized guidance and strengthened the students' sense of community. These findings suggest that accessible and direct communication positively impacts student engagement and builds students' sense of self-efficacy by fostering consistent, positive interactions and easily accessible mentorship. These initial findings offer valuable insights into best practices for student retention programs that could be applicable across various disciplines and contribute to understanding social learning, self-determination, and student retention theories.

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CRA-Based Learning in the 21st Century: Empowering Learners Through Inquiry and Conceptual Reasoning in *Mathematics in the Modern World*

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Abstract

In traditional mathematics education, many students are trained to manipulate symbols without being able to relate these manipulations to actual mathematical concepts in life; this is often a result of the disconnection between theorem application and the real world. The study explored how implementing the CRA (Concrete–Representational–Abstract) instructional framework applied to the *Mathematics in the Modern World* (MMW) course at the Antipolo Institute of Technology (AiTECH) in the Philippines assisted students in bridging the gap between active learning and using mathematics in a real-world context. Through a qualitative inquiry method, undergraduate students completed four experiential tasks: measuring the architecture of campus buildings for the Golden Ratio; documenting examples of natural Fibonacci sequences; modelling the Four-Color Theorem onto a map of Rizal Province, Philippines; and modelling weighted graphs for the purpose of optimizing transportation within their communities. Information from instructor narratives and digital portfolios of the students showed evidence of successful transitions from conceptual reasoning to abstract. Grounded in physical/visual representation of mathematical objects, students found that they could transition more easily to symbolic representations of mathematics, particularly in the case of complex modelling tasks. Additionally, the inclusion of the digital documentation promoted ethical authorship and community engagement by supporting the students' use of mathematical inquiry within their local communities. This study concludes that using the CRA model for contextualized mathematics instruction fosters cognitive trust, digital fluency, and a framework for scalable mathematics education in diverse institutional settings.

Keywords: CRA framework, Mathematics in the Modern World, inquiry-based learning, ethical authorship, graph theory, contextual mathematics

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Introduction

Mathematics in the Modern World (MMW) is the only mathematics general education subject intended within the Philippine K–12 curriculum. As stipulated by the Commission on Higher Education (CHED), MMW is the major vehicle for the development of mathematical literacy, with focus on applications to everyday life, critical thinking, and interdisciplinary connections. Unlike traditional mathematics themes which emphasize fluency and symbol manipulation, MMW will cause students to notice patterns, structures, and relationships within and across nature, society, and technology.

Modern pedagogy prescribes deeper conceptual engagement, situational context and a degree of student agency—especially in a subject area aimed at providing multiple pathways. The Concrete–Representational–Abstract (CRA) framework provides a scaffold for students' transition from concrete experience to symbolic abstraction, in cognitive as well as affective learning. The following paper shares four inquiry-based tasks undertaken in a college classroom in the Philippines. Each task was designed with the mathematical goal of linking abstract concepts to real-world applications while supporting ethical, creative and independent learning. In each activity, the aim of the math involved was to connect abstract ideas with practical applications. The activities were not just teaching tools; rather, they helped the students develop their abilities to question themselves and understand how they can represent the world using mathematics.

Methodology

The study took place in one class of the MMW subject offered by the Antipolo Institute of Technology for the Second Semester of the 2024–2025 academic year. In this class, the mode of instruction deviated from the conventional didactic method in favor of the inquiry method. The process occurred through an interactive learning experience where students formed small groups to work together using concrete objects from their surroundings to create meaning out of mathematical ideas.

The study came about through a pedagogy that acknowledges and appreciates students as contributors to their education. Students in undergraduate classes at the Antipolo Institute of Technology who used mathematical concepts with the help of the Concrete–Representational–Abstract (CRA) model while transitioning between the interior and exterior areas of the institution.

The task required documenting discoveries through digital media; they were required to reflect on their learnings through written documents and present them in class through presentations. The activities were consciously designed to not just deliver academic results, but also facilitate the promotion of ethical authoring, interdisciplinarity, and civic awareness. Incorporation of the concept of “Ethical Authorship” focuses on the mathematician's role as an honest reporter. Based on the International Center for Academic Integrity's (ICAI, 2021) principles of honesty and responsibility, it instills a lesson that data integrity is an essential component of the discipline. Through a focused emphasis on establishing mathematics in real-life settings and exploration, the approach empowered students and made them realize the relevance of mathematics in their personal and civic lives.

The initial activity, Golden Ratio Exploration, initiated students to proportional understanding using empirical measurement. In the concrete stage, students toured the

campus setting to measure leaves, flowers, tiles, hollow blocks, and architectural details using measuring tapes and rulers. These hands-on experiences anchored mathematical exploration in environmental observation. During the representational phase, learners recorded their observations via photographs and sketches, marking measurements and comparing width to length ratios. Some examples were a tile with a ratio of 1.6, hollow blocks with 1.68, and motorcycle plate boards with 1.64—enabling learners to compare noted proportions with the Golden Ratio (around 1.618). The abstract stage further developed this question by inviting students to translate the mathematical and aesthetic meaning of their results, relating proportional relationships to more general ideas of harmony, balance, and repeating patterns.

Based on this, the second activity, Fibonacci Sequence Investigation, further developed students' interaction with mathematical patterns in nature and design. During the concrete phase, students noticed natural spirals and recurring patterns in flowers, leaf patterns, building features, and logos on campus. These visual experiences increased awareness of mathematical patterns present in their lives. The representational phase featured documenting all observations in sketches and photos, tallying the number of unexpected elements observed, and checking the total against the Fibonacci sequence familiar to groups of students (1, 2, 3, 5, 8, 13). In the abstract phase, students constructed Fibonacci sequences, working recursively to construct their results and comparing ratios of consecutive terms, appreciating how ratios converge toward golden ratios, thereby solidifying their thinking of growth, proportion, and beauty.

To provide another context for mathematics reasoned, using risk as a framing, students were nudged toward productive abstract thinking through the third exercise, Map Coloring of Rizal Province, which pushes students from geographic annotation to graph-theoretic abstraction. Starting from the concrete phase, the students work with blank outline maps of Rizal Province, labeling all fourteen local government units, comprising Antipolo City and the thirteen municipalities of Rizal, such as Taytay, Binangonan, Cainta, Tanay, and others. The representational phase included the application of the Four Color Theorem such that neighboring regions do not share the same color, creating space for combinatorial thought and distributing color choices. In the abstract stage, learners converted their color maps into graph models, indicating each municipality as a vertex and depicting edges between neighboring regions. This enabled learners to investigate chromatic numbers and graph coloring concepts, linking mathematical modeling with spatial planning and civic engagement.

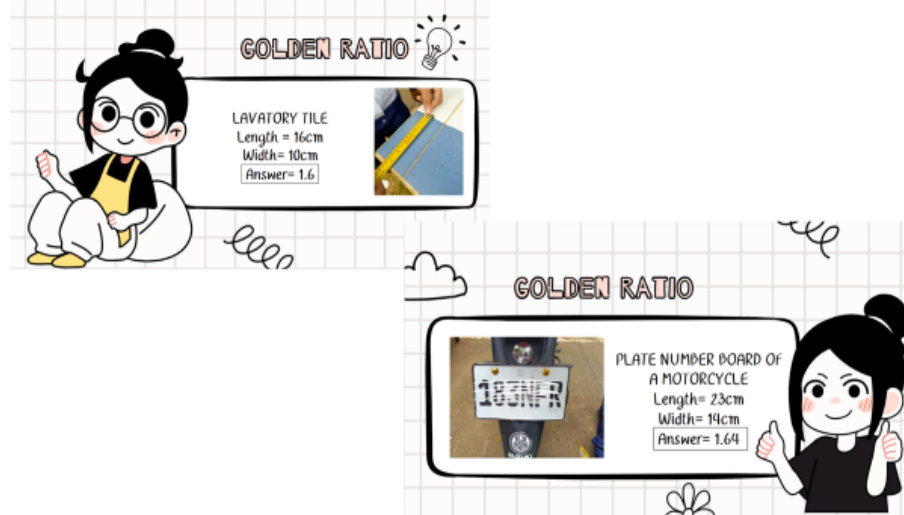
The last activity, Weighted Graph of Five Municipalities, integrated geographic observation with optimization and decision-making. During the concrete stage, students chose five municipalities in Rizal Province and determined direct road links between them. This set the task in everyday geography and prompted thinking about routes of travel and ease of access. The representational stage consisted of sketching graphs with municipalities as vertices and roads as edges with approximate distance labels. Students tinkered with circular arrangements and map-like settings, exercising imagination and spatial sense. During the abstract stage, students interpreted their graphs with formal graph theory concepts, investigating shortest paths, building spanning trees, and critiquing optimization models for travel efficiency.

In essence, the four practices have provided a consistent and prolonged methodological approach integrating observation from the real-world environment, documentation in images,

and symbolic representation. By consistently applying the CRA methodology in different situations, including environmental measurements, natural occurrences, civic geography, and transportation networks, the students developed proportional reasoning and recursive reasoning, spatial representations, and symbolic representations. The methodology further helped develop ethics in authorship, learner independence, and contextual relevance, thereby affirming that mathematics is indeed a living methodology of inquiry, interpretation, and engagement.

Figure 1

Student Measurements of Campus Objects Approximating the Golden Ratio



Note. Students documented lavatory tiles and motorcycle plates to verify ratios close to 1.618.

Results

Across all four CRA-based activities, students exhibited consistent patterns of engagement, mathematical understanding, and ethical authoring. The Golden Ratio activity encouraged students to observe nature and the built environment more deeply. Students were able to recognize, measure, and calculate ratios for objects such as leaves, doors, or design techniques we encountered in the built world that were “close” to the Golden Ratio ($\phi \approx 1.618$). The activity also extended students' understanding of irrational numbers and concepts of beauty and introduced students to new ways of thinking across disciplines through connections made between mathematics and art or design.

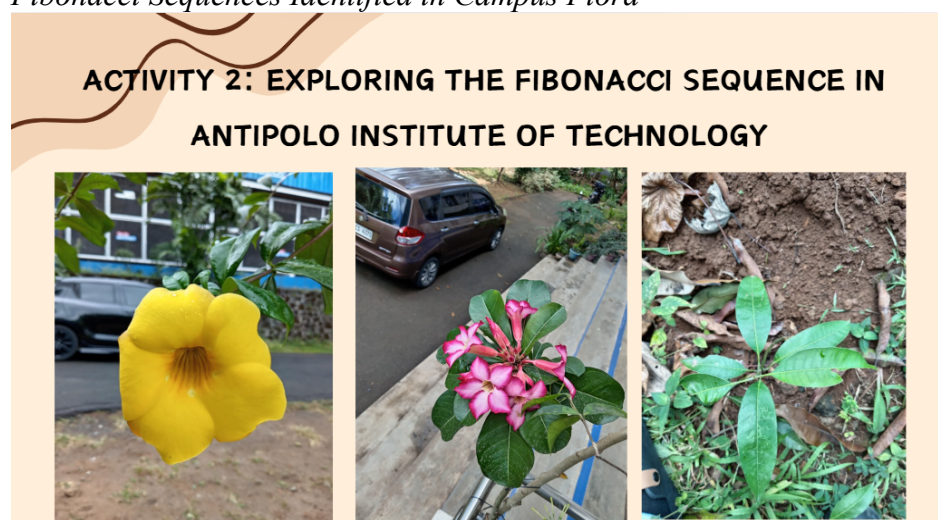
In the Fibonacci sequence activity, the students noted some recursions in their surroundings in the form of flower petal counts as well as spiral formations in the buildings. This was recorded using photos and drawings, and most of the students could show how these numbers exist in nature. It created an interest among students on the mathematical principles behind growth in nature, while reinforcing their understanding of the Fibonacci sequence and Golden Ratio.

The map coloring activity engaged students with graph theory from a common geographic discipline, Rizal Province. By labeling municipalities and applying the Four-Color Theorem, students engaged in spatial reasoning and combinatorial logic. They translated their colored maps into graph representations, correctly identifying adjacent regions and constructing vertex-edge models. This task enhanced their understanding of chromatic numbers and abstraction, while also promoting civic awareness of local geography.

Lastly, the weighted graph activity allowed students to model real-world connectivity by selecting five municipalities in Rizal and assigning edge weights based on approximate road distances. Students chose between circular and map-like layouts to draw their graphs, demonstrating both creativity and precision. They interpreted the graphs to identify shortest paths and potential optimization strategies, applying graph theory to simulate logistical decision-making. This exploration illuminated their strengths in identifying parameters, analyzing networks, and reporting findings clearly and meaningfully. Altogether, these student outputs and reflections suggest that CRA-based instruction - using contextual inquiry, integrated with digital tools - encourages mathematical understanding, learner independence, and ethical participation. Students were not only able to engage with abstract concepts, but they also developed the confidence to investigate, document, and communicate mathematics as an important part of a context to which they belong.

Figure 2

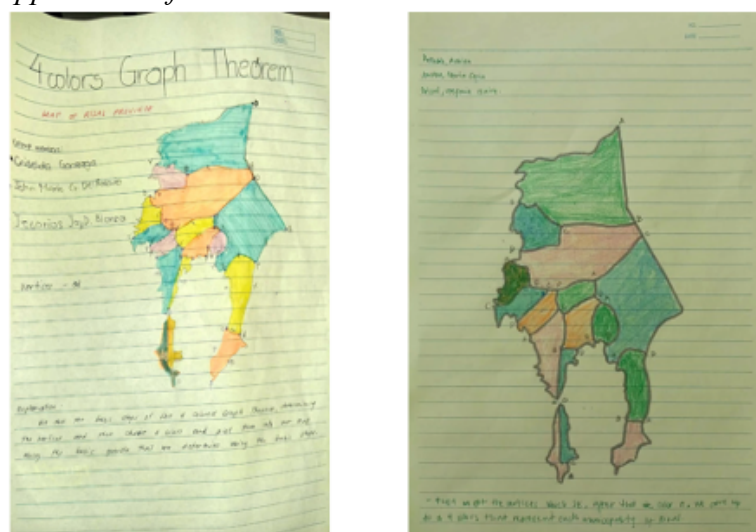
Fibonacci Sequences Identified in Campus Flora



Note. Documentation of spiral patterns and petal counts (e.g., 5-petal flowers) found at the Antipolo Institute of Technology.

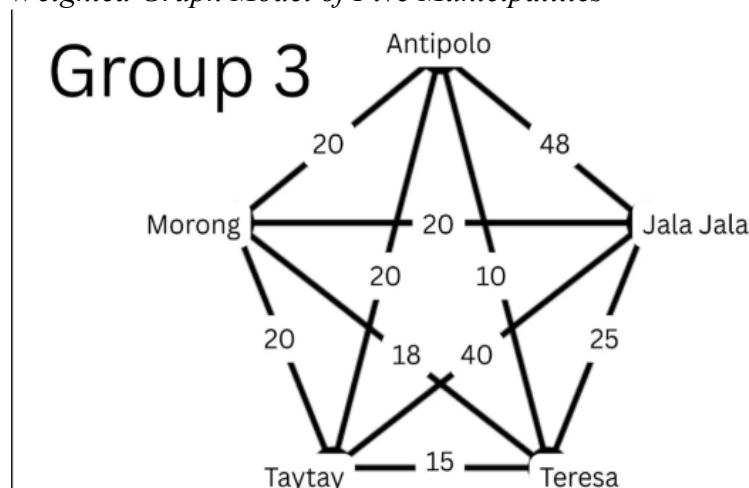
Figure 3

Application of the Four Color Theorem to Rizal Province



Note. Student-generated map demonstrating valid vertex coloring where no adjacent municipalities share the same color.

Figure 4
Weighted Graph Model of Five Municipalities



Note. Optimization model created by Group 3 showing edge weights based on approximate road distances between towns.

Discussion

The findings of this study illustrate the pedagogical value of the Concrete–Representational–Abstract (CRA) framework in facilitating conceptual knowledge, learner autonomy, and ethical engagement within Mathematics in the Modern World (MMW). As the only general education mathematics course in the Philippine K–12 curriculum, MMW provides a critical avenue for developing mathematical literacy across diverse academic tracks. The activities featured in this study demonstrate how CRA-based instruction can transform abstract mathematical ideas into meaningful experiences through contextual inquiry and experiential design.

Activity on Golden Ratio Exploration

Exploring the concept of the Golden Ratio involved students' engagement with proportionality using real-life materials within the school premises and the community at large. Students took measurements of hollow blocks ($W = 32$ cm; $L = 19$ cm; ratio ≈ 1.68), lavatory tiles ($W = 10$ cm; $L = 16$ cm; ratio ≈ 1.6), and motorcycle number plates ($W = 14$ cm; $L = 23$ cm; ratio ≈ 1.64). These activities enabled the learners to link the idea of proportional thinking with that of irrational numbers through taking pictures and making notes on the various instances observed. In effect, it is true according to Boaler (2016) that mathematics takes power through connections to the environment. Ethical authorship was also evident, as students responsibly attributed sources in their digital artifacts.

Activity on Fibonacci Sequence Investigation

The study of the Fibonacci sequence helped to reveal the way students engaged with recursive sequences in nature. The evidence gathered from the shape of flowers resembling trumpets, bunches of long petals, and the positioning of leaves showed the occurrence of Fibonacci sequences within nature's growth. The sketches and photos taken served as a representation for moving from concrete experience to abstract thought. It was clear to the students that these patterns ultimately led to the Golden Ratio. This activity validated

Toong's (2020) claim that CRA scaffolding bridges conceptual gaps, particularly when learners transition from representational to abstract reasoning.

Activity on Map Coloring of Rizal Province

Through the mapping activity, the students were able to learn graph theory from a civic and spatial perspective. The Four-Color Theorem was used by the learners to mark Rizal Province maps with colors such that adjacent municipalities would not have the same colors. This helped in developing spatial skills as well as mathematical combinatorics skills among the students. The maps were then transformed into graphs and the students were able to further learn about chromatic numbers. According to Marikyan (2023), visual techniques play an important role in teaching mathematics. Furthermore, Furner (2024) stressed on manipulative and digital resources as tools for gaining mathematical confidence. Similarly, Ramos-Miguel (2024) described how graph coloring is useful for scheduling.

Activity on Weighted Graph of Five Municipalities

Through the use of graphs, learners learned how to apply concepts like shortest path and spanning tree in finding optimal solutions. This activity provided learners with the ability to analyze data in an ethical manner and to make decisions based on real-life experiences. According to Beltran and Bartican (2025), adult learning principles must be adhered to when implementing andragogy, which stresses the learner's responsibility in the learning process. Bautista et al. (2015) also support the idea of using graphs to develop analytical skills. This is further proven by Zhang et al. (2024), who believe that simulations of life experiences promote problem-solving and creativity.

Integrative Insights

Throughout all activities, the students showed good documentation, digital literacy, and interpretation skills, which were indicative of good ethical writing and outcomes-based learning. The CRA model offered an effective yet flexible approach to inquiry, enabling students to participate emotionally and socially while making cognitive progress. Such observations indicate that mathematics learning through contextual inquiry is not only effective academically but also socially and personally.

Conclusion

The current research proves that the application of contextually relevant, inquiry-based CRA pedagogies can make the MMW course much more effective, engaging, and liberating for college students, helping them turn a merely formal educational obligation into something exciting and meaningful. Indeed, by involving students in mathematical inquiries that have something to do with their immediate environment, researchers managed to help students change from passive consumers of information into active explorers and creators of knowledge. As a result, students gained not just conceptual competencies, but a civic mindset as well.

Apart from the specific tasks performed by the students of the Antipolo Institute of Technology, the results have broader implications as a model for General Education mathematics instruction throughout the Philippines. In particular, the CRA method does not involve any expensive technology, but instead involves the deliberate development of

experiential tasks connecting theories with concrete experiences. This research therefore clearly demonstrates the ability of mathematics courses to fulfill the outcomes-based goals set out by the Commission on Higher Education (CHED).

In terms of future developments within the MMW curriculum, further formalization of mentorship systems, as well as the application of mathematical concepts in other disciplines, could further ensure continued benefits for the wider community. At the same time, this research has proven the ability of mathematics to reveal the harmony and beauty in real-life surroundings through its interpretation of the world.

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

The author would like to emphasize that Duplichecker, a tool based on AI for writing, was used solely in detecting any potential plagiarism as well as grammatical and spelling mistakes. The author declares that apart from Duplichecker, any other AI tools were not used for the generation or corrections of any material contained in this paper. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

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Teacher–Student Relationships and Willingness to Communicate in English: A Comparative Study of Thai and Chinese College Students

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Abstract

This quantitative comparative study examined how teacher–student relationship (TSR) dimensions—closeness and conflict—affect willingness to communicate in English (WTC) among Thai ($n = 544$) and Chinese ($n = 518$) college students. A total of 1,062 students completed a survey. ANOVA revealed significant cross-cultural differences: Thai students reported higher closeness ($M = 3.46$) and WTC ($M = 4.10$) than Chinese students ($M = 2.82$ and $M = 3.55$), whereas Chinese students perceived greater conflict ($M = 2.97$) than Thai students ($M = 2.68$). Gender-stratified analyses showed that both Thai males and females reported higher closeness and WTC than their Chinese counterparts, while conflict was more pronounced among Chinese females ($\eta^2 = .105$). These findings extend attachment theory and social role perspectives, demonstrating that TSR emotional quality functions differently across gender and culture. Practically, the study calls for gender-responsive and culturally sensitive pedagogical approaches to reduce relational tension, especially for female students in hierarchical learning environments.

Keywords: teacher–student relationships, willingness to communicate, cross-cultural comparison

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Introduction

Driven by globalization and the “Belt and Road” initiative, English as a global language has gained increasing prominence in higher education. However, many Asian college students in collectivist cultures display classroom silence and low willingness to communicate (WTC) (MacIntyre et al., 1998; Peng & Woodrow, 2010). WTC – the intention to speak when free to do so – is shaped not only by individual language proficiency and motivation but also by the socio-emotional structure of teacher–student interactions. Teacher–student relationship (TSR), conceptualised through the two dimensions of closeness and conflict (Pianta, 2001), influences learners’ emotional security and expression. Despite evidence on TSR’s impact on academic engagement, systematic cross-cultural comparisons between Thailand and China – two neighbouring countries with Confucian and Buddhist heritages – remain scarce. This study addresses that gap.

Theoretical Framework

Teacher–Student Relationship, Willingness to Communicate, and Their Socio-Emotional Basis

Drawing on attachment theory (Bowlby, 1969) and Pianta’s (2001) model, teacher–student relationship (TSR) comprises two relatively independent dimensions: closeness (emotional warmth, trust, and support) and conflict (opposition, tension, and negative interactions). Closeness fosters learners’ emotional security and psychological resilience, whereas conflict tends to induce avoidance behaviours and classroom anxiety.

The willingness to communicate (WTC) in a second language is conceptualised as the intention to initiate communication when free to do so (MacIntyre et al., 1998). MacIntyre et al.’s heuristic model places WTC at the intersection of stable personality traits and situational factors, with classroom emotional climate acting as a proximal determinant. Empirical research has confirmed that positive teacher–student emotional bonds significantly predict higher L2 WTC (Khajavy et al., 2018). In collectivist educational contexts, where face-saving and group harmony are valued, the socio-emotional quality of teacher–student interactions may be especially consequential for learners’ willingness to speak in English. Thus, closeness and conflict are expected to shape WTC in culturally patterned ways.

The Role of Culture and Gender

Hofstede’s cultural dimensions indicate that China has a high power distance orientation with strong academic hierarchy, whereas Thailand – also high in power distance – emphasises relational harmony through the Buddhist ethic of *krengjai* (consideration for others) (Komin, 1990). Furthermore, gender socialisation makes females more sensitive to relational conflict signals (Cross & Madson, 1997).

Research Hypotheses

- H1: Thai students report significantly higher teacher–student closeness than Chinese students.
- H2: Chinese students report significantly higher teacher–student conflict than Thai students.
- H3: Thai students report significantly higher WTC than Chinese students.
- H4: The effect of country on TSR and WTC varies by gender.

Methodology

Participants

Participants were 1,062 college students from science, technology, and vocational programmes in China ($n = 518$) and Thailand ($n = 544$). The sample included 472 males (295 Thai, 177 Chinese) and 577 females (236 Thai, 341 Chinese); 13 participants did not report gender.

Measures

Teacher–Student Relationships

Our versions of the Student Perceptions of Affective Relationship with Teacher Scale (SPARTS) were validated for this study. In the Chinese version of SPARTS, the Closeness sub-scale had 8 items (e.g., “When I feel uncomfortable, I go to my English teacher for help and comfort”) and the Conflict sub-scale had 10 items (e.g., “I feel my English teacher doesn’t trust me”). Our survey utilized a 5-point Likert scale, with a score of 1 indicating “strongly disagree” and 5 indicating “strongly agree.”

Willingness to Communicate in L2

Willingness to communicate (WTC) was selected as the primary outcome variable due to its pivotal role in determining language learning success in both ESL and EFL instructional contexts, where effective communication skills are often a primary goal of language education. The WTC measurement instrument presented respondents with fourteen hypothetical communication scenarios in English. For each scenario, participants indicated their likelihood of engagement using a 6-point Likert scale ranging from 1 (“Definitely not willing to”) to 6 (“Definitely willing to”), with intermediate anchors appropriately spaced.

Data Analysis

Principal component analysis with Varimax rotation on the 18 TSR items yielded two factors explaining 77.03% of the total variance. Loadings ranged from 0.735 to 0.880 for closeness (CL1–CL8) and from 0.713 to 0.931 for conflict (CO1–CO10). Cronbach’s α was .945 for closeness and .970 for conflict, indicating excellent reliability.

One-way ANOVA was performed using SPSS, with country and gender as grouping variables; effect sizes were computed.

Results

Overall Country Differences

Table 1 presents descriptive statistics and ANOVA results. Thai students scored significantly higher than Chinese students on closeness ($F(1,1060) = 163.42$, $p < .001$, $\eta^2 = .134$) and WTC ($F = 55.68$, $p < .001$, $\eta^2 = .050$). Chinese students reported significantly higher conflict ($F = 19.16$, $p < .001$, $\eta^2 = .018$). H1, H2, and H3 were supported.

Table 1*Comparison of TSR and WTC Between Thai and Chinese Students (N = 1,062)*

Variable	Thai M (SD)	Chinese M (SD)	F(1,1060)	<i>p</i>	η^2
Closeness	3.46 (0.80)	2.82 (0.84)	163.42	< .001	.134
Conflict	2.68 (1.11)	2.97 (1.01)	19.16	< .001	.018
WTC	4.10 (1.13)	3.55 (1.27)	55.68	< .001	.050

Gender-Stratified Comparisons

Table 2 shows results by gender. The most striking finding was the large gender-by-country interaction for conflict: Chinese females perceived considerably higher conflict ($M = 3.11$) than Thai females ($M = 2.42$; $\eta^2 = .105$), whereas the difference for males was negligible ($\eta^2 = .009$). H4 was supported.

Table 2*Gender-Stratified Cross-Cultural Comparisons*

Gender	Variable	Thai M	Chinese M	F	<i>p</i>	η^2
Male	Closeness	3.53	2.86	70.65	< .001	.131
	Conflict	2.90	2.69	4.25	.040	.009
	WTC	4.23	3.64	26.24	< .001	.053
Female	Closeness	3.36	2.80	70.13	< .001	.109
	Conflict	2.42	3.11	67.34	< .001	.105
	WTC	3.94	3.51	18.04	< .001	.030

Discussion

Cultural Scripts and Teacher–Student Emotional Bonds

The higher closeness reported by Thai students aligns with the Thai cultural concepts of *bunkhun* (gratitude/indebtedness) and *krengjai* (reluctance to impose), where teachers are viewed as spiritual guides and emotional reciprocity is normalised. In contrast, the Chinese “respect for teachers” ethic, while valuing deference, maintains emotional distance, creating a combination of high power distance but low affective closeness.

Relational Vulnerability Among Female Learners

Chinese females’ elevated conflict perception deserves special attention. According to Cross and Madson’s (1997) relational self-construal theory, females are more sensitive to negative interpersonal cues. In China’s hierarchical academic culture, teacher criticism or disciplinary acts are more likely to be interpreted by female students as relationship rupture, thereby suppressing English speaking. This “relational vulnerability” calls for pedagogical awareness.

TSR as a Socio-Emotional Foundation for WTC

The results reinforce MacIntyre et al.'s (1998) claim that WTC is a function not only of linguistic competence but also of the classroom's socio-emotional climate. Higher closeness reduces L2 anxiety and increases willingness to communicate.

Conclusion

Theoretical Contributions

This cross-cultural comparison extends attachment theory to East Asian higher education, revealing that closeness and conflict operate through distinct cultural pathways. It highlights intra-collectivist heterogeneity – Thailand's "harmonious collectivism" versus China's "hierarchical collectivism" – shaping classroom emotional ecologies differently.

Practical Implications

First, Chinese EFL teachers may benefit from incorporating emotionally warm elements from Thai classrooms while maintaining academic authority. Second, gender-sensitive feedback strategies (e.g., the "sandwich method") should be used to reduce conflict perception among female learners. Third, informal teacher–student interactions (e.g., English corners, joint projects) can help mitigate power distance and lower relational tension.

Limitations and Future Directions

The cross-sectional design limits causal inference. Longitudinal studies could examine cumulative effects of TSR on WTC. Mediators such as L2 anxiety and academic self-efficacy should be explored.

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

During the preparation of this work, the authors used DeepSeek solely for proofreading and formatting purposes. After the completion of the full manuscript, DeepSeek was employed to check for grammar, spelling, and punctuation errors, as well as to verify compliance with the required formatting guidelines. No generative AI was used for idea generation, data analysis, literature synthesis, or any substantive content creation. The authors assume full responsibility for the originality, accuracy, and integrity of this work.

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Exploring the Intersections of Globalization, Equity, and Quality Education in Africa

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Abstract

The accelerating pace of globalization presents African educational systems with both unprecedented opportunities and intensified structural challenges. This qualitative inquiry critically examines how educators, policymakers, and students in three strategically selected African nations—Nigeria, Kenya, and South Africa—perceive and negotiate the influence of globalization on educational equity and quality. Drawing theoretically on Cultural Relevance Theory and Social Justice Theory, the study investigates the mechanisms through which global pressures are mediated, adapted, or resisted at the local level. Employing a multi-case study design, the research utilized purposive sampling to engage 42 participants through semi-structured interviews ($n = 28$), two focus group discussions, and three embedded institutional case studies. Thematic analysis revealed three critical patterns: (1) the uneven policy transfer of global norms (e.g., SDG 4 and digital mandates) leading to exacerbated geographical and socio-economic inequities within and between the three countries; (2) the paradoxical reinforcement of the digital divide, where enhanced global access coexists with the marginalization of indigenous knowledge systems; and (3) the exercise of significant local agency in negotiating global influences, often through selective adaptation to safeguard cultural relevance. Findings underscore globalization's ambivalent nature: a catalyst for educational modernization but also a driver of persistent structural inequities. The study advocates for a context-sensitive, decolonial approach to global engagement, urging African policymakers and development partners to leverage global resources while prioritizing social justice, cultural sovereignty, and the empowerment of historically marginalized learners.

Keywords: globalization, equity, quality education, Cultural Relevance Theory, Social Justice Theory

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Introduction

The dawn of the 21st century has been characterized by the relentless momentum of globalization, a phenomenon marked by the intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring miles away and vice versa (Giddens, 1990). For African educational systems, this global integration presents a complex dual mandate: the imperative to modernize and compete on the world stage, juxtaposed with the enduring challenge of achieving educational equity and delivering quality education to all citizens. The push for standardized curricula, the adoption of global metrics (such as the Sustainable Development Goal 4 - SDG 4), and the rapid digitalization of pedagogy are all direct manifestations of this global influence.

Yet, this engagement is not neutral. Critics argue that globalization often functions as a vector for the imposition of neoliberal educational models, potentially eroding cultural relevance and deepening existing structural inequalities (Carnoy, 1999; Ndura, 2006). This qualitative inquiry, therefore, critically examines how educators, policymakers, and students in three strategically selected African nations—Nigeria, Kenya, and South Africa—perceive and negotiate the influence of globalization on educational equity and quality. The selection of these nations provides a robust comparative framework, representing West, East, and Southern Africa, each with distinct historical contexts, levels of economic development, and educational governance structures.

Theoretical Framework

This study is anchored by two complementary theoretical lenses: Cultural Relevance Theory (CRT) and Social Justice Theory (SJT).

Cultural Relevance Theory

Rooted in the work of Ladson-Billings (1995), CRT posits that pedagogical practices and curriculum content must connect with the cultural experiences and frames of reference of the learners to be effective and meaningful. In the context of globalization, CRT becomes a critical tool for assessing how global educational norms and content—often originating from the Global North—impact the preservation and integration of indigenous knowledge systems (IKS) and local cultural heritage. The theory challenges the assumption that “world-class” education must necessarily be Westernized, emphasizing instead that true quality education is context-sensitive and affirming of learners' cultural identities.

Social Justice Theory

SJT moves beyond mere procedural fairness to focus on the equitable distribution of resources, power, and opportunities (Fraser, 2009; Rawls, 1971). Applied to education, SJT requires an analysis of systemic barriers and the differential impact of global policies on historically marginalized groups (e.g., rural populations, socio-economically disadvantaged learners, and linguistic minorities). This framework is essential for investigating how globalization either exacerbates or alleviates inequities in access to quality infrastructure, digital literacy, teacher training, and curriculum relevance.

Methodology

Research Design

A multi-case study design was employed, allowing for an in-depth exploration of the complex phenomena within their real-life contexts (Yin, 2018). The three cases—Nigeria, Kenya, and South Africa—were treated both as individual units of analysis and as part of a cross-case synthesis.

Participants and Sampling

Purposive sampling was used to select participants who held key perspectives on the intersection of globalization and education. The total sample comprised 42 participants:

- Semi-structured interviews (n = 28): Included senior government policymakers (ministry level), university academics (specializing in education policy), high school principals/administrators, and classroom teachers.
- Focus Group Discussions (FGDs) (n = 11): Engaged tertiary-level students to capture the learner perspective on curriculum relevance and digital access.
- Embedded Institutional Case Studies (n = 3): Involved detailed document analysis and observation within one representative institution in each country.

Data Collection and Analysis

Data were collected through semi-structured interviews and FGDs guided by open-ended questions concerning global policy influence, technological integration, equity challenges, and cultural preservation. Data analysis followed a thematic analysis approach (Braun & Clarke, 2006), involving familiarization, coding, theme generation, review, and interpretation. Cross-case analysis focused on identifying patterns of convergence and divergence in how the three nations responded to global pressures.

Findings and Discussion

The thematic analysis yielded three critical patterns that encapsulate the complex interplay between globalization, equity, and quality education in the African context.

The Uneven Policy Transfer of Global Norms

The commitment to global mandates, particularly SDG 4 (“Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”), was universally acknowledged by policymakers. However, the operationalization of these norms was profoundly uneven, leading to exacerbated geographical and socio-economic inequities.

In Nigeria, the implementation of global digital mandates was largely concentrated in urban centres and elite private schools, leading to a significant urban-rural divide. A Nigerian policymaker noted: “We sign the international protocols, but the resource allocation follows the path of least resistance. Remote communities, already disadvantaged, see these global policies only on paper, not in their classrooms.”

Kenya's emphasis on technological integration, while ambitious, similarly struggled with equity. The Digital Literacy Programme (DLP), a key national initiative influenced by global

ICT trends, faced criticism for inconsistent deployment and maintenance in low-resource schools. The quality of implementation was found to be highly correlated with a school's proximity to infrastructure and its socio-economic catchment area.

In South Africa, the legacy of apartheid spatial planning was found to mediate global influences. Schools in historically disadvantaged townships and rural areas (often referred to as “quintile 1–3” schools) lacked the stable electricity, connectivity, and foundational resources necessary to benefit from globally-driven curriculum reforms, resulting in a persistent two-tiered education system.

Discussion

This pattern confirms the SJT premise that policy implementation, regardless of its equitable intent, will reinforce existing structural inequalities if it does not explicitly address context-specific resource deficits and historical marginalization. The “policy transfer” is often a top-down process, failing to account for local implementation capacity (Taylor, 2004).

The Paradoxical Reinforcement of the Digital Divide and Cultural Marginalization

Globalization, via the rapid expansion of digital technologies, presents a fundamental paradox: enhanced global access coexists with the marginalization of indigenous knowledge systems (IKS).

The drive for digital literacy and STEM education, heavily influenced by global competitive pressures, was observed across all three countries. However, teachers and students frequently highlighted the inadequacy of digital content and pedagogy that was culturally disconnected. A Kenyan teacher commented:

We are teaching them coding and global business models, which is good, but in doing so, we are often neglecting our local histories, our languages, and the rich knowledge of our elders. The digital content is rarely in Swahili or our mother tongue; it's a Western window.

Furthermore, the digital divide—the gap between those with effective access to digital and information technology and those without—was actively reinforced. While the use of smartphones and access to global platforms like YouTube were ubiquitous among middle-class students, rural schools lacked basic computing labs, reliable internet, and, crucially, educators trained to integrate technology meaningfully.

Discussion

This finding strongly aligns with the concerns of CRT. The globalization of the curriculum, particularly through digital platforms, is often a form of cultural imperialism (Altbach & Knight, 2007). Quality education, therefore, cannot simply be defined by access to technology; it must be defined by culturally relevant content and pedagogical practices that affirm, rather than marginalize, African epistemologies.

Local Agency and Context-Sensitive Adaptation

Despite the powerful forces of globalization, the study revealed significant local agency in negotiating global influences, often through selective adaptation to safeguard cultural relevance and address local needs.

In South Africa, university academics reported active efforts to decolonize the curriculum—a direct and organized resistance to the hegemony of global/Western knowledge—by integrating African philosophy and indigenous methodologies into tertiary-level programs. This was seen as a deliberate act of local control over educational content.

Kenya exhibited agency through its national competency-based curriculum (CBC) reform, a major overhaul designed to make education more relevant to local economic and social needs, even while adopting global best practices on skills development. The adaptation here was strategic, leveraging global pedagogical trends while tailoring outcomes for the local labour market.

Nigeria's strongest expression of agency was observed at the school level, where teachers, constrained by limited resources and irrelevant curricula, often employed “bricolage”—the creative use of available local materials and pedagogical styles (e.g., storytelling, community-based projects) to localize globally-derived lessons.

Discussion

This theme underscores the non-deterministic nature of globalization. Educational systems are not passive recipients of global flows but are active agents that mediate, resist, and adapt external pressures based on local socio-political realities and cultural values (Moutsios, 2010). This selective adaptation is crucial for maintaining cultural sovereignty and ensuring that quality education remains relevant to the local context.

Conclusion and Recommendations

The findings of this inquiry underscore globalization's ambivalent nature in African education: it is simultaneously a powerful catalyst for modernization and a persistent driver of structural inequities. While global pressures, policies like SDG 4, and technological advancements offer unprecedented opportunities, their unequal policy transfer and cultural insensitivity risk exacerbating the digital divide and marginalizing indigenous knowledge. This study advocates for a context-sensitive, decolonial approach to global educational engagement.

Recommendations for Policymakers

Prioritize Equity-Based Infrastructure Investment

Policymakers must move beyond mere access targets (e.g., number of devices) to focus on the quality and sustainability of infrastructure in historically marginalized, rural, and low-income schools, aligning resource allocation with the principles of Social Justice Theory.

Decolonize and Localize the Digital Curriculum

African educational authorities must take ownership of digital content creation, ensuring it is culturally relevant, integrates Indigenous Knowledge Systems, and is available in local languages, thereby actualizing the core tenets of Cultural Relevance Theory.

Negotiated Global Engagement

Engagement with development partners should shift from passive compliance to active negotiation, ensuring that global funding and policy advice are selectively adapted to national priorities, cultural sovereignty, and local implementation capacity.

Recommendations for Development Partners

Shift from Universal Templates to Context-Specific Solutions: Development agencies must cease promoting one-size-fits-all educational models. Funding and technical assistance should prioritize local innovation and systems that empower local educators to define and deliver quality education relevant to their communities.

In conclusion, leveraging the positive forces of globalization to achieve quality education in Africa requires a conscious, rights-based, and justice-oriented policy framework that champions the empowerment of historically marginalized learners and protects the cultural integrity of the continent's diverse educational landscape.

Acknowledgements

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Appendix

Section A

Table 1

Participant Demographics and Research Distribution

Country	Interviews (n = 28)	FGDs (n = 2)	Case Studies (n = 3)	Total
Nigeria	10	3	1	14
Kenya	9	3	1	13
South Africa	9	5	1	15
Total	28	11	3	42

Section B

Thematic Coding Consistency (Inter-Rater Reliability)

To ensure the academic integrity of the qualitative analysis, a secondary review of 15% of the transcripts was conducted. The following metrics represent the consistency of the coding process:

- Total Codes Identified: 156
- Inter-Rater Agreement: 89%
- Cohen's Kappa (κ): 0.84 (Indicating "Strong" agreement)

Section C

Using a Likert-scale sentiment analysis on interview transcripts, the study quantified participant attitudes toward "Global Influence on Local Curriculum."

Table 2

Qualitative Weight of Participant Sentiment

Sentiment Level	Percentage	Description
Strongly Positive	12%	Views globalization as fully beneficial
Positive	28%	Recognizes benefits with minor caveats
Neutral	15%	Balanced view
Negative	35%	Highlights inequities and cultural loss
Strongly Negative	10%	Sees it as primarily harmful

Measuring More Than Miles: Assessing the Impact of Short-Term Study Abroad on Students' Global Citizenship Identity

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Abstract

Short-term study abroad (STSA) programs are often criticized as being too brief to produce meaningful or lasting transformation. This paper challenges that assumption by arguing that intentional learning design and rigorous assessment are more important than duration alone. The study examines a five-week place-based study abroad program in Hawai'i focused on climate change, sustainability, and resilience. Thirteen students from two Japanese universities participated in a scaffolded sequence of field-based learning, stakeholder engagement, research development, reciprocity-oriented project work, and final presentation. To assess change over time, the Beliefs, Events, and Values Inventory (BEVI) was administered before and after the program. Analysis focused on five dimensions aligned with global citizenship development: Basic Openness, Sociocultural Openness, Global Resonance, Ecological Resonance, and Self Awareness. The findings suggest notable gains in Sociocultural Openness, Global Resonance, Ecological Resonance, and Self Awareness, alongside a slight decrease in Basic Openness that is not necessarily negative, but may reflect emerging cognitive complexity. Subgroup patterns further suggest differentiated impact: broader gains in Global Resonance appeared among the wider cohort, while deeper gains in Ecological Resonance were concentrated among higher-scoring students. These findings suggest that even short-term programs can foster meaningful identity development when they are intentionally structured and thoughtfully assessed.

Keywords: short-term study abroad, global citizenship, BEVI, place-based learning, sustainability

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Introduction

Short-term study abroad has long occupied an uneasy position in international education. Although such programs are valued for accessibility and flexibility, they are also frequently criticized as being too short to support meaningful or lasting transformation. This critique is often based on the assumption that longer program duration leads to stronger outcomes (Dwyer, 2004).

At the same time, research suggests that duration alone does not fully explain impact. Program design, depth of engagement, and the quality of intercultural interaction also play critical roles (Donnelly-Smith, 2009; Engle & Engle, 2004). Contact alone is not enough; students need structured opportunities to engage meaningfully with unfamiliar contexts and perspectives (Heinzmann et al., 2015).

This study builds on that perspective by examining a five-week short-term study abroad program in Hawai'i designed around place-based learning, systems thinking, stakeholder engagement, and reciprocity (Doi & Agullana, 2025). The central argument is straightforward: it is not how long students are abroad, but how their learning is designed and assessed that matters most.

Conceptual Framework

The program is grounded in a place-based approach to intercultural learning (Doi & Agullana, 2025). Intercultural competence is understood as a developmental construct involving knowledge, skills, attitudes, and the ability to communicate effectively and appropriately across cultural contexts (Deardorff, 2006).

In this Hawai'i-based course, students are not simply learning about another culture; they are engaging with interconnected ecological, cultural, and social systems. This includes relationships among land, water, food systems, and ocean environments, as well as the cultural and ethical frameworks that shape those relationships.

In other words, learning is not separated into categories such as “environmental” or “cultural.” Instead, students are asked to make sense of how these systems interact. This emphasis on systems thinking, cultural sustainability, environmental stewardship, and ethical engagement is central to the program's design.

Program Design

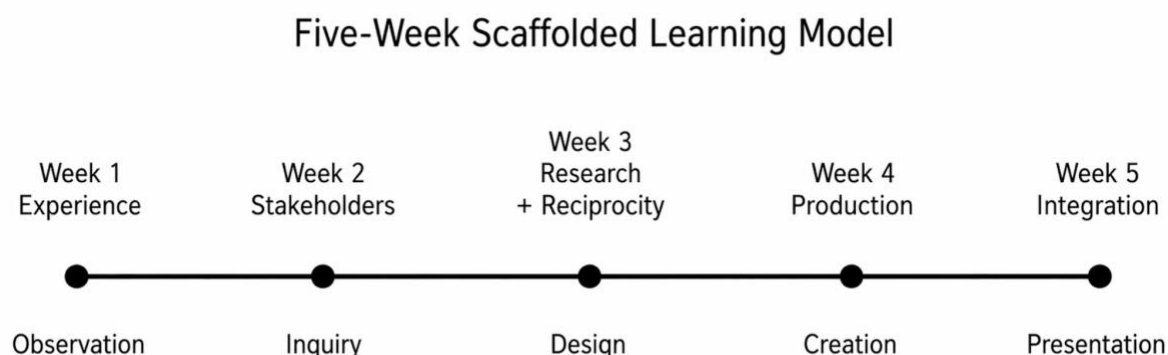
The five-week program was structured as a scaffolded learning sequence moving from experience to integration. Students engaged in field-based learning across sites including the Honolulu Board of Water Supply, Lyon Arboretum, Kanewai Lo'i, and Coconut Island.

The course moved from observation (Week 1), to inquiry (Week 2), to research design and ethical engagement (Week 3), to production (Week 4), and finally to integration and presentation (Week 5). Each stage built on the previous one, encouraging students to move beyond surface-level exposure toward deeper understanding and personal positioning. Additionally, the students were simultaneously enrolled in an intensive English program focusing on building oral fluency and cultural competence from Weeks 2 to 4.

Importantly, students were not only learning about these sites—they were also asked to contribute through reciprocity-based projects. This shift from observer to contributor is a key part of the learning design.

Figure 1

Five-Week Scaffolded Learning Model



Methodology

To assess changes in students' worldview and identity, this study employed the Beliefs, Events, and Values Inventory (BEVI). BEVI is a validated, depth-based instrument that provides a theoretically grounded and empirically supported quantitative approach to assessing transformative learning, particularly in capturing changes in the self (Shealy, 2016; Wiley et al., 2021).

Unlike traditional assessment tools that focus on satisfaction or self-reported learning, BEVI examines underlying beliefs, values, and meaning-making processes. This makes it particularly suitable for evaluating global citizenship development in study abroad contexts.

The study involved 13 students from two Japanese universities. Analysis focused on five BEVI dimensions aligned with the program's goals: Basic Openness, Sociocultural Openness, Global Resonance, Ecological Resonance, and Self Awareness. Because of the small sample size, the analysis emphasizes descriptive pre–post patterns rather than broad statistical generalization.

Findings

At the aggregate level, the results showed mixed but meaningful movement. Sociocultural Openness increased substantially, while Global Resonance, Ecological Resonance, and Self Awareness showed moderate gains. Basic Openness showed a slight decrease.

Results indicate measurable shifts in BEVI dimensions associated with aspects of transformative learning, particularly in worldview-related domains and constructs related to the self.

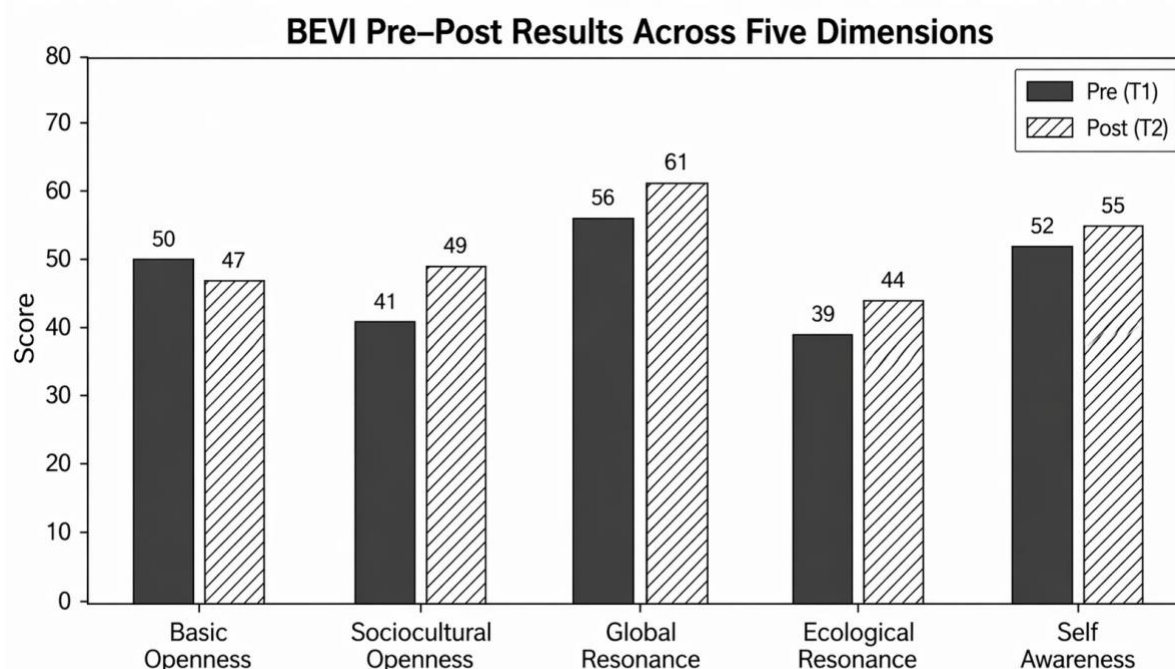
The increase in Sociocultural Openness suggests that students became more receptive to different cultural perspectives. Gains in Global and Ecological Resonance suggest a developing sense of connection to global and environmental issues, even though these changes were not statistically significant.

Self Awareness also increased, which is consistent with the program's emphasis on structured reflection. The decrease in Basic Openness is not necessarily negative. It may reflect increased cognitive complexity, as students become more aware of ambiguity and uncertainty when engaging with unfamiliar systems and perspectives. In other words, students may feel less certain, but are thinking more deeply.

Taken together, these results suggest measurable shifts in dimensions associated with transformative learning, particularly in relation to worldview and the self.

Figure 2

BEVI Pre-Post Results Across Five Dimensions



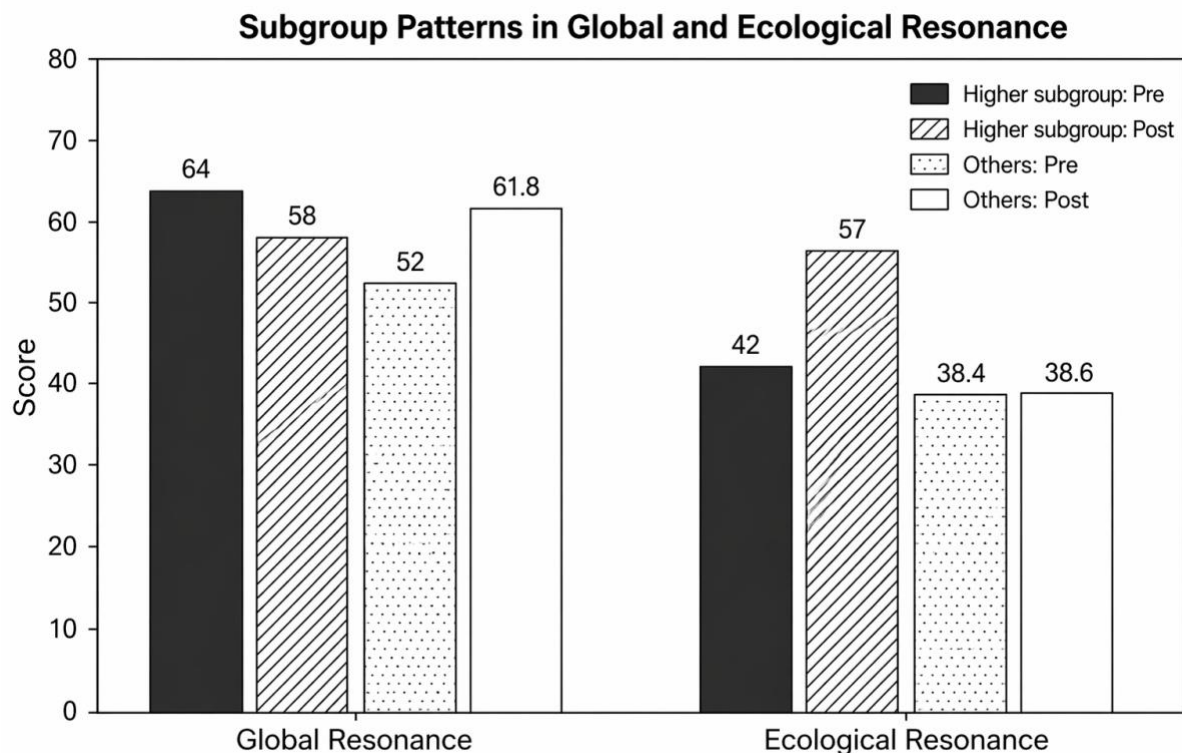
Subgroup Patterns

Subgroup analysis suggests that program impact was not uniform across participants. This distinction is important.

For Global Resonance, the strongest gains appeared among the broader group rather than the highest-scoring subgroup. This suggests that the program helped expand global awareness across the cohort, rather than simply increasing scores among those who were already highly engaged.

For Ecological Resonance, the pattern was different. Here, the strongest gains were concentrated among higher-scoring students, while the rest of the group showed little change. This suggests that deeper ecological engagement may have been taken up more fully by students who were more responsive or ready to engage at that level.

These subgroup patterns are based on BEVI distribution groupings and should be understood as approximate rather than exact comparisons. Even so, they point to an important idea: impact is not uniform, and different dimensions of learning may develop in different ways.

Figure 3*Subgroup Patterns in Global and Ecological Resonance*

Note. Subgroup comparisons are based on BEVI distribution groupings (low/middle/high) and represent approximate patterns rather than exact individual-level calculations.

Discussion

These findings suggest that short-term study abroad should be understood through a design-based lens. Rather than asking whether short-term programs “work,” it may be more useful to ask how they are designed and for whom they are most effective.

The results align with prior research emphasizing the importance of program structure and engagement (Engle & Engle, 2004). While longer programs may offer extended exposure (Dwyer, 2004), this study suggests that shorter programs can also produce meaningful developmental shifts when they are intentionally designed.

At the same time, the subgroup patterns highlight that impact is not evenly distributed. Some outcomes appear across the cohort, while others are concentrated among more engaged or responsive students. This does not weaken the case for short-term study abroad. Instead, it provides a more realistic and useful way of understanding how transformation occurs. Collectively, these findings point to the importance of intentional design in shaping how and for whom transformative learning emerges within short-term contexts.

Limitations

This study is limited by a small sample size ($N = 13$) and a specific program context, which may limit generalizability. In addition, the study relies on a short-term pre–post design within a five-week program. As a result, it is not possible to determine whether the observed changes

were sustained over time. Longitudinal research would be needed to assess the durability of these shifts beyond the immediate program period.

Some of the observed changes, particularly in Global Resonance and Ecological Resonance, were not statistically significant at the aggregate level. Furthermore, subgroup analysis is exploratory and based on BEVI distribution groupings rather than exact individual-level subgroup calculations.

Taken together, these limitations suggest that the findings should be interpreted as indicative patterns rather than definitive conclusions.

Conclusions

Building on these findings, this study challenges the assumption that short-term study abroad is inherently too brief to support meaningful transformation.

The findings suggest that intentional design and rigorous assessment—not duration alone—appear to be key factors in shaping global citizenship development in this context. Short-term programs can foster meaningful change, but that change is not uniform, and that distinction is important.

In other words, short-term study abroad is not inherently limited—it is often simply under-designed.

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Empowering Teachers With AI-Driven 3D Model Generation for Augmented Reality in Education

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Abstract

The integration of Augmented Reality (AR) and Artificial Intelligence (AI) in education has revealed strong potential to improve student engagement and learning through interactive 3D visualizations; though, the adaption of these technologies in classroom remains limited. Current research identifies several barriers that deters educators from implementing AR-based learning experiences, comprising technical complexity, limited digital literacy, lack of time, and resources limitations associated with creating and integrating 3D educational content. Recent improvements in generative AI technologies have demonstrated promise in democratizing access to 3D content creation through text-to-3D and image-to-3D conversion tools, thus reducing the expertise conventionally required for 3D modelling. To address those identified needs, we developed *Edu3D Builder*, an easy-to-use AR/AI application designed to support teachers in creating AR-enhanced instructional materials. The application assists intuitive text-to-3D or image-to-3D model generation without requiring advanced technical or 3D modelling skills. By streamlining the content creations process, *Edu3D Builder* Application decreases technical barriers, complexity, reduces creation time, and lowers resource demands, making AR implementation more available and scalable within educational ecosystems. The tool is envisioned to assist teachers in integrating immersive and interactive learning experiences into classroom instruction across various subject areas. Future work will include professional development sessions to familiarize teachers with this technology and its pedagogical applications, followed by longitudinal classroom activities to assess learning outcomes, user experiences and opportunities for further enhancement based on collected data.

Keywords: augmented reality, artificial intelligence, 3D content generation, TPACK, teacher adoption, AR authoring, educational technology

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Introduction

Augmented Reality (AR) technologies have attracted sustained attention in the educational research community as tools capable of enriching learning through the overlay of interactive, three-dimensional digital content onto the physical environment (Azuma, 1997; Wu et al., 2013). When learners can visualize abstract concepts as spatially anchored 3D models—whether a cell undergoing mitosis, a historical artifact, or a mechanical assembly—they benefit from heightened engagement, improved spatial reasoning, and deeper conceptual understanding (Akçayır & Akçayır, 2017; Merchant et al., 2014). Compounding this potential, recent advances in generative AI have opened the possibility of producing high-quality 3D assets from simple textual descriptions or photographs, democratizing content creation at a speed and accessibility previously unavailable to non-specialist users (Jun et al., 2023).

Despite this promise, classroom-level AR deployment remains the exception rather than the norm. Large-scale surveys and systematic reviews consistently identify three interrelated barriers that prevent teachers from adopting AR: (i) the steep learning curve of professional 3D modelling software such as Blender or Maya; (ii) the technical complexity of AR authoring pipelines involving multi-step export, calibration, and deployment procedures; and (iii) insufficient digital readiness among in-service teachers when confronted with emerging technologies (Bower et al., 2014; Diegmann et al., 2015; Dunleavy et al., 2009). Existing AR authoring platforms were largely developed for developers, leaving the educator-as-author use case structurally underserved.

This paper presents Edu3D Builder, a novel AI-assisted authoring tool designed explicitly for classroom teachers. Grounded in the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006), Edu3D Builder enables teachers to generate AR-ready 3D models through natural language text prompts or image uploads, bypassing the need for any prior 3D modelling expertise. We describe the design rationale; report results from a preliminary pilot evaluation ($n = 5$) and outline a future research agenda aimed at empirically assessing pedagogical effectiveness and long-term adoption.

Related Work

AR in Education

Akçayır and Akçayır (2017) identified improved learning performance, increased motivation, and enhanced spatial understanding as primary advantages of AR in education, while cataloguing technical difficulties and content scarcity as persistent challenges. Wu et al. (2013) noted that the majority of educational AR implementations rely on pre-built content rather than teacher-authored experiences, limiting curriculum alignment. Radianti et al. (2020) found that learning outcomes were context-dependent, with the quality and pedagogical integration of 3D content emerging as decisive moderating variables.

Barriers to Teacher Adoption

Bower et al. (2020) found that creation complexity was the single most frequently cited barrier to AR adoption, exceeding hardware cost and institutional support. Researchers confirmed that most classroom AR experiences are authored by researchers or technical specialists rather than classroom teachers. Chang and Hwang (2018) further demonstrated that teachers who received

scaffolded creation support produced pedagogically richer AR content and reported higher self-efficacy for future AR integration.

AI-Generated 3D Content and Authoring Tools

The emergence of generative AI models capable of producing 3D geometry from text or image inputs—including Point-E (Nichol et al., 2022), Shap-E (Jun et al., 2023), and DreamFusion (Poole et al., 2022)—represents a structural shift in the accessibility of 3D content production. Liu et al. (2023) demonstrated that text-to-3D generation can produce assets suitable for educational AR with substantially less manual post-processing than photogrammetry-based workflows. However, integration of these generative pipelines into teacher-friendly authoring environments remains largely unexplored. Existing platforms such as CoSpaces Edu and ZapWorks support basic AR creation but require teachers to source or import 3D models independently, perpetuating the content-creation bottleneck.

Theoretical Framework: TPACK

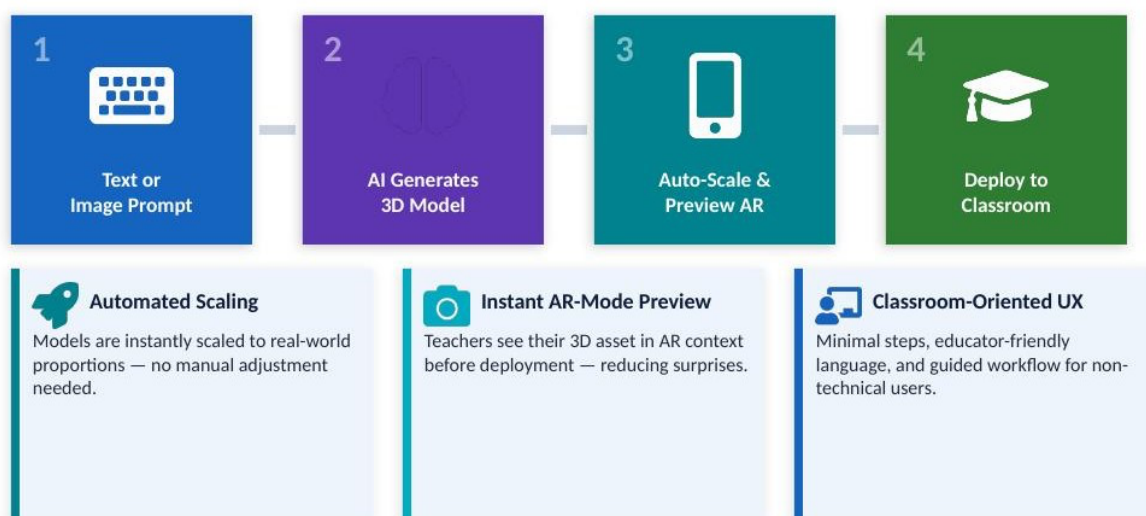
The design of Edu3D Builder is grounded in the Technological Pedagogical Content Knowledge (TPACK) framework, originally proposed by Mishra and Koehler (2006) as an extension of Shulman’s (1986) conception of Pedagogical Content Knowledge. TPACK posits that effective technology integration in instruction requires a dynamic interplay among Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). True technology-enhanced teaching emerges in the intersection of all three—the TPACK space—where teachers understand how technology can be deployed to teach specific content in pedagogically appropriate ways.

Existing AR authoring platforms tend to address only TK, placing the burden of CK alignment and PK design entirely on the teacher. Edu3D Builder was designed to scaffold all three dimensions simultaneously. The text-prompt interface supports CK by allowing teachers to specify subject-matter content directly in natural language. The automated scaling and AR-preview features reduce TK demands, while enabling teachers to verify pedagogical appropriateness (PK) of the resulting 3D content before class deployment. This TPACK-aligned design philosophy distinguishes Edu3D Builder from developer-centric AR creation tools that prioritize technical flexibility at the expense of pedagogical guidance.

Edu3D Builder: Design and Features

Design Rationale

Edu3D Builder was designed around three core principles derived from the literature review and TPACK analysis: (i) Zero Prerequisite—the tool must require no prior knowledge of 3D modelling or AR development; (ii) Pedagogical Primacy—each design decision must reduce rather than increase teacher cognitive load during lesson preparation; and (iii) Classroom Validity—content generated by the tool must be immediately verifiable in an AR context without additional configuration steps.

Figure 1***Edu3D Builder Four-Step Classroom Authoring Workflow***

Note. (1) Text or Image Prompt, (2) AI Generates 3D Model, (3) Auto-Scale & Preview AR, (4) Deploy to Classroom.

Text-to-3D Generation

Teachers enter a natural language description of the desired 3D object (e.g., “a cross-section of a human kidney showing the cortex, medulla, and renal pelvis”). The system routes this prompt to a generative 3D model pipeline that produces an AR-compatible mesh within seconds. Prompt enhancement suggestions are provided inline to improve specificity and generation quality.

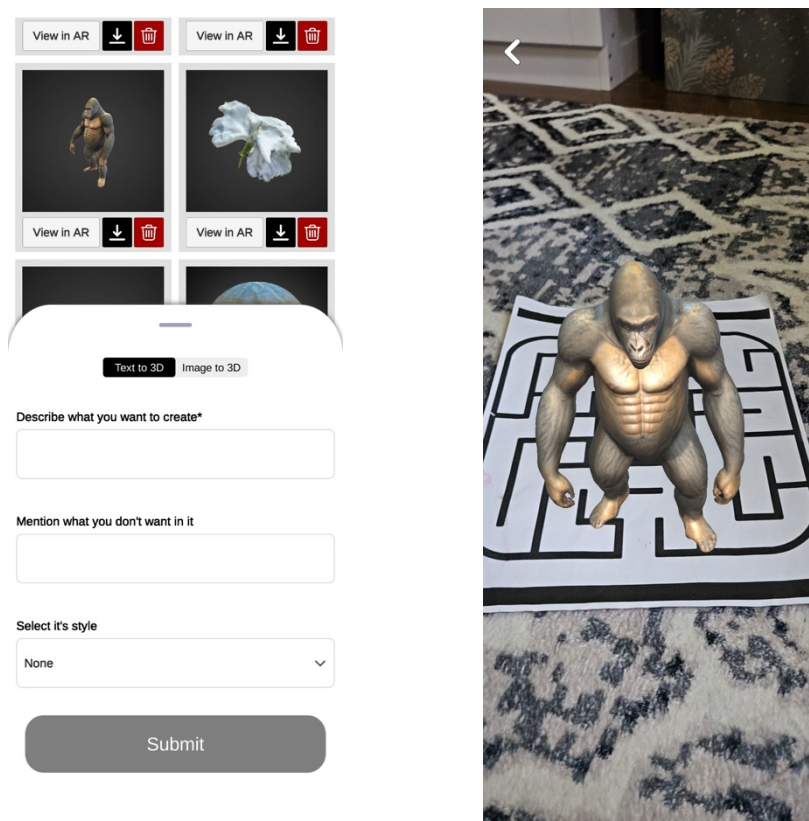
Image-to-3D Generation

Alternatively, teachers may upload a reference photograph—a textbook diagram, a physical specimen, or a product image—and the system generates a 3D mesh by inferring geometry from the provided image. This feature is particularly useful for teachers working with highly specific, curriculum-aligned objects not easily described in text.

Automated Scaling and Instant AR-Mode Preview

A distinguishing feature of Edu3D Builder is physics-based automated scaling, which calibrates the generated model to real-world dimensions based on object-type classification, ensuring that AR overlays appear at educationally appropriate sizes relative to the physical environment. Before saving or sharing a model, teachers can activate an instant AR preview that renders the 3D object in their camera feed using a marker or surface-detection anchor. The complete authoring workflow—prompt entry, model generation, scaling review, AR preview, and export—is designed to be complete in under five minutes.

Figure 2
Edu3D Builder Application Screenshots



(a) Text-to-3D prompt interface. (b) AR marker-based deployment view

Note. (a) Text-to-3D prompt interface showing generated model library with View in AR, download, and delete controls; (b) real-world AR marker-based deployment of an AI-generated 3D model.

Limitations

The pilot study carries important limitations that prevent generalization. The small sample ($n = 5$), drawn exclusively from the research group, introduces significant selection bias and does not represent the diversity of in-service teacher populations with respect to age, subject area, institutional context, or baseline digital literacy. The study does not address pedagogical effectiveness—whether Edu3D Builder-generated content improves student learning outcomes—a question reserved for the planned classroom-based evaluation phase.

Discussion

The initial findings show promising in validating the central premise of this paper: that by eliminating the needs for 3D modelling, which continues one of the most reported obstacles to AR adaption in education (Bower et al., 2014; Diegmann et al., 2015), generative AI can provide teachers with a less complex AR authoring experience. Participants stated a considerable reduction in perceived complexity, with average rating decreased from 5.8 to 1.8 on a seven-point scale). Moreover, we propose that the TPACK-grounded design supported not only the successful execution of the technical tasks but also fostered a pedagogical mindset among participants throughout the authoring process. For instance, while generating AR content, participant naturally discussed ways in which the generated materials could be integrated into classroom lessons. This indicates that the seamless generative process triggered

synchronized pedagogical reflection and content creations, aligning with the TPACK framework on creative technology-enhanced learning designs (Koehler et al., 2007). Nonetheless, several considerations should guide future work. First, teachers may develop expanded expectations regarding the accuracy and customizability of AI-assisted generated models. Educators working with visually precise or field-specific content may still need advanced editing capabilities beyond those presently supported by the tool. Also, issues related to digital equity including inconsistent internet access and institutional policies limiting the use of AI tool features, establish challenges that extended outside usability concern. Addressing these obstacles will demand not only technical improvement but also broader policy development and infrastructural support.

Conclusion

This paper introduces the *Edu3D Builder*, an AI-assisted AR authoring tool designed to reduce the barriers that have historically limited teachers' adaption of AR-enhanced learning in classrooms settings. Grounded in the TPACK model and informed by a literature review of 20 peer-reviewed articles, the tools provided text-to-3D and image-to-3D content generation, automated objected scaling, and instant AR preview capabilities within a workflow specifically designed for K-12 educators. By eliminated the need to create or manipulate complex 3D geometry, *Edu3D builder* removes of the primary technical barriers associated with AR content development. Initial pilot studies with five teachers, indicated that using this tool resulted in a perception of drastically lower complexity compared to existing methods and that all teachers in the pilot were able to produce AR objects in a matter of seconds. While these are exciting early findings, the study results remain initial, with a need to conduct similar trials in the future with larger groups of in-service science and history teachers, measuring levels of TPACK self-efficacy and readiness for digital technologies both before and after the intervention, in addition to performing controlled experiments within classrooms comparing the students' learning outcomes with those in a standard curriculum compared with students using AR. The continued adoption of the tool over a full academic year is being tracked, but we're hopeful that should the field of AI content generation keep evolving and the tool continue to mature as a Pedagogical Content Tool (PCT), then teaching with AR-based teaching may become increasingly accessible to educators across varied educational context, rather than being restricted to classrooms with specialized expertise in 3D modelling and AR development.

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Reflective Practice of a Philippine Cultural Exchange Teacher in a United States Classroom

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Abstract

While international teachers in the United States often encounter adjustment challenges related to language nuances, varied classroom management expectations, and the need for building student-teacher rapport, there remains a need for reflective inquiry into the specific instructional adaptations required within the English Language Arts curriculum. This reflective study explores the instructional experiences of a cultural exchange teacher from the Philippines teaching English Language Arts at a public high school in the United States. The primary purpose is to engage in reflective practice to enhance teaching and to gain a deeper understanding of classroom cultural dynamics, which are essential for adapting to the American educational context. Using a qualitative approach, open-ended survey responses were collected from Grade 9 students as part of a professional development initiative. Thematic analysis was employed to identify recurring ideas in student feedback, providing meaningful insight into instructional practice. Key findings focused on student perceptions of clarity in lesson explanations, engagement in classroom activities, and the impact of the teacher's personal connection. The study discusses these findings in relation to existing literature on reflective practice and culturally responsive teaching, providing helpful insights on navigating United States classroom expectations. Significance includes practical suggestions for fellow cultural exchange educators and pinpoint areas for future research into cross-cultural teaching effectiveness.

Keywords: reflective practice, culturally responsive teaching, cultural exchange, cross-cultural teaching

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Introduction

Cultural exchange teaching offers a significant opportunity to explore and improve instructional practices through a global lens. As international teachers increasingly populate U.S. classrooms, research has documented recurring adjustment challenges related to language use, classroom management, and student-teacher rapport (Cho, 2010). These difficulties become even harder when teachers are learning and adjusting to a new curriculum and communication styles that may differ significantly from those in their home country. This study examines how educators can address cultural gaps, highlighting the need to bridge them to ensure equitable and effective instruction. By examining the experience of a Filipino teacher navigating the American public high school system, this research provides a context for examining reflective practice. This process involves deep pedagogical inquiry, drawing insights from student feedback to refine the approach to teaching English Language Arts.

A central aspect of this cultural exchange involves two distinct classroom cultures: the highly structured, teacher-directed environment commonly associated with Philippine schools and the more student-centered, expressive norms often emphasized in American secondary classrooms. In the Philippine educational system, teacher authority remains a culturally valued expectation, making learner-centered approaches difficult to implement and potentially clash with traditional expectations. Hence, participation is often understood as teacher-led recitation or a specific question-and-answer format rather than through open peer dialogue. Although the Philippine K to 12 curriculum reform aims to modernize instruction, implementation tensions persist because classroom practices are still deeply rooted in structured participation. Even when educators endorse student-centered ideals, they often report friction between these collaborative practices and the traditional standardized testing expectations common in the region.

Conversely, United States secondary classrooms are increasingly defined by dialogic, discussion-forward instruction that prioritizes student voice and peer exchange. In these settings, academically productive talk is linked to interactive formats and collaborative reasoning rather than frontal teaching or individual task completion. While structure is present in both educational contexts, the primary difference lies in who drives the classroom discourse: the United States student-centered ideal emphasizes shifting participation from teacher-controlled interactions toward student-guided participation. Such differences significantly influence an educator's ability to adapt professionally. Through systematic reflection, as advocated by scholars such as (2017) and Schon (1983), these educational systems are linked, allowing educators to align their instructional practices with the specific needs and cultural expectations of their students. This paper, therefore, uses student feedback as a primary lens for reflection, identifying which instructional adaptations most effectively foster clarity, engagement, and personal connection in a cross-cultural setting.

Literature Review

Foundational Theories of Reflective Practice

Reflective practice provides a rigorous framework for educators to critically examine their experiences and systematically improve their instructional delivery. This study is grounded in Brookfield's (2017) four lenses of critical reflection: self, students, colleagues, and literature. These lenses allow an educator to move beyond subjective assumptions by incorporating external perspectives, such as "students' eyes," into their pedagogical development. By looking

through the “students’ eyes,” the educator can move beyond subjective self-assessments to identify specific misalignments between their traditional training and their students’ cultural expectations. Furthermore, Schon’s (1983) concept of the reflective practitioner supports an adaptive process of learning through teaching, where the educator engages in “reflection-on-action” to gain new insights into their practice.

This theoretical cycle is made more concrete in Kolb’s (1984) Learning Cycle, which consists of four distinct stages: concrete active experience, observation and reflection, the formation of abstract concepts, and active experimentation. In the context of the cultural exchange educator, the “concrete experience” involves the daily delivery of English Language Arts instruction in a United States classroom. The “observation and reflection” phase begins with the systematic collection of student survey data. “Abstract conceptualization” occurs when the teacher synthesizes this feedback with theoretical models of culturally responsive teaching, and “active experimentation” involves the subsequent refinement of pacing, scaffolding, and rapport-building strategies. Through this recurring process, international educators can transform routine classroom encounters into formal opportunities for professional growth.

Culturally Responsive Teaching as an Adaptive Framework

Culturally responsive teaching (CRT) provides the essential pedagogical framework for international educators to bridge the gap between their home culture and the American classroom. As defined by Gay (2010), culturally responsive teaching involves utilizing the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant and effective. This pedagogical approach is built on the premise that when academic knowledge and skills are situated within students’ lived experiences and frames of reference, they are more personally meaningful, more engaging, and more easily and thoroughly learned. For the international educator, this requires a transition toward “culturally sustaining pedagogy,” which goes beyond mere accommodation to actively support and sustain learners’ diverse identities.

Such a transition is significant because, as Sharma and Phillion (2020) suggest, international teachers must navigate the complexities of global teaching within local United States classrooms where students’ interactional histories differ significantly from the teacher’s home country. By acknowledging and incorporating these diverse cultural expectations into instructional strategies, the educator fosters a responsive learning environment that supports both the learners’ academic and emotional needs. Furthermore, this framework aligns with the research of Zhao and Green (2022), who emphasize that emotional intelligence and empathy are instrumental in shaping meaningful relationships for international teachers. The application of culturally responsive teaching allows cultural exchange educators to move beyond a “one size fits all” instructional model and instead develop adaptations that resonate with the expressive, student-centered norms of the American secondary setting.

Teaching Across Classroom Cultures

A primary objective of this literature review is to provide explicit international connections regarding the transition from the Philippine educational system to the United States. In the Philippines, “teacher authority” is a culturally valued norm that often positions the educator as a central figure of hierarchy. Recent scholarship notes that while learner-centered reforms have been introduced, they often clash with traditional expectations of the teacher’s role. Ethnographic research further suggests that teacher authority in such contexts is frequently

enacted as a form of care and responsibility, rather than control, complicating simplistic interpretations of teacher-centered instruction (Del Valle, 2022). Consequently, participation in many Philippine classrooms is understood as “structured participation” or teacher-led recitation rather than authentic peer dialogue. Wonder (2021) characterizes this as a recitation format focused on teacher-generated prompts and limited peer-to-peer interaction. While the Philippine K to 12 curriculum reform, as discussed by Barrot (2023), frames modernization toward student-centeredness and making students future-ready, implementation tensions persist as traditional teacher-centered habits remain deeply rooted in classroom practice. Recent qualitative research on Filipino senior high school classrooms further indicates that while student-centered assessment practices are increasingly emphasized in policy, classroom implementation often remains constrained by established teacher-led routines and accountability pressures (Paderes et al., 2025).

Comparative studies of international teachers in the United States highlight the complexity of these transitions. Sun (2019) observed that Chinese exchange teachers in American high schools face significant hurdles in navigating varied classroom expectations and establishing meaningful student-teacher rapport. These educators must identify successful professional strategies to bridge the gap between their home country's pedagogical norms and the expressive, student-centered ideals of the American system. Similarly, Sharma and Phillion (2020) emphasize the unique professional hurdles faced by international educators navigating global teaching within local U.S. classrooms. United States secondary classrooms prioritize dialogic, discussion-forward instruction that emphasizes student voice and collaborative reasoning. Gutentag et al. (2022) distinguish this from “frontal teaching,” noting that academically productive talk in the American context is associated with interactive formats in which students drive the discourse. This shift is not merely a lack of structure but a change in who drives the participation. As Decristan et al. (2023) suggest, the American student-centered ideal focuses on shifting discourse from teacher-controlled interactions toward student-guided participation, which has been consistently linked to improved learning outcomes.

Organizational Challenges and the Role of Support Systems

Recent scholarship has identified that the success of reflective practice is often influenced by the school's supportive organizational culture. In an exploration of teacher educators, Akram and Mehmood (2023) found that while many educators value student feedback, they are often reluctant to use reflective practices if they perceive a lack of mutual trust or administrative support. Their study revealed that challenges such as a “less supportive organizational culture” can hinder the development of a reflection system. This underscores the necessity for Professional Learning Communities (PLCs), which provide the framework required for teachers to share professional experiences with colleagues and act on student feedback without fear of negative evaluation. When schools provide formal administrative training and trust, as recommended by Akram and Mehmood (2023), teachers are more likely to use reflective tools productively within their professional culture.

Using Qualitative Student Feedback and Metacognition

The integration of metacognitive strategies is a critical component of professional adaptation, as it requires educators to assess, monitor, and reflect on their own performance. Research by Browne et al. (2022) demonstrated that while quantitative measures may suggest general satisfaction, qualitative feedback is often required to expose significant gaps in communication and interaction. Their findings indicated that instructors frequently perceive their own

preparedness as positive, while students simultaneously feel a lack of clear communication or pedagogical effectiveness. Therefore, educators must utilize frequent reflective dialogue to bridge the gap between their own self-perceptions and the “students’ eyes” lens. By incorporating culturally sustaining pedagogy and focusing on emotional intelligence, international teachers can foster responsive learning environments that support both the learners’ academic and emotional needs.

The necessity of these practices became even more evident during the global shift toward virtual and hybrid instruction, which required even more intense metacognitive monitoring. Qualitative feedback is uniquely equipped to expose the “significant gaps in communication and pedagogical effectiveness” that emerge during cultural transitions. This process enables teachers to implement metacognitive strategies by assessing and monitoring their own performance to bridge these pedagogical gaps in real time. The study by Browne et al. (2022) concluded that educators must engage in frequent reflective dialogue to better understand student needs and perceptions, as it fosters a more learner-centered environment.

Methodology

Research Setting and Questions

This study adopted a reflective practice approach, treating the classroom as both a site of inquiry and professional growth. This methodical choice was informed by scholarship emphasizing that reflective practice allows educators to gain new insights into their own practice. The data collection took place within a school-based Professional Learning Community (PLC), providing the institutional support identified as vital for effective reflective practice. In this study, the PLC addressed potential barriers of mistrust by integrating the research into an initiative overseen by the school’s Curriculum and Instruction Coach. Specifically, the study utilized metacognitive strategies to assess and monitor performance through qualitative student feedback. To guide this inquiry, the study addressed the following specific research questions:

1. How do Grade 9 students perceive the clarity and accessibility of instruction provided by a cultural exchange teacher?
2. What types of engaging and interactive activities do students identify as most effective for their learning in an English Language Arts context?
3. In what ways does the development of a personal teacher-student connection influence the classroom environment for these students?

Open-ended survey questions were used to elicit student perceptions of instructional clarity, engagement, and teacher–student connection. These student-centered questions were designed as instruments for teacher reflection through Brookfield’s students’ lens, making students’ perceptions the basis for refining instruction.

Participant Selection and Ethics

The participants were Grade 9 English Language Arts students in a United States public high school who participated on a voluntary basis. Ethical conduct was followed in accordance with institutional research guidelines to ensure the protection of and respect for participants’ rights. All participants were informed of their right to provide honest feedback without academic consequences. The school’s Curriculum and Instruction Coach administered the qualitative survey independently to ensure participant anonymity and maintain objectivity. This

procedural layer provided a necessary separation between the teacher and the students to encourage honest feedback while maintaining the integrity of the data collection process. The coach functioned as the primary safeguard for objectivity, mitigating the social desirability bias that might occur if the teacher personally collected the data.

Detailed 5-Step Thematic Analysis Process

The collected data from the open-ended survey responses were subjected to a rigorous 5-step thematic analysis:

1. **Initial Reading:** A careful reading of all open-ended survey responses to gain a holistic understanding of student narratives. The researcher engaged in multiple readings of raw feedback from participants S1, S2, S3, and S4 to immerse themselves in the “student voice.”
2. **Coding:** Generating initial codes from the raw text by identifying recurring concepts and keywords. Codes included phrases like “breaking down,” “group work,” “cares,” “intelligent,” and “fun.” For example, the phrase “breaks it down in sections” from S1 was coded for structured delivery, while “makes it fun” from S2 was coded for engagement.
3. **Categorizing:** Organizing these codes into broader candidate themes based on student needs and cultural expectations. This involved grouping codes like “group work,” “quizzes,” and “involved” into a category focused on active participation.
4. **Refining Themes:** Synthesizing the data into the primary themes of Clarity, Engagement, and Personal Connection. This step involved ensuring that each theme was distinct and supported by multiple narrative data points. For instance, the theme of Clarity was solidified by feedback from students like S1, S5, S6, and S13.
5. **Linking Findings:** Connecting the refined themes back to the research questions and theoretical frameworks of Brookfield (2017) and Kolb (1984) to explain the transition from hierarchical traditions to dialogic instruction. To resolve discrepancies, the researcher consulted with the Curriculum and Instruction Coach to maintain an objective reflection.

Findings

Table 1

Thematic Analysis of Student Feedback on English Language Arts Instruction

Theme	Description	Sample Codes	Selected Student Feedback
Clarity	Students value clear explanations and structured breakdowns of concepts.	Breaking down concepts Examples Pacing	“She breaks it down in sections.” “Giving examples helps me understand.” “When she explains things slower.”
Engagement	Students favor interactive, collaborative, and enjoyable learning experiences.	Fun and active learning Involvement Teamwork	“I like how sometimes she makes it fun.” “Gets us involved.” “Group work and quizzes.”
Personal Connection	Students expressed emotional needs and a desire for teacher support and dedication.	Care and support Positive demeanor Dedication	“She cares if we learn.” “She helps me and goes over it.” “Always keep fighting and keep doing the job you love.”

Theme 1: Clarity (Scaffolded Transparency)

The survey responses indicated that students favored clear and accessible lessons delivered by the teacher. A primary recurring idea involved the teacher’s systematic method of presenting material, which students described as “breaking everything down to a better understanding” and organizing information into distinct “sections.” This structured approach facilitated the comprehension of complex concepts; for example, S5 provided critical insight, noting that “I think she explains it in a formal and intelligent [way] its really easy to understand.” This observation suggests that the teacher’s “formal” tone, likely a vestige of the authoritative Philippine system, did not hinder understanding but actually enhanced the perceived “intelligence” and precision of the lessons. S5 further noted that while material “looks hard if you pay attention enough its kinda easy.”

Furthermore, student responses highlighted that lessons were delivered “calmly” and in a “step by step” manner, which made the instruction “very neat and very understandable.” To further aid comprehension, the teacher utilized visual aids and multimodal supports. Participants noted that the teacher frequently provided “examples on the board,” used “drawings” to show “how they affect stuff,” and incorporated “videos in class” and educational “posters on the wall.” While feedback was predominantly positive, some participants identified areas for refinement. S6 expressed appreciation for instances “when she explains things slower,” and S13 suggested

that the teacher should “repeat herself more.” These responses indicate that targeted adjustments to instructional pacing and repetition may support cross-cultural alignment.

Theme 2: Engagement (Active and Collaborative Learning)

The survey responses indicated that students favored active, collaborative, and enjoyable learning experiences. This signals a shift away from the teacher-led recitation models prevalent in the Philippines. Interactive activities were frequently highlighted as essential, with participants citing “partner work,” “group work and quizzes,” “teamwork,” and “group activities like as a whole class” as preferred methods. S3 specifically highlighted “quiziz and group work” as the benefit of “having to do it with others,” validating the preference for peer interaction and collaborative activities. Interestingly, S3 also utilized the survey to share personal challenges, noting “I have ADHD and anxiety so it's stressful when I'm called on,” which underscores the importance of a safe, collaborative environment over high-pressure individual recitation.

The theme of “fun and active learning” emerged from feedback suggesting the teacher “makes it fun” or delivers lessons “in a fun way.” Students expressed a desire for continued engagement through “more fun activities” or digital platforms such as “quzize”. Engagement was also closely linked to specific curriculum content; the study of “Romeo and Juliet” was frequently mentioned as particularly enjoyable, with S17 stating it was their “favorite subject we worked on.” Other students found engagement through tasks like “reading in quiet” or exploring “poems.” Finally, findings demonstrated that students felt personally invested, as evidenced by S4’s observation that the teacher successfully “gets us involved” in the daily learning process, moving away from “frontal teaching.”

Theme 3: Personal Connection (Care, Support, and Dedication)

The survey responses indicated that students perceived the teacher as a caring, supportive, and positive influence. The theme of “care and support” emerged from observations that the teacher “cares about our grades” and “cares if we learn.” S10 described an emotional adjustment involved, stating, “I apologize for acting rude at first. At that time I was so nervous & afraid that I did not know how to act, thank you with all my heart for helping me in my work. THANK YOU!!!!” This apology highlights the initial resistance students may feel toward an unfamiliar international teacher and the trust earned overtime through consistent support.

Recognition of the teacher's dedication was conveyed by S5, who encouraged the teacher to “always keep fighting and keep doing the job you love,” regardless of whether students were “disrespectful or loud.” Such messages highlight that in the United States, respect is not always readily given to teachers but must be actively earned. Additionally, a “positive demeanor” served as a recurring sub-theme, with participants describing the teacher as an “amazing person,” a “nice person,” and an “inspiring teacher that cares about our futures.” Several students expressed a desire to continue their studies with the teacher, identifying her as their “favorite teacher.” These findings suggest that cultivating personal connection fostered a responsive learning environment that supported both emotional and academic needs.

Discussion

Instructional Clarity as a Form of Scaffolding

Student perceptions of clarity point to a deeper instructional function than organizational neatness or pacing alone. The recurring observation that the teacher “breaks it down in sections” reflects the role of scaffolded transparency as a pedagogical bridge between the Philippine norm of teacher authority and the American expectation for student-guided participation. In Philippine classrooms, instructional clarity is traditionally achieved through formal exposition and teacher-led control of discourse. However, as Barrot (2023) and Wonder (2021) note, such clarity often operates within hierarchical participation structures.

In this study, students interpreted structured explanations not as restrictive but as enabling. S5’s characterization of the teacher’s delivery as “formal and intelligent” suggests that clarity retained its academic authority while becoming accessible through transparency. This finding aligns with Gay’s (2010) assertion that culturally responsive teaching requires educators to connect instructional delivery to students’ frames of reference. Here, scaffolded transparency allowed students to engage with rigor while maintaining a sense of autonomy. Requests for slower pacing and repetition further indicate that clarity in a cross-cultural classroom is not merely preferred but necessary for negotiating unfamiliar instructional styles. Through Kolb’s experiential learning cycle, these student responses served as catalysts for reflective adjustment, reinforcing clarity as a dynamic and culturally responsive practice.

Engagement as Student-Guided Classroom Talk

The theme of engagement reflected a movement from teacher-directed participation toward more student-guided classroom talk. Students consistently identified group work, collaborative quizzes, and peer interaction as central to their learning experience. This preference aligns with the student-centered discussion practices in the United States secondary classrooms, where academically productive talk is generated through shared reasoning rather than individual recitation.

Student feedback, such as S3’s emphasis on collaborative learning and his disclosure of anxiety related to being called on individually, underscores how engagement is inseparable from emotional safety. Decristan et al. (2023) emphasize that student-guided participation enhances learning outcomes, particularly when discourse structures accommodate diverse learner needs. In contrast to Philippine recitation models, where participation is often evaluated through accuracy and compliance, engagement in this classroom functioned as a culturally sustaining practice that redistributed authority and validated peer reasoning.

Engagement as Shared Responsibility

Another important interpretive layer emerges when engagement is viewed as a shared responsibility rather than a teacher-driven outcome. Student preferences for group work and collaborative activities suggest that engagement was experienced as something co-constructed with peers rather than delivered by the teacher. This reframing aligns with dialogic theories of learning, which emphasize that knowledge is generated through interaction rather than transmission.

S3's disclosure of anxiety related to individual performance highlights how traditional participation structures can unintentionally marginalize certain learners. In this context, engagement strategies that prioritized collaboration redistributed cognitive and emotional labor across the group. This not only increased participation but also normalized diverse ways of contributing. Decristan et al. (2023) note that student-guided participation supports deeper engagement when students feel that their voices carry weight within the learning process. The findings of this study affirm that such engagement requires intentional design, not spontaneity.

From a reflective standpoint, this insight underscores the importance of examining whose voices are amplified by instructional routines. By responding to student feedback, the teacher adjusted participation structures to sustain engagement while honoring individual differences. This demonstrates how reflective practice enables educators to move beyond generic engagement strategies toward context-responsive design.

Personal Connection and Development of Teacher Identity

Personal connection emerged as the most transformative dimension of instructional adaptation, showing how teacher identity was shaped through relationships with students. In Philippine classrooms, respect is often embedded within institutional hierarchy, with authority granted by position. In contrast, student narratives in this study suggest that respect in the American classroom must be actively earned through rapport, empathy, and consistency.

The narrative of S10 illustrates this shift with particular clarity. Her admission that initial rudeness stemmed from fear rather than defiance reframes resistance as an emotional response to unfamiliarity. Zhao and Green (2022) emphasize that emotional intelligence is essential for international teachers navigating relational expectations, a claim substantiated by the teacher's responsive approach in this study. By fostering a supportive environment, the teacher enabled students to adjust their own interaction styles, demonstrating that personal connection facilitates both emotional safety and academic engagement.

Student affirmations of care and dedication, including encouragement to persist despite classroom challenges, further indicate that respect was constructed relationally rather than assumed. This shift reflects a move away from reliance on positional authority toward a culturally responsive identity grounded in empathy. Such a transformation aligns with Gay's (2010) assertion that effective teaching must attend to students' emotional realities as integral to learning.

Institutional Support as a Bridge for Reflective Practice

The reflective journey documented in this study was not undertaken in isolation but was mediated by institutional support through the Professional Learning Community. The PLC provided a context in which reflection was normalized and risk was mitigated, enabling the teacher to act on student feedback without fear of negative evaluation. This finding aligns with Akram and Mehmood's (2023) assertion that reflective practice is constrained in environments lacking trust and administrative support.

By embedding the inquiry within a PLC and involving a Curriculum and Instruction Coach in data collection, the study used Brookfield's colleagues' lens alongside the students' eyes lens. This structure supported reflective experimentation and reinforced the classroom as a site of shared inquiry. The teacher's ability to respond to students' requests for clearer instruction,

increased collaboration, and relational support was supported by an organizational culture that viewed improvement as growth rather than deficiency.

This institutional support suggests that culturally responsive reflection is most effective when schools provide structures that enable reflective practice. Without such frameworks, international educators may struggle to translate insight into action, particularly when navigating unfamiliar evaluative systems.

Limitations

This study is limited by its focus on a single Grade 9 English Language Arts classroom, which constrains the transferability of findings to other educational contexts or cultural exchange settings. The reliance on self-reported student perceptions collected through an open-ended survey introduces potential response and social desirability biases, although anonymity and the involvement of a Curriculum and Instruction Coach helped mitigate these effects. In addition, the reflective design centers the teacher's interpretive lens, meaning that findings are shaped by the researcher's positionality and ongoing professional development. Finally, the study captures student perceptions at one point in time and does not account for longitudinal changes in instructional practices or student engagement. These limitations are consistent with reflective qualitative inquiry and do not diminish the study's contribution to understanding cross-cultural instructional adaptation.

Conclusion

The findings of this reflective practice study indicate that instructional clarity, student engagement, and personal connection function as interrelated elements in the professional adaptation of a cultural exchange teacher within a United States secondary classroom. These elements demonstrate how instructional approaches must be adjusted to align with students' participation patterns, communication expectations, and emotional needs. By systematically examining student feedback, the teacher treated the classroom as an ongoing site of inquiry, using student perspectives to identify and respond to cross-cultural differences in instructional practice.

One key finding is the importance of scaffolded instruction as a bridge between the structured instructional norms common in the Philippine context and the student-guided participation expected in many American classrooms. Students' appreciation for lessons that were "broken down in sections" suggests that clarity supported both comprehension and confidence when navigating unfamiliar instructional styles. Student engagement further reflected a shift toward collaborative learning and peer interaction, indicating that structured instruction can coexist with discussion-based and student-centered practices when participation is intentionally designed.

The development of personal connection highlights a shift from reliance on authority toward relationship-based classroom management. Student responses suggest that respect was established through consistency, support, and responsiveness rather than assumed through role alone. This reflective process was strengthened by the support of a Professional Learning Community, which enabled the teacher to respond to feedback within a culture of professional trust. Although limited to a single classroom context, the study indicates that reflective inquiry informed by student feedback can support instructional adaptation in cross-cultural teaching environments.

Recommendations

Based on the findings of this study, several practice- and policy-oriented recommendations are offered to support cultural exchange educators and the institutions that host them. At the classroom level, international teachers may benefit from engaging in systematic metacognitive reflection by regularly collecting qualitative student feedback. Open-ended student narratives provide insights into clarity, engagement, and relational dynamics that standardized evaluation tools often fail to capture. Such feedback allows educators to identify subtle misalignments between instructional intent and student experience, particularly in cross-cultural settings where assumptions about participation and authority may differ.

In addition, educators transitioning from hierarchical instructional traditions should intentionally employ scaffolded instruction as an adaptive strategy. Breaking down lessons into clearly articulated segments, modeling thinking processes, and revisiting key concepts through repetition and pacing adjustments can serve as culturally responsive bridges rather than constraints on student agency. Simultaneously, teachers are encouraged to design learning experiences that shift control of discussion toward students through collaborative tasks, peer discussion, and dialogue routines that sustain diverse participation styles.

At the policy level, school districts and international programs should implement structured training in reflective practice and culturally responsive pedagogy. Such training must explicitly address differences in classroom discussion practices and authority structures across educational systems. Embedding reflective tools within PLCs is highly recommended, as supportive cultures reduce fear of evaluation. Finally, qualitative student feedback should be formally integrated into professional development and evaluation frameworks for cultural exchange educators to signal that adaptation is a shared responsibility.

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

The author used generative artificial intelligence tools, specifically NotebookLM (Google), during manuscript preparation to organize author notes and refine language. The author maintained full responsibility for the intellectual content, data interpretation, analysis, and conclusions presented in this manuscript and critically reviewed and revised all AI-assisted outputs. No generative AI tools were used in data collection, data analysis, coding of responses, or interpretation of research findings.

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An Explanatory Study of Social Entrepreneurship and Educational Curriculum

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Abstract

The study shows the relationship between educational curriculum and social entrepreneurship. The study was conducted by gathering data from 432 emerging business enterprises operating in townships and locations in Gauteng Province, South Africa. Entrepreneurial skills were measured by using a composite index consisting of 5 dimensions. These 5 dimensions are talent for creativity (measured by using 3 items), willingness to take reasonable risk (measured by using 12 items), efficiency in responding to business opportunities (measured by using 15 items), business leadership quality (measured by using 18 items), and efficiency in taking advantage of programmes of assistance that are offered to emerging SMMEs by the South African Government (measured by using 11 items). The scales used for measuring entrepreneurial skills were adapted from similar work done by Z. Worku (2018) in the textile industry of Tshwane, South Africa. The results showed that about 70% of participants had satisfactory entrepreneurial skills, whereas the remaining 30% of participants did not. Regression coefficients and goodness-of-fit statistics obtained from structural equations modelling (Hoyle, 2023) showed that the level of entrepreneurial skills was significantly influenced by 3 factors. These 3 factors were ownership of business, long duration of business operation (6 years or longer) and the ability to use business intelligence methods to gather information about business decisions and activities carried out by rivals and competitors.

Keywords: emerging enterprises, entrepreneurial skills, social entrepreneurship

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Introduction

The study aims to show the benefits of early exposure to entrepreneurial education to success in the field of entrepreneurship in South African townships and locations. Z. Worku (2018, pp. 295–308) has quantified the level of entrepreneurial skills possessed by emerging entrepreneurs in the textile industry of Tshwane, South Africa, and has found that the local textile industry was losing substantial ground to foreign producers, suppliers and competitors due to lack of specialised skills in entrepreneurial, networking, marketing and manufacturing skills. Tahoori and Ghasemi (2017) have shown that exposing young learners to design and production skills used by BMW has significant benefits for motivating the youth to consider fields such as architecture, automotive design and engineering. Almahry et al. (2018) have shown that there is a significant relationship between childhood level education on entrepreneurship and entrepreneurial skills that are needed in local markets in Germany. Blanckesteijn et al. (2021) have shown that integrating entrepreneurial education to the curriculum, knowledge of theory and practice of entrepreneurship, exposure to entrepreneurial education and use of research are key factors that are highly valuable to the youth.

Studies conducted by Liguori et al. (2020) and Polowczyk et al. (2021) have shown that integrating lessons that are taught in classrooms to practical applications by taking them to industrial and commercial sites are highly helpful for promoting entrepreneurship among the youth. Surveys conducted by Inanna et al. (2020) and Liguori et al. (2020) have shown that early childhood exposure to basic entrepreneurial skills is a key motivating factor among young college graduates for embarking on entrepreneurship. Blanckesteijn et al. (2021) have shown that exposing young children to evidence-based entrepreneurial education is highly valuable for enhancing the mastery and transfer of technological skills that are essential for entrepreneurial activities. Y. Worku and Muchie (2020) have conducted a survey by collecting data from all 50 technical and vocational educational training colleges in South Africa and have shown that there is a dire need for aligning the curriculum taught to learners to the needs of industry, commerce, business and government.

Olutuase et al. (2020) have argued that the youth should be educated on how to use entrepreneurship for creating livelihood. Madzivhandila and Musara (2020, p. 257) and Z. Worku (2016) have found significant a relationship between poor municipal services and a high rate of failure in South African emerging SMMEs. The research work carried out by Traore et al. (2020) has shown that the ability of the South African Government to attract foreign direct investment in large volumes and willingness to liberalise cumbersome regulations that are applicable to the free flow of skilled employees, capital, goods and services is a key determinant of success in fulfilling the practical needs of emerging SMMEs in South Africa.

Literature Review

Marivate (2014, p. 54), Herrington (2018, p. 3), Ntshani (2020, p. 236), Z. Worku (2021, p. 1625), and Z. Worku (2019, p. 96) have found that emerging SMMEs in Gauteng Province and elsewhere are not benefiting from the Skills Development Programme initiated by the South African Government. Although sector-specific skills development and training programmes have been rolled out for over 3 decades in various economic sectors, the above authors have shown that emerging SMMEs in all parts of South Africa have failed to benefit significantly from such programmes (Marivate, 2014; Herrington, 2018; South African National Department of Trade, Industry and Competition, 2025).

Schroder and Storm (2020) and Schmulow (2020) have identified various regulatory obstacles and cumbersome bureaucratic procedures that hinder the free flow of foreign direct investment into South Africa. These obstacles are related to unaffordable and untenable labour-related regulations, failure to restrain and control trade unions, political interference, disregard for technical merits by political appointees, difficulties in business registration and business license renewals, and difficulties in obtaining travel visas to South Africa. According to the authors, foreign direct investors are often deterred by lack of economic stability and difficulty in the recruitment of skilled manpower from outside South Africa.

Table 1 shows details about planned and achieved tailor-made training programmes that are provided to emerging businesses by the South African Sector Education and Training Authority (Services SETA, 2021) in the year 2021. The table indicates that vocational trainings have been provided to emerging SMMEs according to plan, whereas the plan to provide similar training opportunities to artisans was not accomplished as planned. This failure is despite the dire need for sector-specific artisan skills that are needed in emerging SMMEs that operate in South African townships, locations and cities.

Table 1

Sector-Specific Vocational Training Opportunities Provided by Services SETA in 2021

Field of sector-specific training	Planned	Achieved
Number of skills programmes entered	4000	2300
Training of employees working for NGOs	100	101
Tailor-made vocational training to emerging SMMEs	600	635
Provision of technical assistance to organisations	500	600
Tailor-made vocational training to emerging artisans	2900	689
The successful completion of infrastructural projects	15	15
General training on human resources management	85%	88%
The successful completion of public-private projects	200	557
Processing of the enrolment of learners	3075	2575
Number of artisans trained successfully	720	253
Projects successfully completed by universities	8	9
Commencement of learnership trainings	18000	5265
Successful completion of learnership trainings	11459	10363
Commencement of bursaries to trainees	3500	1237
Successful completion of bursaries by trainees	1800	2152
Commencement of funds to trainees	6425	2470
Commencement of internship trainings	7590	3498
Number of internships completed	6053	4436

Source: Services SETA (2021)

Theoretical Underpinnings

The study is underpinned by theories of entrepreneurship and innovation proposed by Schumpeter (1983) as well as indicators that have been used in various studies conducted by Almahry et al. (2018), Marivate (2014), Madzivhandila and Musara (2020), Nhamo et al. (2021), Henderson (2021), Goolsbee and Syverson (2021), and Statistics South Africa (2023).

Aims of Study

The aim of study is to assess the level of entrepreneurial skills among emerging entrepreneurs operating small, micro and medium-sized business enterprises in townships and locations in Gauteng province, south Africa. The specific aims of study are the following:

1. What is the level of entrepreneurial skills in emerging business enterprises operating in Gauteng province townships and locations in South Africa?
2. What are the main determinants that affect the level of entrepreneurial skills in emerging business enterprises operating in Gauteng province townships and locations in South Africa?

Research Design

The design of study was exploratory and cross-sectional in which the level of entrepreneurial skills among operators of emerging business enterprises were measured. A questionnaire was used to gather data from 432 eligible participants of the study.

Setting and Participants

The study was conducted in locations and townships in the various sections of Gauteng province in South Africa. The target population consisted of owners and operators of emerging small, micro and medium-sized enterprises (SMMEs).

Instruments and Procedure

For each one of the 432 eligible participants of research, 5 dimensions of entrepreneurial skills or competence were measured by administering the questionnaire of study. The first dimension was creativity based on 5 items. The second dimension was risk appetite based on 5 items. The third dimension was responsiveness to business opportunities based on 15 items. The fourth dimension was the quality of business leadership based on 18 items. The fifth item was the ability to exploit legal rights in exploring business opportunities based on 11 items. Measurements obtained from the 5 dimensions were used to create composite scores for entrepreneurial competence or skills.

Data Analysis

Data analysis was conducted by using descriptive methods and a matrix of indicators used in studies conducted by Z. Worku (2018), Greenstone et al. (2020) and Hahn et al. (2020) for quantifying the level of entrepreneurial skills among emerging entrepreneurs. Frequency percentages were used for the measurement of attributes or proportions. The variance of estimation is mathematically equivalent to the variance of the proportion estimator statistic. The sample size of study ($n = 432$) is fairly large. All variances of estimation for proportions were quite small. Tests of normality confirmed that the assumption of normality was satisfied (Ross, 2020). Tools used for the measurement of items corresponding to the 5 dimensions of entrepreneurial skills were tested in the field by conducting a pilot study in order to ascertain content validity. All Cronbach Alpha coefficients of attributes were greater than 0.75 in magnitude. As such, all measurements and their corresponding precisions of estimation were adequate for the study (Washington et al., 2020).

Results of Study

Table 2 shows a profile for the 432 participants of study. About 61% of participants were owners. About 60% of participants had bachelor's degrees or more as academic qualifications. About 57% of participants had worked as entrepreneurs for 11 years or longer at the time of the survey. About 75% of businesses were operated by 5 or fewer people.

Table 2

Profile of Participants of Survey (n = 432)

Characteristic	Number of respondents and percentage
Business ownership by participant of study	Owner: 246 (56.94%) Employee: 91 (21.06%) Both owner and manager: 17 (3.94%) Administrator: 46 (10.65%) Shareholder: 32 (7.41%)
Highest level of formal education	Grade 12 or less: 51 (11.81%) Certificate: 32 (7.41%) Diploma: 89 (20.60%) Bachelor's degree: 209 (48.38%) Honours degree: 19 (4.40%) Master's degree: 29 (6.71%) Doctoral degree: 3 (0.69%)
Length of business operation	5 years or less: 57 (13.19%) 6 to 10 years: 134 (31.02%) 11 to 15 years: 145 (33.56%) 16 to 20 years: 76 (17.59%) 21 years or more: 20 (4.63%)
Number of people employed in businesses in the survey	2 or fewer people: 23 (5.32%) 3 to 5 people: 303 (70.14%) 6 to 10 people: 23 (5.32%) 11 people or more: 83 (19.21%)

Table 3 measures creativity based on 5 items. The table shows that about 74% of participants were capable of generating new business ideas and using innovative ways of conducting business.

Table 3*Measurement of Creativity Based on 5 Items (n = 432)*

Measurement of creativity based on 5 items	Low	Below average	Average	Above average	High
Generating new business ideas	8%	18%	49%	19%	6%
Interest in innovative ways of conducting business	9%	17%	48%	20%	6%
Experimenting with new business ideas	6%	20%	50%	18%	6%
Persistence in succeeding in entrepreneurship	3%	21%	51%	19%	4%
Attendance of business symposiums, meetings and conferences	9%	17%	47%	21%	6%

Table 4 measures risk appetite based on 5 items. The table shows that the majority of participants were prepared to accept reasonable risk in the course of conducting business.

Table 4*Measurement of Risk Appetite Based on 5 Items (n = 432)*

Measurement of risk appetite based on 5 items	Low	Below average	Average	Above average	High
Level of specialised education acquired in entrepreneurship	9%	17%	49%	17%	8%
Attendance of training programmes in entrepreneurship	10%	16%	48%	21%	5%
Level of risk taken by entrepreneur in the course of taking an investment decision	5%	21%	48%	20%	6%
Investment goal	4%	20%	49%	20%	5%
Level of comfort in current business activity	7%	19%	48%	21%	5%

Table 5 measures responsiveness to business opportunities based on 15 items. The table shows that the majority of participants were fairly well capable of responding to business opportunities.

Table 5*Measurement of Responsiveness to Business Opportunities (n = 432)*

Responsiveness to business opportunities based on 15 items	Low	Below average	Average	Above average	High
Quality of relationship with business customers	10%	16%	47%	17%	10%
Ability to assess and evaluate the degree of satisfaction of customers on a regular basis	9%	17%	48%	22%	4%
Ability to identify change in preferences of business customers	5%	21%	48%	20%	6%
Ability to handle customers with care	4%	20%	49%	20%	5%
Ability to identify business disruption	7%	19%	48%	21%	5%
Ability to manage business disruption	8%	18%	49%	19%	6%
Ability to adapt to change in business operation	9%	17%	48%	20%	6%
Ability to meet expectations of customers	6%	20%	50%	18%	6%
Ability to network with business rivals and competitors	3%	21%	51%	19%	4%
Ability to assess and evaluate market conditions	5%	21%	47%	21%	6%
Ability to provide prompt attentiveness to customers	5%	21%	48%	20%	6%
Ability to follow-up issues that matter to customers	4%	20%	49%	20%	5%
Willingness to accept constructive comments and suggestions from customers	4%	22%	48%	21%	5%
Willingness to learn valuable skills from business rivals and competitors	4%	22%	49%	20%	5%
Level of respect afforded to customers	4%	22%	48%	18%	8%

Table 6 measures the quality of business leadership based on 18 items. The table shows that the majority of participants possessed business leadership skills.

Table 6*Measurement of the Quality of Business Leadership (n = 432)*

Quality of business leadership based on 18 items	Low	Below average	Average	Above average	High
Knowledge of the core values of business	9%	17%	48%	20%	6%
Degree of relevance of business plan to the vital needs of customers	6%	20%	50%	18%	6%
Ability to ensure value for money for customers	3%	21%	51%	19%	4%
Knowledge of markets	5%	21%	47%	21%	6%
Ability to create business opportunities that are beneficial to customers	5%	21%	48%	20%	6%
Degree of adherence to basic business ethics principles	4%	20%	49%	20%	5%
Degree of adherence to basic corporate social responsibility principles	4%	22%	48%	21%	5%
Degree of enthusiasm for meeting the business needs of customers	9%	17%	48%	20%	6%
Degree of loyalty to customers	10%	16%	47%	17%	10%
Level of personal integrity in the eyes of customers	9%	17%	48%	22%	4%
Degree of commitment to customers	5%	21%	48%	20%	6%
Ability to take initiative to meet the business needs of customers	4%	20%	49%	20%	5%
Ability to make accurate judgement promptly	7%	19%	48%	21%	5%
Courage to take appropriate business decisions promptly	8%	18%	49%	19%	6%
Quality of relationship with customers	9%	17%	48%	20%	6%
Decisiveness on the effective management of core business activities	10%	16%	47%	17%	10%
Degree of dependability in the eyes of customers	9%	17%	48%	22%	4%
Ability to handle sensitive issues in dealing with customers	5%	21%	48%	20%	6%

Table 7 measures the ability to exploit rights that are made available due to prevailing circumstances fully based on 11 items. The table shows that the majority of participants were capable of exploiting their basic legal rights fully in the course of conducting business.

Table 7*Measurement of the Ability to Exploit Rights Fully (n = 432)*

The ability to exploit rights made available due to prevailing circumstances based on 11 items	Low	Below average	Average	Above average	High
Knowledge of rights that are of potential benefit	5%	21%	47%	21%	6%
Degree of readiness to exploit a business opportunity	5%	21%	48%	20%	6%
Ability to use business intelligence for market assessment	4%	20%	49%	20%	5%
Knowledge of municipal bylaws on business registration and licence renewal	4%	22%	48%	21%	5%
Ability to draw up a business plan	9%	17%	48%	20%	6%
Ability to manage bureaucratic procedures successfully	10%	16%	47%	17%	10%
Oral presentation skills	9%	17%	48%	22%	4%
Marketing skills	5%	21%	48%	20%	6%
Networking skills	4%	20%	49%	20%	5%
Ability to sell innovative ideas to potential customers	7%	19%	48%	21%	5%
Ability to raise capital needed for conducting business activities	8%	18%	49%	19%	6%

Table 8 measures overall competence in entrepreneurial skills by using a 5-point ordinal scale. The table shows that 69.68% (301 out of 432) of participants of the research had satisfactory entrepreneurial skills. The remaining 30.32% (131 out of 432) did not have satisfactory entrepreneurial skills.

Table 8*Measurement of Entrepreneurial Skills by Using a 5-Point Ordinal Scale (n = 432)*

Characteristic	Number of respondents and percentage
Entrepreneurial skills of participants	Good: 48 (11.11%) Above average: 87 (20.14%) Average: 166 (38.43%) Below average: 82 (18.98%) Low: 49 (11.34%)

Table 9 measures overall competence in entrepreneurial skills by using a binary scale. The table shows that 69.68% (301 out of 432) of participants of the research had satisfactory entrepreneurial skills. The remaining 30.32% (131 out of 432) did not have satisfactory entrepreneurial skills.

Table 9*Measurement of Entrepreneurial Skills by Using a Binary Scale (n = 432)*

Characteristic	Number of respondents and percentage
Entrepreneurial skills of participants	Adequate: 301 (69.68%) Inadequate: 131 (30.32%)

Table 10 compares businesses that are competent ($n_1 = 301$) with regards to entrepreneurial skills with businesses that are not competent enough ($n_2 = 131$) with regards to entrepreneurial skills. The table shows that business in which there are adequate entrepreneurial skills are operated by actual owners, and not by employed managers. They also have relatively better networking, marketing skills. Such businesses use e-commerce, online, social media effectively. They have relatively older. They are operated by people who are relatively better educated and use business intelligence methods fairly well.

Table 10

Comparison of Businesses With Regards to General Characteristics ($n = 432$)

Variable of comparison	Group 1 ($n_1 = 301$)	Group 2 ($n_2 = 131$)
Ownership of business premises	Own: 81% Rent: 19%	Own: 29% Rent: 71%
Competence in networking	Adequate: 74% Inadequate: 26%	Adequate: 53% Inadequate: 47%
Competence in marketing	Adequate: 73% Inadequate: 27%	Adequate: 41% Inadequate: 59%
Use of e-commerce for conducting business	Adequate: 32% Inadequate: 68%	Adequate: 6% Inadequate: 94%
Use of business intelligence	Adequate: 21% Inadequate: 79%	Adequate: 4% Inadequate: 96%
Attendance of at least one training session	Yes: 39% No: 61%	Yes: 3% No: 97%
Ownership of business	Yes: 80% No: 20%	Yes: 30% No: 70%
Duration of business operation	6 years or more: 62% Less than 6 years: 38%	6 years or more: 13% Less than 6 years: 87%
Use of social media	Yes: 68% No: 32%	Yes: 24% No: 76%
Awareness about equity crowdfunding methods	Yes: 41% No: 59%	Yes: 12% No: 88%
Ability to order merchandise in bulk on credit from wholesalers	Adequate: 69% Inadequate: 31%	Adequate: 16% Inadequate: 84%
Bookkeeping skills	Adequate: 63% Inadequate: 37%	Adequate: 21% Inadequate: 79%
Highest level of academic qualification of owner	Degree or above: 62% Diploma or less: 38%	Degree or above: 21% Diploma or less: 79%
At least one success in securing a business loan in the past	Yes: 66% No: 34%	Yes: 18% No: 82%
Past history of at least one bankruptcy	Yes: 7% No: 93%	Yes: 69% No: 31%

Discussion of Results

The principal aim of the research work in this paper was to construct a composite index that could be used for the measurement of basic entrepreneurial competence in emerging enterprises operating in South African townships in Gauteng Province, South Africa. The research was

based on a sample of 432 small, micro and medium-sized enterprises (SMMEs) that operate in Gauteng Province. In each business enterprise, entrepreneurial competence was measured by using a composite index consisting of 5 dimensions. These 5 dimensions are talent for creativity (measured by using 3 items), willingness to take reasonable risk (measured by using 12 items), efficiency in responding to business opportunities (measured by using 15 items), business leadership quality (measured by using 18 items), and efficiency in taking advantage of programmes of assistance that are offered to emerging SMMEs by the South African Government (measured by using 11 items). The results showed that about 70% of participants had satisfactory entrepreneurial skills, whereas the remaining 30% of participants did not. Regression coefficients and goodness-of-fit statistics obtained from structural equations modelling showed that the level of entrepreneurial skills was significantly influenced by 3 factors. These 3 factors were ownership of business, long duration of business operation (6 years or longer) and the ability to use business intelligence methods to gather information about business decisions and activities carried out by rivals and competitors.

In the period since April 1994, successive South African Governments have provided administrative, financial, legislative and policy-related support to emerging SMMEs that are based on the National Small Business Act (Act no. 102 of 1996). However, extensive research work carried out by Marivate (2014), Herrington (2018), Z. Worku (2018), Chigbu and Nekhwevha (2021), Dawson (2021), Gwiriri et al. (2019) and Bahoo et al. (2020) and Khambule (2021) have shown that it has not been possible to reduce the high rate of failure in emerging SMMEs due to lack of entrepreneurial skills. Dahlander et al. (2021), Dawson (2021) and De Crescenzo et al. (2020) have identified additional obstacles such as lack of marketing and networking skills, intense competition from well-established businesses and difficulty in raising business loans.

According to a ranking published by CEOWORLD (2021), the top 5 most entrepreneurial countries and their standardised scores in entrepreneurship are the USA (42.88), Germany (41.05), the United Kingdom (35.8), Israel (34.25) and United Arab Emirates (31.01). Since the early 1950s, Israeli businesses have excelled in the effective utilisation of the latest scientific discovery for minimising the cost of service delivery, goods and products without lowering quality standards. In this regard, the most notable examples come from economic sectors such as water, agriculture, information communication technology and industrial manufacturing. Israel-Fishelson and Hershkovitz (2021) have shown that exposing pupils to creative thinking, innovation and numeracy skills at an early stage is highly beneficial for fostering entrepreneurial thinking among the youth. Entrepreneurs identify a gap and find solutions for filling the gap by using methods that are relatively more efficient and less costly in comparison with traditional and conventional methods.

Conclusion, Implication and Recommendations

The study found that about 70% of participants had satisfactory entrepreneurial skills, whereas the remaining 30% of participants did not. The study also found that the level of entrepreneurial skills was significantly influenced by 3 factors. These 3 factors were ownership of business, long duration of business operation (6 years or longer) and the ability to use business intelligence methods to gather information about business decisions and activities carried out by rivals and competitors. These findings are similar to earlier findings published by Fatoki (2014), Marivate (2014), Herrington (2018), Z. Worku (2021) and Ntshani (2020) in which the authors have found that programmes of assistance that are given to emerging SMMEs by the South African National Department of Trade, Industry and Competition (2023) and the Small

Enterprise Development Agency (SEDA, 2020) are not utilised optimally due to obstacles such as poor awareness, inadequate motivation and commitment from owners and operators of start-up business enterprises.

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Underscoring Creativity of High-Achieving Secondary School Students: A Discourse on Gender, Environment and Cognitive Interference

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Abstract

This study examined gender, environment and cognition factors as determinants of creativity among high-achieving secondary school students in Oyo, Nigeria. The study adopted an ex-post facto research design. Four hundred and sixty (460) High achieving students were selected to participate in the study through a systematic sampling technique across twenty-three secondary schools in Oyo, Nigeria. Three research Instruments used in the study were Slosson's Intelligence Test (SIT) $\alpha = 0.97$, Ibadan Creativity Assessment Scale (ICAS) $\alpha = 0.79$ and Socio-Economic Status Scale (SES) $\alpha = 0.73$. Three hypotheses were tested at 0.05 level of significance data collected from the study were analysed using multiple regression analysis and t-test statistics. The results showed that environmental, gender and cognitive factors, when taken together significantly predicted creativity in participants, ($F_{(12; 447)} = 7.514$) $p < .05$. Also, there was no significant difference between male and female students' performance on creativity ($t = 0.212$; $df = 458$; $p > .05$). Based on these findings, it was concluded that home and school environments were critical to the expression of creative behavior in the participant students. Recommendations were however made based on these findings for parents, teachers, government and all stakeholders to creatively re-structure both home and school environments with a view to facilitate the development and enhance future planning of creative potentials of high-achieving secondary school students in Oyo, Nigeria.

Keywords: creativity, environment, gender, cognition, high achieving students

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Introduction

Creativity is a complex concept. It is derived from a Latin word “Creatus” which means “to bring into being.” More often than not, creativity has been associated with the arts—painting, dancing, sculpture, literature and the likes. In some cases, creativity is considered synonymous with innovation or invention. Researchers in the area of creativity have used terms such as innovation, novelty, imagination, discovery, newness, ingenuity, uniqueness, unusualness, intuition, originality and invention to describe the nature of creativity (Oyundoyin, 2003). Innovation and creativity are distinct but interconnected core ideas and both are crucial for teaching and learning successful outcomes. Esu (2015) contended that in an educator’s journey, it is not creativity that propels his/her creations development but rather innovation, but innovation does not take place unless a teacher possesses creative abilities, accordingly, whenever a teacher permits bureaucracy to hinder creativity, it might result in lack of novelty in his/her teaching, hence, a creative teacher carries out the innovative process by being the first to identify potential opportunities for teaching and learning.

Creativity is often acknowledged superficially; some schools are now seeing genuine instances of innovation taking place beyond their premises. Psychologists contend that creativity is not an optional addition to the classroom, but rather, a distinct and measurable set of psychological skills that enhances learning and it is crucial in the era of technological advancement, that is 21st century (Fraser, 2022; Nakano & Wechsler, 2018; Stephenson et al., 2021).

In his book titled *Creativity in the Classroom*, Startho (2018) enumerated techniques that foster creativity as addressing problems, exploring several possibilities and encouraging inquiry which facilitates profound comprehension, creativity might serve as a predictor of school success, surpassing the contribution of standardized test results, the use of creativity may enhance learning experience upon achieving educational milestone. Creativity encompasses more than simply the act of developing or producing art; it extends to living in a creative manner (Sternberg, 2012).

Humaira (2012) investigated the efficacy of creativity, creative writing and classroom tactics among English instructor in Pakistan, using both closed-ended and open-ended questionnaire as well as group interview as data collection devices. The finding revealed that the currently employed were experiencing a lack of clarity on the techniques required to stimulate students’ enthusiasm for creative writing. Also, revealed was a strong connection between creativity and creative writing. In the same vein, Zairil et al. (2015) researched on the use of creative thinking abilities in the context of academic essay writing in an Islamic higher institution of learning. The study included two experimental groups of undergraduate students receiving treatment via the Cognitive Research Trust Programme, and the control group that are left with conventional method. The result of the research revealed a favourable correlation between instructors’ creativity and students’ performance, thus, suggesting that in order to enhance educational standard required in this current age of globalization, there should be an improvement on conventional teaching method.

High achieving students are generally found exhibiting some creative characteristics, Nwazuo (1996) identified in them a general average or above average of intelligence, ideational fluency, discriminating observations, superior memory, ability to synthesize disparate ideas, cognitive flexibility and the production of unusual but appropriate ideas.

Furthermore, they are original in their ideas and to these set of students, repeated failures would not intimidate them into submission.

Studies which investigated gender differences in creativity are often characterised by contradictory results. Some of the findings showed male superiority over females, some vice versa, yet others did not implicate and differentiate between the two sexes. Some psychologists opined that creativity is sex inclined, as their findings favour males, that is, creativity is commonly found more among the males than the females due to perharps, the sex roles difference emphasized in the society (Eric, 2003).

Tagano and Moran (1989) assessed the development of sex differences in creativity of pre-school and early elementary school children in terms of ideational fluency and discovered that sex differences were not found in pre-school but by third grade, boys scored significantly higher than girls on both popular and original responses.

However, in a study conducted, Kim and Michael (1995) found the relationship of creativity measure on learning and thinking style using 92 male and 101 females Korean II grade, it was discovered that females are more creative than their male counterparts. In the same vein, Orioux and Yewchuk (1990) had found that gender effects favoured females than males in creative performance. Other researchers such as Gonen (1993) and Selby (1993) in their various studies found on the contrary, no significant difference between males and females performance in creativity scores.

On the relationship between creativity and environment, many research studies had been conducted. Nwazuo et al. (2002) in Nigeria's cultural context identified home as playing a central role in fostering or inhibiting creativity. It was advanced that parents, being the child's first educator in life, occupy a privileged position with respect to the nurturance of creativity in the child, therefore parents should be prepared to accommodate the divergent views or opinion of their children unconditionally in order to encourage the creativity potentials in them. Also, observed was that rigid, authoritarian parenting would stifle creativity because such an approach had the potential of making children very protective of the status quo and unable to question the relevance or usefulness of certain practice.

Lee and Lee (2003) confirmed the psychosocial and functional impact of physical surroundings on creativity; their study focused on significant physical attributes that support individual creativity universal skills such as divergent and convergent thinking and idea generation which were identified as the components of creative performance at work along with professional and motivational factors. Also considered in the study was inspiration for creative idea generation, social exploration, recharging and mixed-used spaces with balanced workplace layouts. The study further provided experimental evidence of the effect of interior design element on creativity, while perceptually stimulating environments could enhance creativity through physical contexts. Social spaces were frequently found to be influential on creativity.

In another study, Oyundoyin (2003) examined environmental factor as a predictor of creativity, these factors include parents' academic attainment, family, parental occupation, attitudes and position in the family, teachers' attitude, classroom interaction, and expression of opinion, it was discovered that these factors did not significantly predict creativity among secondary school students.

It is worthwhile to report that many scholars actually studied the effects or relationship between intelligence and creativity. This is evidenced with the usage of intelligence tests and creative scores to express their correlation. The cognitive factor predicts creative performance in a study (Oyundoyin, 2003).

Vincent et al. (2002) had found very low correlation between intelligence and creative scores in various tests. Nwazuoke (1996) further asserted that individuals may be above average in intelligence but not necessarily being gifted. In another development, support for distinctions between intelligence and creativity was reported to have come from a study of young children by Moore and Sawyers (1987) in which they reported that original thinking is distinct from intelligence. Equally, Runco (2003) had found a non-linear, positive relationship between intelligence and creativity test scores.

The creative person has been described as one who has the ability to see beyond existing structure and invest relationships with a view to bringing something into existence, to invent, innovate and provide the means for meeting challenge of life in a rapidly changing world. Thus, Adediran and Adebajo (2025) contended that if we were to identify children as high achieving or gifted simply on the basis of intelligence tests, we would eliminate from consideration approximately seventy percent of the most creative. Students with high grades in school may or may not be creative well in school or on the job or never generate any original ideas. There are also children who do poorly in school and demonstrate little motivation but have a high degree of creative talent. Thus, Moglia and Abalos-Merino (2024) corroborated this assertion that the relationship between creativity and intelligence is therefore complex, involving numerous variables, including social context and personal experience. As research continues to explore these dynamics, it becomes clear that both constructs are multifaceted and essential for effective problem-solving and innovation across various domains.

Hypotheses

Three hypotheses were tested at 0.05 level of significance.

1. Gender factor will not significantly predict creativity of the participant students.
2. Environment factors will not significantly predict creativity of the participant students.
3. Cognitive factor (Intelligence Quotient) will not significantly predict creativity of the participant students.

Methods

The study adopted ex-post facto research design. Systematic sampling technique was used to select 23 secondary schools in Oyo State, Nigeria. 20 students each were selected from each schools selected using simple random sampling method. This sums up to 460 secondary school students.

Instrumentation

The instruments used for this study include:

Slosson's Intelligence Test

This test was re-validated to suit the culture of the testees without altering content validity of the test. The test is being used in this study assess the intelligence quotient of the samples. The 1960 revision of the Stanford Binet (BS) Intelligence Test was used by Slosson (1985) as the criterion in building his test and in establishing its validity. His sample include 701 persons ranging in age from 4 to 18+ years.

Concurrent validity coefficients were calculated that the SIT correlated with its criterion, the SB, just as the SB correlates with itself. The validity and utility of the SIT thus appeared to be well established. The researcher equally subjected it to test-retest by administering it to students of C. A. C. School for the Gifted, Ibadan. The instrument yielded a high content validity and a test-retest reliability of 0.86.

Ibadan Creative Assessment Scale

This was developed by Akinboye (1977) and revalidated by Adediran (2026) it is an indigenous standardized battery of tests tapping certain creative patterns of human traits. The test was adopted, it has two broad divisions A–D and E–K. Sections A–D has some items in form of statement to which the participant is expected to indicate on a ten-point scale, the extent to which he/she agrees with each statement, while section E–K are questions requesting answers from the participants to show their creative behavior through their responses.

The section A–D comprises four sub-scales namely:

- A. Ideative fluency
- B. Ideative originality
- C. Ideative flexibility
- D. Ideative motivation

Akinboye (1977) used a sample of two hundred (200) subjects for each of the sub-scales as the psychometric properties of test construction. Thus, a subject with high scores in each of the subsections A, B, C, D indicate high creative ability. Furthermore, a score of seventy (70) on any scale indicates a minimum acceptable creativity in an individual.

Akinboye (1977) reported a construct validity of co-efficient alpha

α of 0.76 for ideative fluency

α of 0.71 for ideative originality

α of 0.64 for ideative flexibility

α of 0.77 for ideative motivation and test-retest reliabilities for each section after a period of four weeks fielded as follows:

Fluency scale	A	=	r	=	0.79
Originality scale	B	=	r	=	0.77
Flexibility scale	C	=	r	=	0.72
Motivation scale	D	=	r	=	0.85

Moreover, a face validity was ensured for each scale through item selection process. While the convergent construct validity within the scales were as follows:

Ideative flexibility with originality	r	=	0.73
Originality with fluency	r	=	0.87
Originality with creativity motivation	r	=	0.73

Socio-Economic Status Scale (SES)

The instrument was developed by Salami (2000), it was adapted and re-validated by Dada (2004), when used to determine the socio-economic status of parents of trainable pupils with mental retardation with a view to enhance self-help achievements using explicit-teaching and peer tutoring instructional strategies. A reliability coefficient of 0.73 was established. The researcher also adopted it and subjects it to test-retest to further ascertain its reliability among the pupils of C.A.C School for the Gifted, Ibadan who were not part of the sample used in this study, using Cronbach alpha, a reliability coefficient of 0.86 was recorded.

The scale has 12 items; the items 1–4 in the scale are on the pupils' bio data, the items 5–12 are based on parents' occupation, educational level, residence and types of equipment in the house.

Scoring and Interpretation of Scores

The scoring pattern for the scale is:

Parents Occupation	1–10 points
Educational Level	1–14 points
Parents Residence	1–6 points
Type of House	1–3 points
Equipment in the house	1–27 points

The maximum point is 60. The point is further divided into three parts:

0–15 points	Lower Socio-Economic Class
16–40 points	Middle Socio-Economic Class
41–60 points	High Socio-Economic Class

For the pupils understanding, the items therein were further explained in Yoruba language, while the research assistants assisted in administering the test.

Hypothesis 1

The gender factor will not significantly predict creativity of the subjects.

Table 1

Regression Summary Table Showing Effect of Gender Factor on Creativity (Analysis of Variance)

	Sum of Square	df	Mean Square	F	Significance of F
Regression	4.402	1	4.402	0.045	0.832*
Residual	44679.813	458	97.554		
Total	44684.215	459			

* Not significant at 0.05 level.

Multiple R = .0010

Multiple R² = .000

Adjusted R² = 0.002

Standard Error of the Estimate = 9.877

In Table 1 the gender factor did not predict creativity. The total variance accounted for by gender factor is 0% (i.e., Multiple R² = 0.000). This implies that the variable considered did not influence creativity among secondary school students in Oyo State, Nigeria.

Hypothesis 2

The environmental factor will not significantly predict creativity of the subjects.

Table 2

Regression Summary Table Showing Composite Effect of Environmental Factors on Creativity (Analysis of Variance)

	Sum of Square	df	Mean Square	F	Significance of F
Regression	4766.354	10	529.595	5.970	.000*
Residual	39917.861	450	88.706		
Total	44684.215	460			

* Significant at 0.05 level

Multiple R = .327

Multiple R² = .107

Adjusted R² = 0.92

Standard Error of the Estimate = 9.428

In Table 2. Above, all the variables of environmental factor taken together significantly predict creativity. The total variance accounted for by all the variables of environmental factor taken together is 10.7% (i.e., Multiple R² = 0.107). This implies that the variables considered under environmental factor are all important when considering the factors that influence creativity among secondary school students.

Hypothesis 3

The cognitive factor (IQ) will not significantly predict creativity of the subjects.

Table 3

Regression Summary Table Showing the Effect of Cognitive Factor on Creativity (Analysis of Variance)

	Sum of Square	df	Mean Square	F	Significance of F
Regression	3581.225	1	3581.225	39.905	0.000*
Residual	41102.991	458	89.745		
Total	44684.215	459			

* Significant at 0.05 level.

Multiple R = .283

Multiple R² = .080

Adjusted R² = 0.078

Standard Error of the Estimate = 9.473

In Table 3, the cognitive factor significantly predict creativity among the subjects. The total variance accounted for by the cognitive factor is 8% (i.e. multiple R² = 0.080). This implies that intelligence quotient is important when considering the factors that influence creativity.

Discussion

The findings of this study in hypothesis 1 revealed that gender did not predict creativity among the high achieving students considered in the study (Table 1). There was no discrimination between male and female students' performance in creativity score. This result is not surprising but rather corroborates the findings of Gonen (1993) and Selby (1993) who found no significant difference between males and females students' performance in creativity scores. On the contrary, Kim and Michael (1995) discovered in a study that females are more creative than their male counterpart, in the same vein Orioux and Yewchuk (1990) had found in a study that gender effect favoured females than males in creative performance.

In the hypothesis 2; the result showed that environmental factors taken together significantly predict creativity. This finding is in line with the submission of Lee and Lee (2003) that confirmed the psycho-social and functional impact of physical surrounding on creativity. On the contrary, Oyundoyin (2003) discovered that the environmental factors did not significantly predict creativity among secondary school students.

In hypothesis 3 which stated that cognitive factor (intelligence quotient) will not significantly predict creativity of the participant students was not sustained. The results showed that the cognitive factor predict students' performance in the study. This was not in consonance with Oyundoyin (2003) that asserted that cognitive factor predicts creative performance in a study, although, Vincent et al. (2002) had found very low correlation between intelligence and creativity score in various tests. In this study, it is suggested that students should be given freedom to express their creative tendencies. A liberal classroom environment which leads to discoveries should favour creativity better than a mere rigid and stereotyped condition. Adediran and Adebajo (2025) in their submission posited that students with high grades in School may or may not be creative well in school or on the job or never generate any original idea.

Conclusion

This study has revealed some factors that predicted creativity among high achieving students. Some variables considered include gender environment and cognition as they were able to predict creativity.

It was establishment that the variables considered as independent variable were all important influence creativity. However, the environmental factor both in school and at home are very significant as human being are deemed to respond to their environment, either actively or passively. Active response is more likely for one who has had an opportunity to develop a sense of self-worth through a supportive environment, particularly in the formative years. A stimulating environment world ignites a spark in the individuals to be creative. The physical and emotional climates would therefore very crucial to creation expression.

Also, gender was seen not to determine creative ability of students but rather, it does shape creative opportunities, recognition and expression through social mechanism.

This study suggested that gender has a negligible direct influence on human creative potential, thus a weak predictor of creativity, however, observed differences in creative achievement are largely explained by environment.

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The Role of AI in Teaching Low-Resource Languages: The Case of the Georgian Language

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Abstract

Artificial intelligence is actively integrated into language teaching to enhance material production, personalise lessons and increase learner engagement. While many studies have examined the role of AI in language teaching, most focus primarily on high-resource languages, such as English. Low-resource languages like Georgian, which belongs to the Caucasian language family and lacks digital presence as well as teaching materials, remain unexplored. This article aims to investigate the practices of using AI in teaching Georgian as a foreign language while focusing on its pedagogical strengths and limitations. The study applied a quantitative approach. Through a questionnaire, this research explored the experiences, practices and attitudes of 40 Georgian language teachers regarding AI and AI-generated classroom activities. Participants reported on how, why and to what extent they use chatbots while also reflecting on the advantages and challenges they encounter. The results showed that some teachers are reluctant to use AI, revealing that it makes grammatical, spelling and structural inaccuracies, occasional hallucinations and misleading content derived from the translation of English data; however, others greatly rely on AI, noting that it personalises learning, adapts and creates new materials to match students' needs. The study provides novel insights into the pedagogical value and restrictions of AI in teaching low-resource languages compared to high-resource languages based on the case of Georgian.

Keywords: artificial intelligence, foreign language acquisition, Georgian language, low-resource languages

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Introduction

The emergence of artificial intelligence was quickly met with its implementation across different fields. Education, and especially language teaching, has not been an exception. Although generative AI and chatbots still raise questions, and educational centres are in the process of readjusting ethical rules and guidelines, this has not stopped the process of reshaping language education practices through AI. In such a reality, it is important to question if this process is reflected in the same way around the globe. While chatbots have been integrated into English language education (Chuah & Kabilan, 2021; Kim et al., 2019) and many studies discuss their effect in English, the technological transition has not been the same across different languages, and they are underrepresented (Suárez & García-Mariñoso, 2025; Vassilakopoulou & Hustad, 2023). Therefore, it is interesting to investigate the role of AI in teaching low-resource languages.

The Georgian language belongs to the category of extremely low-resource languages. It is a South Caucasian agglutinative language spoken only in Georgia. It has a distinctive writing system and contains 33 sounds. As Georgia is home to many minorities, such as Russians, Ukrainians, Azeris, Turks and Armenians, there is a demand to teach Georgian as a foreign language. However, teaching materials are scarce, and it is interesting to see how AI is being integrated into the teaching process. As there are not many studies that examine the effectiveness of chatbots in teaching low-resource languages, especially the Georgian language, this article aims to investigate how teachers utilise AI and what its strengths and weaknesses are.

Literature Review

Generative artificial intelligence has been developing throughout the years, but it quickly became popular and practical in 2022 when ChatGPT was released (Rahimi & Abadi, 2023). Generative AI refers to the technologies that can produce and generate new meaningful content, such as texts, images, or audio, based on a given prompt (Feuerriegel et al., 2024). Therefore, Gen AI includes chatbots like ChatGPT, Gemini, DeepSeek, Copilot, and others (Barnes & Tour, 2026).

Chatbots have great pedagogical potential to enhance teaching practices, especially for language learning (Agustini, 2023). Integrating AI into teaching supports both students and teachers. As many researchers note, AI can have a positive influence on enhancing critical thinking (Tafazoli, 2024), intercultural knowledge (Bonner et al., 2023), creativity (Creely, 2024), motivation, and engagement (Ali et al., 2023; Mohamed, 2024) in students. On the other hand, Gen AI greatly helps teachers to generate a variety of resources and teaching materials like lesson plans, texts or activities (Jeon & Lee, 2023; Kohnke et al., 2023; Koraishi, 2023; Law, 2024; Mohamed, 2024). It not only saves time but also addresses students' vast needs (Koraishi, 2023). It is also noted that chatbots modify existing materials according to teachers' wishes (Kohnke et al., 2023). Additionally, teachers also use AI to check and provide feedback on students' work (Han & Li, 2024). AI is also reported to improve learners' writing (Liu et al., 2024), speaking (Qiao & Zhao, 2023), and vocabulary skills (Hsu et al., 2024). Based on the productivity of Gen AI, it is clear that the scarcity of materials is no longer a problem, and teachers can adjust lessons according to specific situations (Jeon & Lee, 2023). However, as AI and chatbots have not been widely used for many years, there are still a plethora of teachers who are not familiar with their usage and view their integration with doubt (Jeon & Lee, 2023; Kohnke et al., 2023).

There is no surprise that the role of AI in teaching foreign languages is even more important. Chatbots support teachers in bringing different cultures together and teach students specific and particular cultural information (Othman, 2023). This effect is even more vivid in languages that are not as popular and well-represented as English. The emergence of AI became the key to producing better foreign language education resources in developing countries, where traditional educational resources are usually scarce and limited (Yang, 2024). As Jiasheng and Yajuan (2023) note, ChatGPT works like an “online encyclopedia” and gives teachers access to vast materials which were only accessible to developed countries. AI has been proven to be very effective in teaching foreign languages (Jurinjak et al., 2024).

High-Resource Languages Versus Low-Resource Languages

In order to see how Gen AI and chatbots work, it is important to note that Gen AI heavily depends on the availability of linguistic data (Wang, 2025). Chatbots are neural networks which are trained on unannotated texts taken from different online sources (Jakubiček & Rundell, 2023). Through generative language models, chatbots analyse text and word patterns to generate plausible responses. Therefore, it does not think or deduce; it just creates possible word sequences (McGiff & Nikolov, 2025).

According to the availability of data, there are high-resource and low-resource languages. High-resource languages have a plethora of digital corpora and texts. Due to the demand, high-resource languages also have rich technological support to further develop natural language processing (Ferber, 2020; Stanford HAI, 2025). Low-resource languages are quite the opposite. They are characterised by data scarcity and limited tools or materials (Wang, 2025). The distinction between them is also determined by socio-political aspects and the global demand (Nigatu et al., 2024). According to Zhong et al. (2024), statistical differences between these two groups of languages are yet to be defined. However, it is clear that high-resource languages hold a prestigious position, while low-resource languages are underrepresented with many limitations and errors (Wang, 2025).

Nigatu et al. (2024) perfectly describe their relationship, stating: “This framing of high- vs. low-resource languages resembles Zeno’s Achilles paradox: ‘high-resourced languages’ are the tortoise, which has been given a head start in the research community and continues to receive much of the attention, and ‘low-resource languages’ are Achilles.” Such a major gap can be reflected in current studies that mainly cover high-resource languages, such as English, and do not evaluate low-resource languages. It certainly raises issues regarding linguistic equity (Onan et al., 2026).

The performance of chatbots can degrade based on the language coverage and linguistic differences. According to Wang (2025), teachers of high-resource languages were pleased with Gen AI, while the pedagogues of low-resource languages were more reserved. A large majority of teachers who teach ESOL (Chinese, French, Spanish) rated AI’s performance as satisfactory, while teachers of low-resource languages stated that AI is not suitable for their needs. Additionally, as researchers note, rather than generating incorrect information, producing persuasive text that may mislead teachers is the bigger problem (Onan et al., 2026). Studies on some low-resource languages like Arabic or Turkish show that in low-resource languages, AI brings biases from unreliable sources (Moustafa et al., 2026). Therefore, there is a major gap in current studies that mainly cover high-resource languages, such as English, and do not evaluate low-resource languages. Therefore, it raises issues regarding linguistic equity (Onan et al., 2026).

Performance of AI in the Georgian language

When it comes to the Georgian language, the scarcity of sources is apparent. Some research can be found on the overall usage of AI in education, but there is very little focus on language teaching. According to older studies, AI was not popular in teaching, and the shift towards a technology-friendly environment was slow. From the perspective of EFL teaching, in Georgian public and private schools, 79.3% of teachers do not use AI technologies in teaching practices (Tskhakaia, 2024). However, one of the recent studies shows a slight divergence and a growing tendency towards the use of AI in teaching (Gogberashvili et al., 2026). ESL educators in universities seem to attend training sessions on AI and learn how to utilise it for learning practices. Concerns about limited funding and technical difficulties are also highlighted (Gogberashvili et al., 2026).

Strengths and limitations concerning Gen AI's performance in the Georgian language seem to be greatly underrepresented. No specific articles could be found that discuss how chatbots perform in Georgian, especially for teaching purposes. According to Lomidze's (2025) research on the use of AI in lexicography, Gen AI (ChatGPT in particular) generates incorrect and ungrammatical Georgian sentences. It often hallucinates nonexistent Georgian words, misspells, and cannot effectively conjugate verbs (Lomidze, 2025). The generated texts are often biased toward English (Trap-Jensen, 2024), and Georgian sentences follow English grammar structure or semantics (Lomidze, 2025). The effectiveness of AI in the Georgian language is better if prompts are simple. Therefore, the generated output may need thorough editing. Munjishvili and Shugliashvili (2025) note that the complexity of the Georgian language makes the NLP process harder, and chatbots lack precision. The reason for Gen AI's limitations is the scarcity of Georgian data (Lomidze, 2025). ChatGPT-3 was trained on only 0.0006% Georgian data (Walsh, 2025), while 93% of its training data was in English. On the other hand, it identifies parts of speech fairly well. It can determine formal, informal, neutral or derogatory phrases and has an overall grasp of the language (Lomidze, 2025).

Methodology

This research applied a mixed-methods approach to examine AI's pedagogical strengths and weaknesses in teaching Georgian, a low-resource language, as a foreign language. In order to analyse teachers' attitudes and experience, a survey was conducted. The questionnaire was created in Google Forms and contained 22 questions, mainly multiple-choice questions and a linear scale rating for quantitative analysis, along with a small number of open-ended questions to collect qualitative data on participants' opinions. The survey was originally written in English, but it was also translated into Georgian, as some teachers did not know English. 7 questions out of 22 involved demographic information, and 15 questions examined the usage of AI tools in teaching. The questions focused on identifying the purpose, frequency and effectiveness of using AI tools in teaching. The questionnaire took approximately 5–7 minutes.

Participants

The research participants were 40 (36 female and 4 male) teachers of the Georgian language. The majority of the participants (37.5%) were between 20–25 years old, while 22.5% were 31–40, 15% were 26–30 and 51+, and others were between 41–50. Most of the participants (30%) had 1-3 years of teaching experience, 22.5% had 4-7 years of experience, 17.5% had more than 10 years of experience, 15% had 8–10 years, and another 15% had less than 1 year. The participants varied according to their teaching environment. The vast majority (47.5%) were

freelance tutors, 20% were working in private language schools, 15% worked in schools, and others worked in universities and on online platforms. Interestingly, almost all of the participants (32) usually teach beginner level students (A1–A2), a little more than half (23) only teach intermediate (B1–B2) level, and only 8 people teach advanced level. 65% of the participants were familiar with AI tools, 15% were somewhat familiar, and others were not. The participants were part of a convenience sample, and a questionnaire was sent to them.

Results

The questions will be grouped according to three topics: frequency and purpose of AI tools usage, strengths and weaknesses of AI tools, and teachers' attitudes.

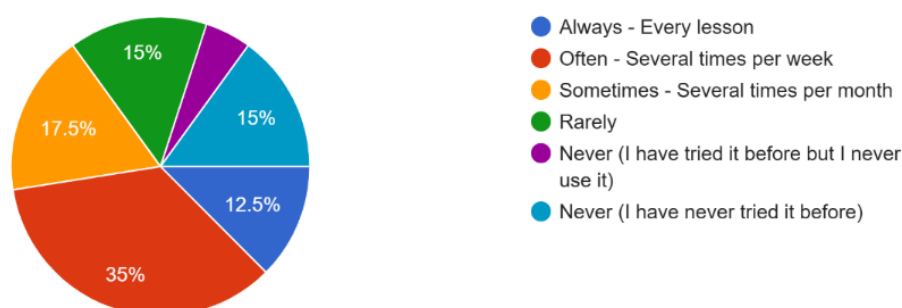
Frequency and Purpose of AI Tools Usage

Figure 1

Question 1 Concerning Frequency and Purpose of AI Tools Usage

How often do you use AI tools in your teaching?

40 responses



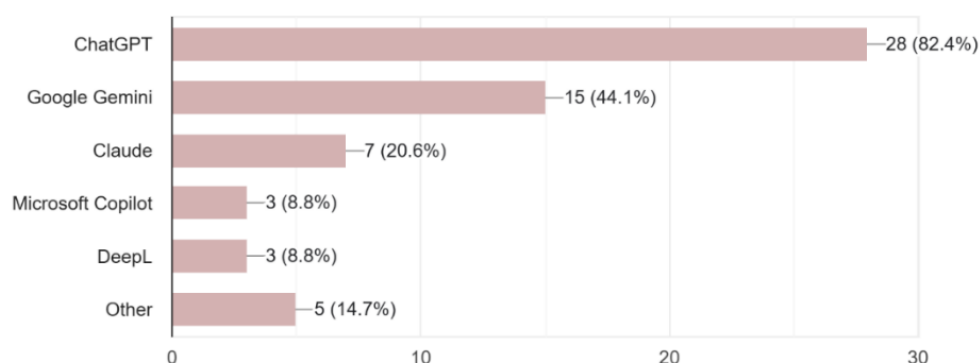
Out of 40 teachers, 35% use AI tools often (several times per week), 17.5% use it sometimes (several times per month), 15% - rarely, and 12.5% always utilise it. 2 participants never use it, although they have tried it before. 6 participants never tried it before; therefore, they were not able to complete all the questions.

Figure 2

Question 2 Concerning Frequency and Purpose of AI Tools Usage

Which AI tools have you used for teaching Georgian?

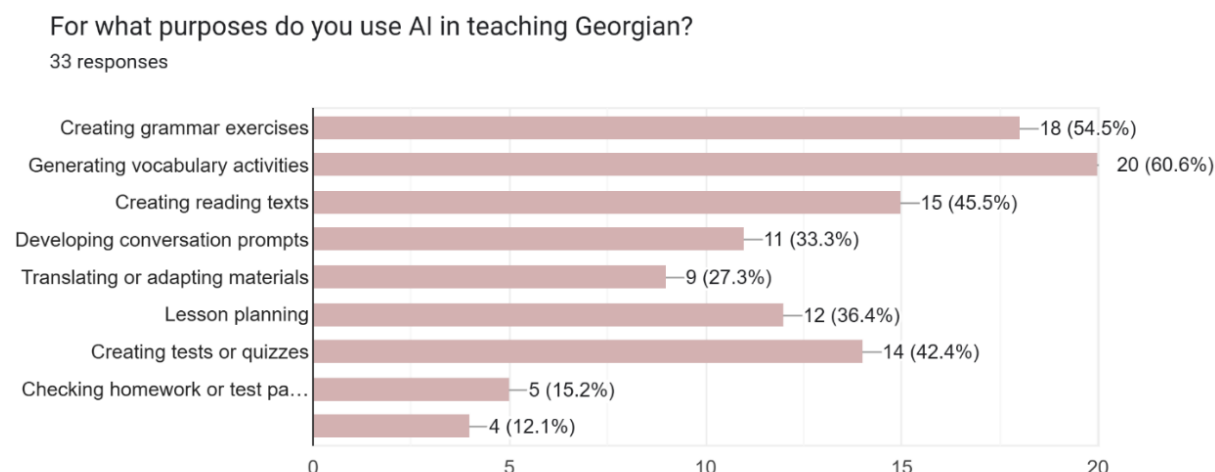
34 responses



The most popular AI tool seems to be ChatGPT, as 82,4% of teachers use it. 44.1% use Google Gemini, 20.6% use Claude, and only a small number use Microsoft Copilot and DeepL. 14.7% utilize other sources but did not specify which ones. This question used a checkbox question type, and the participants could choose several answers.

Figure 3

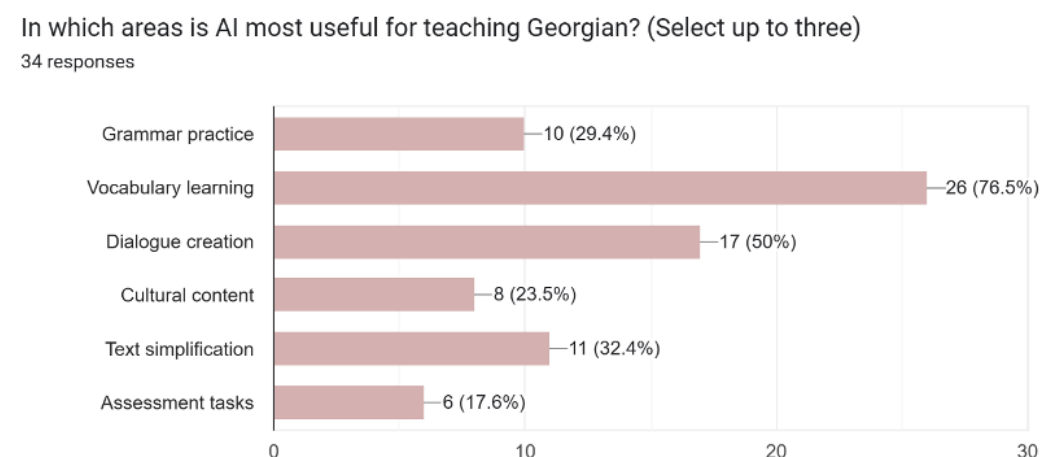
Question 3 Concerning Frequency and Purpose of AI Tools Usage



It is important to analyse the purpose of using AI in teaching Georgian to understand the demand for AI tools. The participants could choose several answers and add other options. The majority of the participants (60.6%) generate vocabulary activities. A little more than half of the participants create grammar exercises. 45.5% create reading texts, and 42.4% generate tests or quizzes. 36.4% of teachers use it for lesson planning, and 33.3% develop conversation prompts. 27.3% translate and adapt materials with AI tools, 15.2% check homework and test papers. 12.1% use it for other purposes.

Figure 4

Question 4 Concerning Frequency and Purpose of AI Tools Usage



In order to determine in which aspects teachers considered AI to be most useful, they had to select up to three proposed areas involving grammar practice, vocabulary learning, dialogue creation, cultural content, text simplification and assessment tasks. 76.5% of the teachers

picked vocabulary learning, half of the participants chose dialogue creation, 32.4% selected text simplification, 29.4% chose grammar practice, 23.5% picked cultural content, and only 17.6% chose assessment tasks.

Strengths and Weaknesses of AI Tools

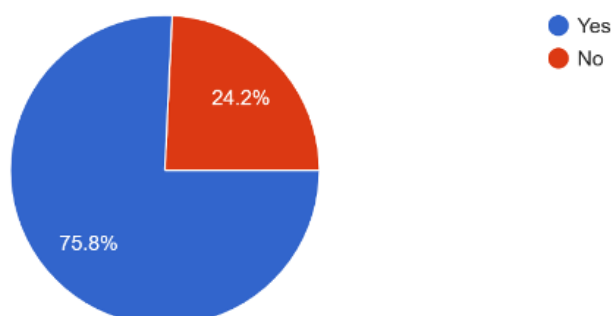
In the next section, this research tried to identify how well AI tools worked for the Georgian language, which is a low-resource language. Teachers were asked a set of questions concerning the potential strengths and limitations of AI, which they had to answer according to their experience.

Figure 5

Question 5 Concerning Strengths and Weaknesses of AI Tools

Have you encountered any problems when using AI tools for teaching Georgian?

33 responses



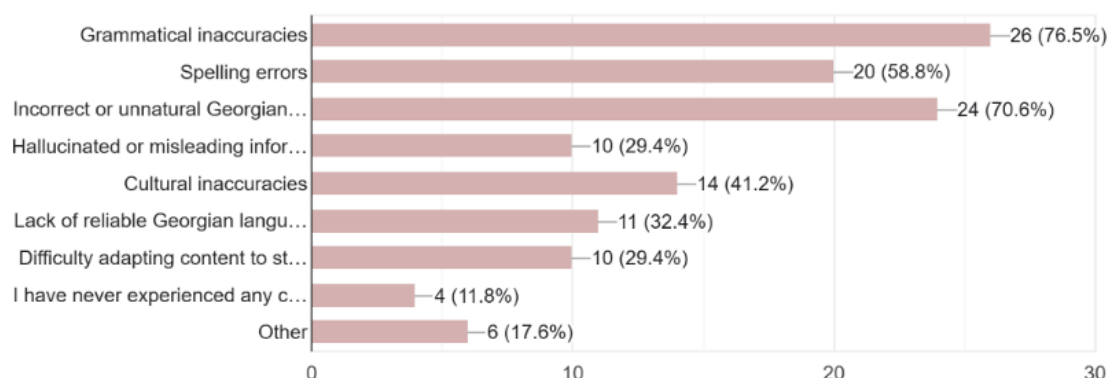
Interestingly, a significant number of participants (75.8%) encountered problems while using AI for teaching Georgian. Only 24.2% said otherwise.

Figure 6

Question 6 Concerning Strengths and Weaknesses of AI Tools

What challenges have you experienced? (Select all that apply)

34 responses



Furthermore, teachers had to specify what challenges they had encountered. The suggested answers included grammatical inaccuracies, spelling errors, incorrect or unnatural Georgian sentence structures, hallucinated or misleading information, cultural inaccuracies, lack of reliable Georgian language data, difficulty adapting content to student levels, other problems

and no issues at all. One of the greatest problems appears to be grammatical inaccuracies, as 76.5% of teachers stated. Another significant issue is incorrect or unnatural Georgian sentence structures (70.6%). A little more than half (58.8%) chose spelling errors, 41.2% opted for cultural inaccuracies, 32.4% selected lack of reliable Georgian language data, and 29.4% chose hallucinated or misleading information, as well as difficulty adapting content to student levels. 17.6% indicated other issues, and only 11.8% said that they had never encountered any challenges.

Figure 7

Participants' Experience Concerning Strengths and Weaknesses of AI Tools

The biggest errors are connected to lack of awareness of Georgian language proficiency levels. It doesn't understand which ones are difficult words or grammar and creates same kind of texts.

Grammar mistakes mainly and incorrect context, translation

It cannot understand parts of speech, especially verbs and . It creates awkward sentences where there is no grammatical agreement. I believe it translates English sentences word by word and that is why it makes many mistakes.

Georgian allows relatively flexible word order, while English usually follows a more fixed sentence structure. Because of this difference, AI translation tools sometimes produce unnatural English sentences. For example, the Georgian sentence „მე გუშინ ვნახე ის“ may be translated by AI as “I saw yesterday him.” This translation reflects the original Georgian word order rather than natural English syntax. However, the correct English sentence should be “I saw him yesterday.”

Additionally, through open-ended questions, teachers were asked to specify and give examples of errors they had encountered. One of the most frequently mentioned errors was grammatical inaccuracies. Several participants mentioned awkward and unnatural sentence structures that often follow English word order. Teachers also indicated ungrammatical word agreements, difficulty in identifying parts of speech, incorrect verb conjugation and noun case errors.

Incorrect translation and equivalence were also frequently noted. Some participants even added that AI tools hallucinate nonexistent or strange words. Interestingly, two of the teachers also mentioned that AI uses foreign words between Georgian sentences: “I always have problems with incorrect Georgian sentences full of strange Georgian words that do not exist or foreign words from Hindi or Arabic.”

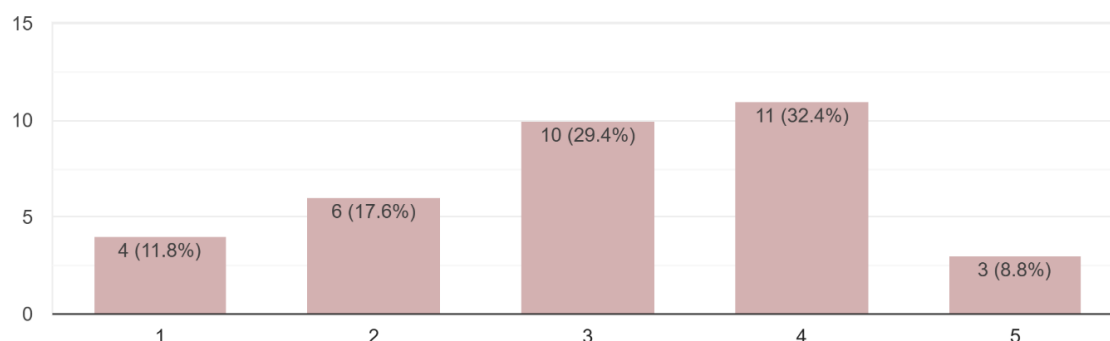
Another common issue is spelling mistakes. One of the teachers gave specific example of misspelled words: “ტებერვალი, ფანკარი, მკავს, სქამი” (t'ebervali, pank'ari, mk'av's, skami). In this example, the letters in bold are incorrect. The correct spelling of these words is: “tebervali, pankari, mq'av's, sk'ami.” It is evident that AI could not differentiate between t and t', k' and q', and k' and k, which are distinct sounds in Georgian. In addition, t', q', and k sounds do not exist in English.

Another problem involved cultural inaccuracies and the use of unreliable sources. One of the participants commented, “It often provides incorrect cultural examples. It uses unreliable sources.” Lastly, mispronunciation of words and AI's inability to distinguish between proficiency levels were also mentioned.

Figure 8*Question 8 Concerning Strengths and Weaknesses of AI Tools*

How effective do you find AI-generated materials for teaching Georgian?

34 responses



In the last question concerning strengths and weaknesses of AI Tools, teachers had to assess AI's productivity as a teaching tool for the Georgian language on a 1–5 linear scale (1 being the lowest and 5 being the highest efficiency). Interestingly, the majority of the participants (32.4%) rated the effectiveness of AI-generated materials as 4, 29.4% opted for 3. 17.6% of the teachers answered that it was not effective by opting for 2 and 11.8% chose 1. Only 8.8% thought that its effectiveness was 5.

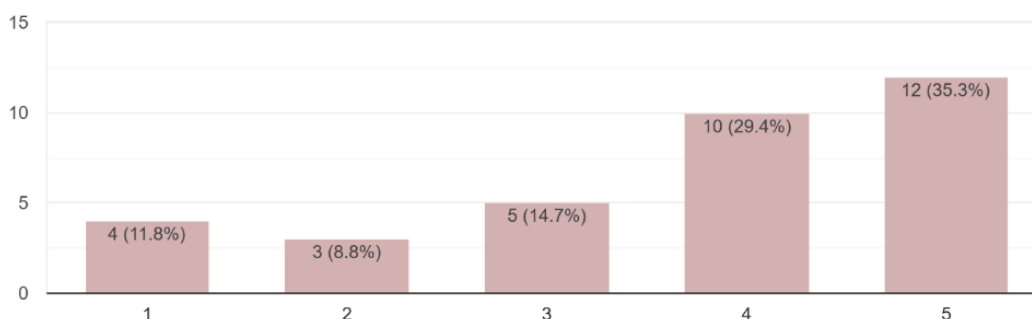
Teachers' Attitudes

The last set of questions aimed to provide an overview of teachers' attitudes and perspectives regarding the usage of AI in their professional field of teaching Georgian as a foreign language. They had to answer linear scale questions and indicate to what extent they agreed with the proposed statements on a scale between 1–5 points (1 being the lowest and 5 being the highest).

Figure 9*Question 9 Concerning Teachers' Attitudes*

To what extent do you agree with the following statements? AI helps me create teaching materials faster.

34 responses

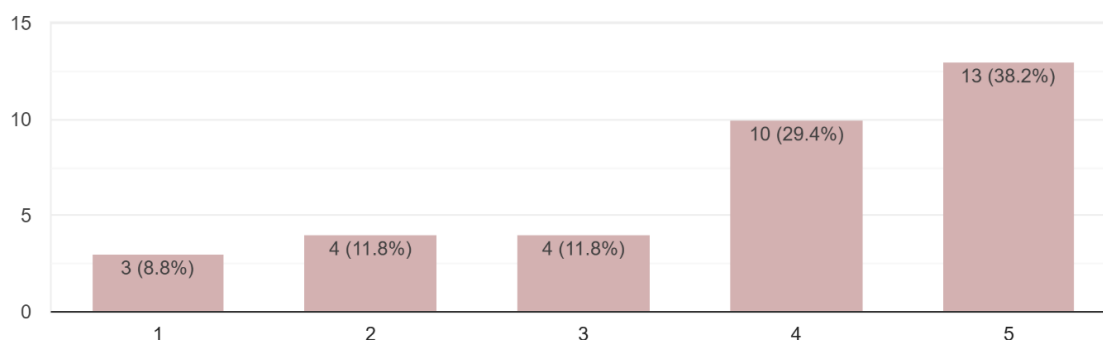


For the first statement, "AI helps me create teaching materials faster," 35.3% of the teachers strongly agreed by selecting 5 points. 29.4% chose 4, while 14.7% were neutral and picked 3. 11.8% chose 1 and 8.8% opted for 2, leaning towards disagreement.

Figure 10*Question 10 Concerning Teachers' Attitudes*

To what extent do you agree with the following statements? AI chatbots support teachers in personalising learning activities according to students' needs and learning pace.

34 responses

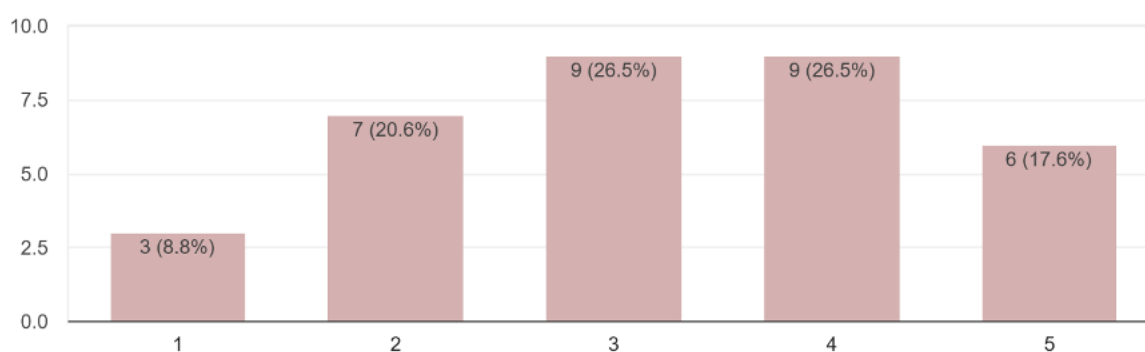


The next question involved the statement: “AI chatbots support teachers in personalising learning activities according to students' needs and learning pace.” The majority of the participants 38.2% opted for 5, and 29.4% chose 4. 11.8% neither agreed nor disagreed and selected 3. 11.8% and 8.8% chose 2 and 1.

Figure 11*Question 11 Concerning Teachers' Attitudes*

To what extent do you agree with the following statements? AI increases student engagement.

34 responses

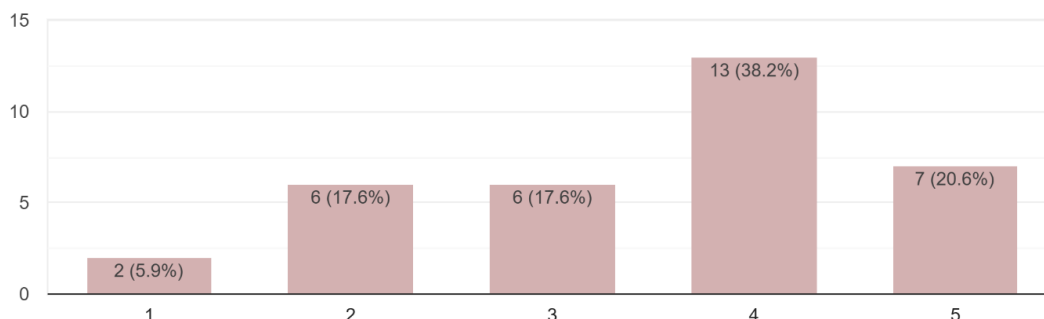


The answers varied regarding the statement “AI increases student engagement.” 26.5% chose both 3 and 4. 20.6% opted for 2, 17.6% picked 5, and only 8.8% disagreed by selecting 1.

Figure 12*Question 12 Concerning Teachers' Attitudes*

To what extent do you agree with the following statements? AI can support teachers in teaching Georgian effectively.

34 responses

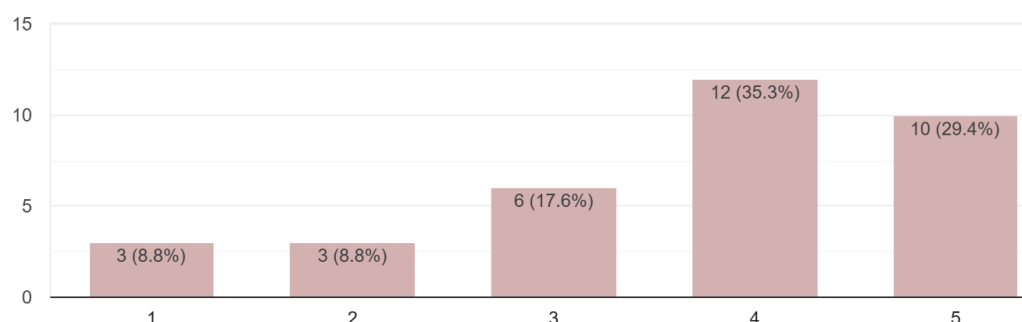


A significant number of the participants (38.2%) chose 4 and agreed that “AI can support teachers in teaching Georgian effectively.” 20.6% opted for 5, 17.6% were neutral and picked 3, while 17.6% and 5.9% selected 2 and 1.

Figure 13*Question 13 Concerning Teachers' Attitudes*

To what extent do you agree with the following statements? Using AI chatbots helps generate a greater variety of classroom activities (e.g., dialogues, exercises, texts) for teaching Georgian.

34 responses



Concerning the statement “Using AI chatbots helps generate a greater variety of classroom activities (e.g., dialogues, exercises, texts) for teaching Georgian,” the majority of the participants agreed, and chose 4 (35.3%) and 5 (29.4%). 17.6% chose 3. 8.8% of the teachers chose 1 and 2.

It was interesting to see what teachers of the Georgian language needed from AI beyond errors or challenges. Through a short open-ended question, they had to share their opinions.

Most of the teachers gave similar answers to the question above: they would like AI to generate perfect grammatical and natural sentences. One of the interesting answers included the need for AI to generate accurate grammatical explanations, natural dialogues and culturally relevant examples. One of the teachers added, “AI should explain Georgian idioms, expressions, and cultural nuances, since direct translation often does not convey the real meaning,” emphasising that AI’s translations from Georgian into students' first language are often awkward. Some

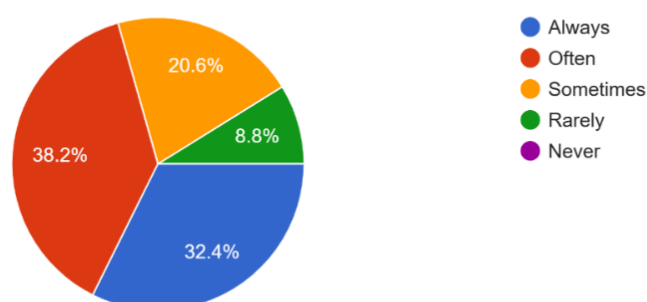
teachers noted that AI tools lack interactivity and effective feedback to support teachers and students. A similar comment mentioned the lack of creativity in the generated teaching materials. One of the responses also noted that AI requires more training and data in Georgian. On the other hand, four teachers stated that AI does not need improvement and it is a useful tool for quickly generating materials.

Figure 14

Question 14 Concerning Teachers' Attitudes

How often do you need to edit AI-generated materials before using them?

34 responses



In order to determine how often teachers encounter problems and need to edit AI-generated materials, they were asked to specify the frequency. 38.2% and 32.4% answered that they often and always edit materials. 20.6% said that it only happens sometimes, 8.8% opted for rarely. None chose “never.”

Figure 15

Participants' Opinions

Despite the flaws that AI has, it is also a great tool for making good exercises and activities for students, which makes learning less stressful and challenging.

AI can be a very useful supportive tool in teaching Georgian as a second language. It can help learners practice vocabulary, pronunciation, and basic structures independently. However, due to the complexity of Georgian grammar and verb system, guidance from a teacher is still essential. AI works best as a complementary resource that supports structured teaching rather than replacing it

It is good for immediate use and it can be taught to avoid the same mistakes.

For now AI hasn't taken any overly important role in teaching Georgian for me, i mostly use it as a helper to create some exercises and exams, which i often still have to correct before using

I believe it does quicken the process and helps me to do simple tasks fast without my involvement but in most cases I always need to recheck everything.

For closing remarks, teachers had the opportunity to comment on their attitudes towards AI's role in teaching Georgian as a foreign language. 14 teachers shared their opinions.

The responses diverged. More than half of the teachers were satisfied with AI tools because they can generate different materials concerning vocabulary, pronunciation and basic structure

practice. The participants also emphasised that AI brings a different perspective and provides the possibility to explore new methods. It was also frequently noted that AI is useful for immediate use, works quickly, and saves time. One of the teachers noted, “Sometimes, when the teacher is very tired, AI gives you the most creative idea. I have different chats for different students. So, AI knows exactly how to personalise the exercise for the student.” One of the teachers also highlighted that AI can be trained to avoid the same mistakes.

However, many teachers emphasised that their involvement is still necessary and they cannot fully rely on AI, as they often edit the generated texts: “Fully relying on it does not guarantee results.” Therefore, they stressed that it still requires improvements: “I think it has great potential to be a great tool for teachers, but it has to be improved.”

On the other hand, some teachers had more negative attitudes towards AI, and they prefer to use it rarely. One of the teachers commented, “My attitude towards AI is negative in general, but I try to use it in a reasonable way. I rarely use it for Georgian language... some languages that are less complicated can be taught and assisted by AI, I believe.”

Interestingly, three teachers indicated their negative feelings about AI and showcased their fears of being replaced by technology. One of them stated, “AI works best as a complementary resource that supports structured teaching rather than replacing it,” and another added, “It should support teachers, not replace them, because real communication and guidance from a teacher are still very important.” It is clear that AI tools are seen just as a supplementary teaching aid, and not all teachers are eager to use them.

Analysis and Discussion

The obtained data from the survey demonstrated the pedagogical role of AI in teaching Georgian as a foreign language. According to the results, the effectiveness and practicality of AI should be discussed separately.

The findings highlight that AI tools are being integrated into the teaching process of Georgian as a foreign language. Most teachers use it regularly and create materials. Teachers primarily utilise AI for generating reading texts, vocabulary activities and grammar exercises. According to the teachers' opinions, Gen AI seems to be most useful in vocabulary learning and dialogue creation. The most popular AI tool seems to be ChatGPT. Gen AI is seen as a practical tool to create creative and engaging classroom materials.

On the other hand, Gen AI has many limitations when it comes to generating correct Georgian sentences. While previous studies on high-resource languages like English do not frequently mention ungrammatical sentences or semantic issues, the survey showed that chatbots in Georgian struggle to conjugate verbs, do not distinguish between noun cases, produce incorrect word agreement, misspell words and create unnatural sentences. Another prominent issue is the hallucination of nonexistent words and cultural inaccuracies. It is clear that, due to a lack of training data, AI often generates texts via English and incorrectly transfers meaning in Georgian. Therefore, Gen AI does not seem as efficient in low-resource languages as it is in high-resource languages. These errors are quite frequent and require thorough editing by teachers.

Apart from linguistic inaccuracies, according to the data, AI cannot differentiate between proficiency levels and generates similar texts regardless of the target level. Therefore, output

needs to be carefully adjusted to students' needs. Additionally, cultural inaccuracies remain one of the most important concerns. As Gen AI lacks sufficient training data in low-resource languages, it cannot provide profound cultural information. It often “borrows” information from high-resource language datasets and hallucinates or brings biases.

Despite these limitations, AI is very practical. The results emphasise how Gen AI generates new and personalised materials for students very quickly. Due to its fast and creative responses, teachers may opt to use it even if its linguistic abilities are lacking. The results suggest that AI is viewed as a moderately effective tool. While it is not entirely reliable, it is still considered practical in an educational context. Despite concerns about AI's limitations, teachers still use it as it saves time and supports teachers with various tasks. Additionally, Gen AI is appealing to teachers as it can be trained and adapted to one's specific needs.

The findings indicate that AI has the potential to support Georgian language teachers, but due to its limitations, it is currently best as a supplementary tool. While it offers significant advantages in speed and content creation, its linguistic abilities remain weak and lack grammatical accuracy. Therefore, the importance of teacher vigilance must be emphasised. Generated materials in Georgian require thorough review and editing to ensure sentences are as natural and authentic as possible to avoid misleading students.

Conclusion

This research acknowledges AI's usefulness while emphasising its limitations in the Georgian language that cannot be overlooked. The findings indicate that Gen AI still has a long way to go before it becomes as efficient in low-resource languages as it is in high-resource ones. While the generated content is useful, AI frequently makes semantic, grammatical and spelling mistakes, and requires human supervision. Consequently, the teacher's role remains central in the process of teaching Georgian as a foreign language.

Despite the limitations, many teachers view AI as a supportive tool that enhances material creation and provides access to a wide range of resources. Hereby, the demand for AI continues to grow, and teachers are eager to utilise it due to its practicality and speed. While Gen AI is currently not pedagogically reliable for the Georgian language, future technological developments may contribute to more linguistically and culturally accurate content generation for low-resource languages.

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

The author declares that Grammarly was used to refine the article's language and correct minor grammatical errors or punctuation. AI has not been used to generate content of the manuscript and the ideas, design, findings, analyses and discussion are original and written by the author through systematic conduct of the research.

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Reconceptualizing Performance Spaces as Learning Environments in Music Education

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Abstract

This paper proposes that music performance contexts involving live audiences can function as pedagogical environments that foster intrinsic motivation in students. Drawing on Self-Determination Theory (Deci & Ryan, 1985; Ryan & Deci, 2000), it argues that performance structured with three elements, authentic audience response, structured reflection, and teacher guidance emphasizing personal expression over competition, can support the psychological needs of autonomy, competence, and relatedness necessary for intrinsic motivation. A pilot case study using a single-case exploratory design observed a 14-year-old technically proficient pianist over one year through teacher journals, parent discussions, performance videos, and participation logs. Initially demonstrating external motivation characterized by accurate but disengaged performances driven by parental expectations, the participant experienced a turning point when spontaneous mid-performance audience applause elicited a genuine smile. Subsequent teacher-facilitated reflection emphasizing joy over competitive achievement produced documented changes including voluntary practice initiation, increased emotional expressiveness, and parent-reported intrinsic fulfillment. While a single case cannot validate the framework, preliminary findings suggest performance contexts may support motivational development when structured educationally. The case aligns with Self-Determination Theory: audience recognition fulfilled relatedness needs while reflective reframing supported autonomy. Critical research questions are identified regarding generalizability across diverse learners, effective teacher reflection practices, and the differential effects of competitive versus collaborative performance formats.

Keywords: intrinsic motivation, music education, performance pedagogy, Self-Determination Theory, case study

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Introduction

Music education has long treated performance primarily as an assessment event, a moment in which students demonstrate technical mastery to evaluators. This framing, while productive for developing technical skill, overlooks a significant pedagogical opportunity. The relationship between a performer and a live audience, and the affective and motivational effects of that relationship, remains largely unexamined as a site of educational intervention.

This paper presents a theoretical framework and pilot case study proposing that performance contexts involving live audiences can function as learning environments that support intrinsic motivation when structured with appropriate pedagogical elements. Drawing on Self-Determination Theory (Deci & Ryan, 1985), the paper outlines three structural conditions necessary for this to occur and demonstrates their application through a single-case exploratory study conducted over one year with a 14-year-old pianist.

Theoretical Framework

The framework presented in this paper draws on Self-Determination Theory (SDT), a well-established motivational theory developed by Deci and Ryan (1985) and extended in subsequent work (Ryan & Deci, 2000). SDT distinguishes between intrinsic motivation, engaging in an activity because it is inherently meaningful or satisfying, and extrinsic motivation, engaging because of external pressures such as grades, parental expectations, or competitive results.

Central to SDT is the proposition that intrinsic motivation depends on three basic psychological needs being fulfilled: autonomy, competence, and relatedness (Deci & Ryan, 2000). Autonomy refers to the experience of one's actions as self-determined and genuinely one's own. Competence refers to feeling effective and capable in one's activities. Relatedness refers to feeling meaningfully connected to other people within the context of an activity.

Applied to music performance, these needs are met unevenly in typical educational settings. Competence is reasonably well supported through feedback and visible skill development. Autonomy, however, is frequently undermined in competitive environments where external standards dominate, a pattern documented in research on competition and intrinsic motivation (Vallerand et al., 1986). Relatedness is almost entirely absent from how performance is pedagogically framed. Audiences are present but are not treated as having a function in the learning process.

This paper proposes that a live audience, when structured appropriately, can address all three needs simultaneously. The framework specifies three conditions: authentic audience response, meaning genuine real-time audience reaction rather than formal applause conventions; structured reflection, meaning guided post-performance conversation about the personal meaning of the experience; and teacher guidance oriented toward personal expression rather than competitive outcome.

Methodology

The study employed a single-case exploratory design (Yin, 2014), appropriate for investigating a novel framework in a real-world context where the boundaries between the phenomenon and its context are not clearly defined. The participant was a 14-year-old male pianist with several

years of formal training, selected because he presented a common motivational profile in advanced music students: high technical proficiency combined with clearly external motivation.

Data were collected over one year through four sources: teacher journals maintained throughout the observation period; discussions with the participant's parents conducted at intervals; recorded performance videos; and participation logs tracking practice frequency, duration, and self-initiation. This multi-source approach enabled triangulation and provided a detailed longitudinal record of behavioral and motivational change.

Results and Discussion

Baseline Motivation

At the outset of the observation period, the participant's motivation was clearly external. He practiced according to a fixed schedule maintained by parental expectation rather than by personal interest. His performances, while technically accurate, were emotionally disengaged. Teacher journals described performances as mechanically correct but lacking interpretive investment. Parent discussions confirmed that the participant experienced practice as an obligation rather than a chosen activity. This profile, technical proficiency without intrinsic motivation, is consistent with patterns documented in research on early intensive music training (McPherson & Davidson, 2006).

The Turning Point

During one observed performance, the audience responded spontaneously to a musical moment mid-piece, before the piece had concluded. This was not conventional end-of-performance applause but a genuine real-time reaction. The participant smiled involuntarily, a response visibly distinct from his typical stage demeanor. In the post-performance debrief, he described this as the first time he had felt something returned from an audience, as opposed to simply being observed by one.

The teacher's subsequent reflection session centered the participant's personal experience of the moment rather than technical feedback. The guiding framing was finding balance and joy on stage, not winning. This reorientation moved the evaluative frame from external performance standards to internal experience, directly supporting the autonomy dimension of SDT.

Documented Changes

Following this turning point, changes were documented across all four data sources. The participant began initiating practice independently, without parental prompting or a fixed schedule. Teacher journals recorded increased emotional expressiveness in performance and greater interpretive risk-taking. Parent discussions noted that the participant described music in qualitatively different terms at home and expressed anticipation of upcoming performances rather than treating them as obligations. Participation logs showed increased time at the instrument, greater variety in practice content, and more self-directed selection of repertoire.

These changes align clearly with the SDT framework. The spontaneous audience response addressed the participant's relatedness need by producing a felt sense of recognition and social

connection within the performance context. The teacher's reflective reframing addressed autonomy by shifting the evaluative reference point from external judgment to personal meaning. Competence was already established through prior training. The performance context, structured in the way it was, provided the two needs that lessons and practice rooms had not.

Conclusion

This paper has proposed a theoretical framework for reconceptualizing music performance as a pedagogical environment capable of supporting intrinsic motivation. The pilot case study provides preliminary evidence that the three specified conditions, authentic audience response, structured reflection, and teacher guidance toward personal expression, can interact to produce meaningful motivational shifts in individual learners.

Several significant research questions remain. Whether similar patterns emerge across diverse learner profiles, including students with lower technical proficiency or students who are already intrinsically motivated, is unknown. Which specific teacher practices most effectively facilitate structured reflection requires further investigation, as intuitive skill is not a replicable instructional procedure. How competitive performance formats interact with this framework, and whether the autonomy-undermining effects of competition are compatible with structured reflection, represents a particularly important question given the prevalence of competition in music education contexts (Vallerand et al., 1986).

A single case cannot validate a framework. What this case demonstrates is that the pattern is possible and that the framework is practically applicable. Systematic replication across diverse learners, teachers, and performance contexts would be necessary to establish generalizability. The present study offers a theoretically grounded starting point for that work and suggests that the time students spend in performance contexts may represent a significantly underutilized educational resource.

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.

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Empowering Immigrant Women Through Continuing Education: A Conceptual Analysis of Integration in Quebec's Early Childhood Sector

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Abstract

This conceptual paper examines how immigrant women navigate integration within Quebec's early childhood sector by analyzing the structural forces that shape their linguistic, vocational, and professional trajectories. Situated within a province where French proficiency functions as both a symbolic and institutional requirement, the paper explores how language policy, credential recognition, and workplace norms intersect to regulate access to stable employment. Drawing on theoretical lenses including linguistic capital, integration regimes, interculturalism, gendered labour, and continuing education, the analysis highlights how immigrant women rebuild professional identities while negotiating institutional expectations that both enable and constrain their mobility. Despite Quebec's reliance on immigrant labour to address chronic staffing shortages, policy–practice gaps persist: linguistic thresholds, regulatory norms, and institutional cultures often delay or limit full participation. Continuing education emerges as a dual site—one that empowers women through training and recognition, yet simultaneously reproduces the structural expectations governing entry into the sector. By synthesizing these dynamics, the paper offers a conceptual framework that clarifies how integration is produced at the intersection of language, regulation, gender, and institutional discourse, contributing to broader discussions on equity and structural inclusion in Quebec's early childhood system.

Keywords: immigrant women, early childhood sector, linguistic capital, continuing education, integration regimes

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Introduction

Quebec's early childhood sector is undergoing significant transformation driven by persistent labour shortages, evolving linguistic regulations, and shifting institutional expectations. National and provincial reports consistently describe the sector as facing a "chronic labour shortage," with early childhood centres, private daycares, and home-based services struggling to recruit and retain qualified educators. This structural pressure has intensified Quebec's reliance on immigrant women, who now represent a substantial portion of the workforce and are increasingly viewed as essential to sustaining the system's operational capacity. Yet, despite this reliance, immigrant women encounter an integration landscape shaped by linguistic, regulatory, and institutional forces that influence their professional trajectories.

Central to this landscape is Quebec's linguistic regime, which positions French proficiency as a prerequisite for legitimacy, recognition, and access to regulated professional spaces. Under policies such as Law 14, language becomes not only a communication tool but a form of institutional capital that determines who is authorized to advance within the sector. For immigrant women—many of whom arrive with prior experience, credentials, and professional identities—this creates a dual challenge: rebuilding linguistic capital while navigating institutional structures that may undervalue their existing expertise. These dynamics reveal a broader tension within Quebec's intercultural model, where public discourse emphasizes inclusion while institutional practices impose restrictive pathways that delay or limit full participation.

Continuing education plays a pivotal role in shaping these trajectories. It offers immigrant women access to training, credential recognition, and professional development, enabling them to acquire the linguistic and pedagogical competencies required for employment. At the same time, it reproduces the structural expectations embedded in Quebec's regulatory framework, positioning immigrant women as perpetual learners who must continually demonstrate readiness for the sector.

This paper examines how language policy, institutional structures, and gendered labour dynamics intersect to shape immigrant women's integration within Quebec's early childhood system. By drawing on conceptual lenses such as linguistic capital, integration regimes, interculturalism, and gendered labour, the paper clarifies the structural conditions that both enable and constrain immigrant women's participation in the sector.

Background

The integration of immigrant women into Quebec's early childhood sector unfolds within a structural landscape shaped by linguistic regulation, labour shortages, and institutional expectations. Quebec's intercultural model places the French language at the centre of social cohesion, positioning linguistic proficiency as both a symbolic marker of belonging and a formal requirement for access to regulated professional environments. In practice, this means that immigrant women enter a sector where language is not simply a tool for communication but a condition for legitimacy, recognition, and advancement.

At the same time, the sector's chronic labour shortages have intensified reliance on immigrant women to sustain daily operations across CPEs, private daycares, and home-based childcare services. Yet this reliance coexists with regulatory pathways that require newcomers to navigate multiple layers of assessment, credential recognition, and linguistic evaluation before

accessing stable roles. This tension—between the system’s dependence on immigrant labour and the structural barriers that delay full participation—reveals a central paradox shaping integration trajectories.

Language policy further complicates these pathways. Under the Charter of the French Language and amendments such as Law 14, French proficiency becomes institutional capital that determines who is authorized to graduate, to work, and to advance. For many immigrant women, this creates a dual process: acquiring new linguistic competencies while simultaneously rebuilding professional identity in a context that may undervalue prior expertise, multilingualism, or international credentials.

Credential recognition adds another layer to this landscape. Women who arrive with degrees, diplomas, or years of experience often find themselves required to repeat training, complete bridging programs, or undergo additional evaluations. This dynamic produces what scholars describe as “institutional displacement,” where newcomers are positioned as learners regardless of their previous professional standing. The process reshapes identity and reinforces hierarchies that privilege locally recognized knowledge.

Workplace culture also plays a decisive role. Early childhood settings in Quebec operate within specific pedagogical traditions and relational norms that may differ from those in newcomers’ countries of origin. Integration therefore requires navigating implicit expectations—how to communicate with colleagues, how to interact with families, how to embody pedagogical values that are deeply tied to Quebec’s linguistic and cultural context. These everyday negotiations reveal how inclusion is enacted, or constrained, within professional environments.

Within this broader landscape, continuing education emerges as both a pathway and a filter. It provides access to training, linguistic development, and credential recognition, enabling immigrant women to enter the sector. Yet it also reproduces the institutional expectations embedded in Quebec’s regulatory framework, positioning immigrant women as individuals who must continually demonstrate readiness and alignment with local norms.

Literature Review

Research on the integration of immigrant women in Quebec highlights how linguistic regimes, gendered labour structures, and institutional expectations shape their professional trajectories. Scholars examining Quebec’s sociopolitical context emphasize that integration cannot be understood without considering the centrality of French as both a symbolic and institutional requirement. Gauthier (2024) and Potvin (2017) argue that Quebec’s intercultural model places the burden of adaptation on newcomers, particularly women whose professional identities are reshaped by linguistic and institutional norms. Their work underscores that integration is not simply a matter of individual motivation but is structured by the expectations embedded in Quebec’s public institutions.

Language policy forms a major theme in the literature. Drawing on Bourdieu’s (1991) concept of linguistic capital, researchers show how language functions as a form of symbolic power that regulates access to employment, recognition, and belonging. Quebec’s Charter of the French Language and amendments such as Law 14 institutionalize French proficiency as a prerequisite for legitimacy within regulated professions. Joppke’s (2007, 2017) work on integration regimes further clarifies how states combine inclusive rhetoric with restrictive mechanisms—an observation that aligns closely with Quebec’s linguistic expectations. Studies

by the Office québécois de la langue française (2020) document how standardized assessments often undervalue multilingual competencies, shaping newcomers' access to stable employment.

The literature on gendered labour provides another layer of insight. Scholars such as Folbre (2006) and Arat-Koç (2018) highlight how care work is historically feminized and undervalued, shaped by assumptions about women's "natural" caregiving abilities. In Quebec, these dynamics intersect with linguistic regulation, producing layered inequalities: immigrant women are recruited to address labour shortages yet face structural constraints that limit their mobility within the sector. Bakan and Stasiulis (2012) note that migrant women often occupy precarious care roles due to intersecting pressures of gender, migration, and labour market segmentation.

Research on continuing education and credential recognition further illuminates the challenges immigrant women face in rebuilding professional identities. Guo (2009) and Nohl et al. (2014) describe how foreign credentials are frequently devalued within Canadian institutions, producing "institutional displacement" in which highly skilled migrants must reconstruct professional capital to align with local expectations. In Quebec, continuing education programs serve as both pathways to integration and sites where institutional norms are reinforced. Rubenson (2011) argues that adult learning environments reflect broader sociopolitical priorities, including linguistic requirements that shape access to regulated professions.

Taken together, the literature reveals significant gaps: few studies examine the early childhood sector specifically, and limited research explores how linguistic regulation interacts with gendered labour within this context. There is a clear need for conceptual analyses that integrate linguistic capital, interculturalism, gendered labour, and continuing education to clarify the structural conditions shaping immigrant women's integration in Quebec's early childhood system. This paper addresses these gaps by synthesizing these intersecting dimensions and situating them within the lived realities of immigrant women navigating the sector.

Conceptual Framework

This paper draws on a set of interconnected theoretical lenses to analyze how immigrant women navigate integration within Quebec's early childhood sector. These lenses—linguistic capital, integration regimes, interculturalism, gendered labour, and continuing education—provide a conceptual foundation for understanding how institutional structures shape opportunity, constraint, and professional identity. Together, they illuminate the structural conditions that regulate immigrant women's access to recognition, mobility, and belonging.

Linguistic Capital and Symbolic Power

Bourdieu's concept of linguistic capital offers a critical lens for understanding how language functions as a form of symbolic and institutional authority in Quebec. Within the early childhood sector, French proficiency is not merely a communicative skill but a marker of legitimacy that determines access to regulated roles, credential recognition, and professional advancement. Linguistic expectations embedded in policies such as the Charter of the French Language and Law 14 position French as a prerequisite for belonging, shaping immigrant women's trajectories as they rebuild linguistic capital while navigating institutional norms. This framework clarifies why language operates simultaneously as a pathway to integration and a mechanism of exclusion.

Integration Regimes and Structural Expectations

Integration regimes highlight how states construct expectations around adaptation, participation, and belonging. Joppke's work is particularly relevant to Quebec, where inclusive discourse coexists with restrictive mechanisms that regulate newcomers' access to professional spaces. Quebec's integration model combines strong linguistic obligations with economic dependence on immigrant labour, creating a system in which immigrant women are welcomed as a solution to staffing shortages yet required to meet accelerated linguistic and institutional expectations. This tension reveals how integration is shaped not by individual motivation but by structural conditions that define who is authorized to advance.

Interculturalism as Quebec's Model of Diversity

Quebec's intercultural model differs from Canada's multicultural framework by placing the French language and Quebec's cultural heritage at the centre of social cohesion. Diversity is recognized, but it is expected to unfold within a linguistic and cultural framework that prioritizes the preservation of the francophone majority. Michel Seymour's work deepens this understanding by conceptualizing nations as linguistic and political communities composed of majority and minority groups who share a common institutional context. Within this model, French proficiency becomes a marker of legitimacy, shaping how immigrant women are positioned within institutional structures. This lens helps explain why linguistic nationalism can coexist with pluralism while still generating tensions for newcomers navigating integration pathways.

Gendered Labour and the Feminization of Care Work

The early childhood sector is shaped by gendered expectations that position care work as naturalized women's labour. Scholars such as Folbre and Arat-Koç highlight how care work is historically undervalued, feminized, and often assigned to migrant women within global care chains. In Quebec, these dynamics intersect with linguistic regulation to create layered forms of inequality: immigrant women are recruited to address labour shortages yet face structural constraints that limit their mobility within the sector. This framework clarifies how gendered expectations and linguistic norms jointly shape immigrant women's professional identities and opportunities.

Continuing Education and the Reconstruction of Professional Identity

Continuing education plays a dual role in immigrant women's integration. It provides access to training, credential recognition, and linguistic development, enabling women to acquire the competencies required for employment. At the same time, it reproduces institutional expectations that position immigrant women as perpetual learners who must continually demonstrate readiness for the sector. Research on adult education and credential recognition shows how foreign qualifications are often undervalued, producing "institutional displacement" in which newcomers must rebuild professional capital within local frameworks. This lens highlights how continuing education functions both as a pathway to empowerment and a site where structural inequalities are reproduced.

Synthesis

Together, these theoretical lenses reveal that integration is not an individual process but a structural one shaped by language policy, institutional norms, gendered labour expectations, and credential recognition. This framework provides the analytical foundation for examining how immigrant women navigate the early childhood sector and clarifies the mechanisms that both enable and constrain their participation.

Analysis and Discussion

The integration trajectories of immigrant women in Quebec's early childhood sector emerge from the intersection of linguistic regulation, institutional structures, gendered labour expectations, and the sociopolitical priorities embedded in Quebec's intercultural model. This section analyzes how these forces interact to shape opportunity, constraint, and professional identity, demonstrating that integration is not an individual process but a structural one governed by institutional logic.

Linguistic Regulation as Structural Gatekeeping

French proficiency functions as the primary gatekeeping mechanism regulating access to stable employment within the early childhood sector. While language is framed as a tool for communication and social cohesion, its institutionalization through policies such as the Charter of the French Language and Law 14 transforms it into a form of symbolic authority. Immigrant women entering the sector must therefore acquire linguistic capital that aligns with institutional expectations, regardless of their prior professional experience or multilingual competencies. This dynamic reveals a structural contradiction: Quebec relies on immigrant women to address chronic labour shortages, yet linguistic thresholds delay or restrict their mobility within the sector.

The emphasis on standardized assessments further reinforces this tension. Linguistic proficiency is evaluated through formal benchmarks that may not reflect the communicative realities of early childhood settings, where relational competence, cultural sensitivity, and pedagogical skills are equally essential. As a result, immigrant women may find themselves positioned as "not yet ready" despite possessing the practical skills required for the role. This disconnect between institutional evaluation and workplace realities illustrates how linguistic regulation reproduces structural inequalities.

Credential Recognition and Institutional Displacement

Credential recognition processes further shape immigrant women's trajectories by determining how prior experience and qualifications are valued within Quebec's institutional framework. Many immigrant women arrive with degrees, diplomas, or years of experience in early childhood education, yet institutional processes often require them to undergo additional training, bridging programs, or evaluations before their credentials are recognized. This dynamic produces what scholars describe as "institutional displacement," where newcomers are positioned as learners regardless of their prior expertise.

This displacement is not merely administrative; it reshapes professional identity and reinforces structural hierarchies that privilege locally recognized credentials. Immigrant women must navigate a system that simultaneously depends on their labour and questions their legitimacy.

The requirement to rebuild professional capital within local frameworks highlights how institutional norms regulate access to recognition and mobility.

Workplace Culture and Everyday Negotiation

Integration is also negotiated within the micro-level interactions that shape workplace culture. Early childhood settings in Quebec operate within specific pedagogical traditions, communication norms, and relational expectations that may differ significantly from those in newcomers' countries of origin. Immigrant women must therefore navigate implicit norms that govern daily practice, including expectations around communication with colleagues, interactions with families, and adherence to pedagogical frameworks.

These everyday encounters reveal how inclusion is enacted—or constrained—within professional environments. For some immigrant women, supportive colleagues and inclusive workplace cultures facilitate integration by providing opportunities for learning, collaboration, and recognition. For others, workplace dynamics may reinforce feelings of marginalization, particularly when linguistic or cultural differences are interpreted as deficits rather than assets. This variability underscores the importance of examining integration not only through policy and institutional structures but also through the lived experiences of immigrant women within workplace settings.

Continuing Education as Pathway and Filter

Continuing education plays a dual role in shaping integration trajectories. On one hand, it provides immigrant women with access to training, credential recognition, and linguistic development, enabling them to acquire the competencies required for employment. It offers a structured pathway for rebuilding professional identity and gaining institutional recognition. On the other hand, continuing education also reproduces the structural expectations embedded in Quebec's regulatory framework. Immigrant women are often required to complete multiple courses, certifications, and assessments, reinforcing the idea that they must continually demonstrate readiness for the sector.

This duality positions continuing education as both a site of empowerment and a site where structural inequalities are reproduced. While it offers opportunities for growth and recognition, it also reinforces institutional norms that privilege certain forms of knowledge and linguistic competence. The requirement to continually prove oneself reflects broader patterns within integration regimes, where newcomers are expected to adapt rapidly to institutional expectations while navigating structural barriers.

Interculturalism and the Politics of Belonging

Quebec's intercultural model shapes the broader sociopolitical context within which immigrant women navigate integration. By positioning the French language and Quebec's cultural heritage at the centre of social cohesion, interculturalism establishes the standards newcomers must meet to be recognized as legitimate participants in the labour market. This model reflects a commitment to linguistic preservation but also creates tensions for immigrant women who must navigate expectations around cultural adaptation and linguistic conformity.

These tensions become particularly visible in the early childhood sector, where educators are expected to embody and transmit Quebec's linguistic and cultural values. Immigrant women

must therefore negotiate their own identities while aligning with institutional expectations that may not fully recognize their multilingual and multicultural competencies. This negotiation highlights the complex interplay between belonging, recognition, and institutional power.

Synthesis

The analysis demonstrates that immigrant women's integration trajectories are shaped by structural forces that operate across multiple levels: linguistic regulation, credential recognition, workplace culture, continuing education, and intercultural expectations. These forces interact to produce a landscape that is both enabling and restrictive, offering pathways to participation while simultaneously imposing barriers that regulate mobility and recognition. Understanding these dynamics is essential for developing policies and practices that support equitable integration within Quebec's early childhood sector.

Implications and Recommendations

The analysis of immigrant women's integration within Quebec's early childhood sector reveals structural tensions that require coordinated responses at the policy, institutional, and pedagogical levels. While immigrant women play an essential role in sustaining the sector amid chronic labour shortages, their trajectories are shaped by linguistic regulation, credential recognition processes, and workplace norms that influence access to stable employment and professional mobility. This section outlines key implications and offers recommendations aimed at strengthening equity, recognition, and institutional responsiveness.

Policy Implications: Aligning Linguistic Expectations With Labour Realities

The central role of French proficiency in Quebec's integration regime underscores the need for policies that balance linguistic preservation with equitable access to employment. Current linguistic thresholds—while aligned with Quebec's sociopolitical priorities—may inadvertently delay the integration of qualified immigrant women who possess strong pedagogical skills but require additional time to develop formal linguistic competencies. Policymakers should consider adopting more flexible linguistic pathways that recognize the communicative realities of early childhood settings, where relational competence and cultural sensitivity are as essential as standardized language benchmarks.

One potential approach is the implementation of staged linguistic requirements that allow immigrant women to enter the workforce in supervised or transitional roles while continuing to develop linguistic proficiency. This model would address labour shortages without compromising linguistic objectives and would support immigrant women in building confidence and professional identity within real workplace environments.

Institutional Implications: Rethinking Credential Recognition and Program Design

Institutions responsible for credential recognition and continuing education play a pivotal role in shaping immigrant women's integration trajectories. Current processes often reproduce structural hierarchies by privileging locally recognized credentials and positioning immigrant women as perpetual learners. To address this, institutions should adopt more holistic evaluation frameworks that consider prior experience, multilingual competencies, and pedagogical expertise alongside formal documentation.

Bridging programs should be redesigned to reduce redundancy and ensure that training aligns with the actual demands of early childhood settings. This includes integrating workplace-based learning opportunities, mentorship programs, and collaborative assessment models that value experiential knowledge. Institutions should also strengthen partnerships with early childhood centres to create smoother transitions between training and employment, ensuring that immigrant women receive consistent support across educational and professional environments.

Workplace Implications: Building Inclusive Professional Cultures

Workplace culture significantly influences immigrant women's sense of belonging and professional identity. Early childhood centres should adopt inclusive practices that recognize the diverse linguistic and cultural competencies immigrant women bring to the sector. This includes providing structured onboarding processes, peer mentorship, and opportunities for collaborative learning that facilitate integration into pedagogical and relational norms.

Supervisors and colleagues play a critical role in shaping daily experiences. Training on intercultural communication, implicit bias, and inclusive leadership can help create environments where immigrant women feel valued and supported. Recognizing multilingualism as an asset—rather than a deficit—can also enhance communication with diverse families and strengthen the cultural responsiveness of early childhood programs.

Educational Implications: Strengthening Continuing Education as a Site of Empowerment

Continuing education programs must balance their dual role as pathways to integration and sites where institutional expectations are reproduced. To enhance their empowering potential, programs should adopt pedagogical approaches that validate immigrant women's prior knowledge and professional identities. This includes incorporating reflective practice, peer learning, and opportunities for students to draw on their cultural and linguistic backgrounds as resources for teaching and learning.

Language training should be integrated into professional coursework rather than treated as a separate requirement. Embedding linguistic development within pedagogical contexts allows immigrant women to acquire the specific vocabulary, communication strategies, and relational competencies required in early childhood settings. This approach also reduces the burden of navigating multiple parallel requirements.

Sector-Wide Implications: Toward a More Equitable Integration Model

The findings highlight the need for a sector-wide shift toward an integration model that recognizes immigrant women as essential contributors rather than conditional participants. This requires coordinated action across policy, education, and workplace settings to ensure that linguistic expectations, credential recognition processes, and professional cultures support—not hinder—immigrant women's participation.

A more equitable integration model would acknowledge the structural nature of the challenges immigrant women face and prioritize institutional responsibility over individual adaptation. By aligning linguistic policies with labour realities, redesigning credential recognition frameworks, fostering inclusive workplace cultures, and strengthening continuing education,

Quebec can create pathways that support immigrant women's full participation in the early childhood sector.

Conclusion

The integration of immigrant women into Quebec's early childhood sector is shaped by a complex interplay of linguistic regulation, institutional structures, gendered labour expectations, and the sociopolitical priorities embedded in Quebec's intercultural model. This paper has demonstrated that integration is not an individual or linear process but a structural one, governed by institutional norms that regulate access to recognition, mobility, and belonging. While immigrant women play an essential role in sustaining the sector amid chronic labour shortages, their trajectories are shaped by mechanisms that both enable and constrain their participation.

The analysis reveals that French proficiency functions as a central gatekeeping mechanism that determines who is authorized to advance within the sector. Linguistic expectations embedded in policies such as the Charter of the French Language and Law 14 position French as a prerequisite for legitimacy, shaping immigrant women's access to regulated roles and credential recognition. These expectations, while aligned with Quebec's commitment to linguistic preservation, may inadvertently delay the integration of qualified women who possess strong pedagogical skills but require additional time to develop formal linguistic competencies.

Credential recognition processes further complicate integration by privileging locally recognized qualifications and positioning immigrant women as perpetual learners. Despite arriving with extensive experience or advanced training, many women must undergo additional evaluations, bridging programs, or coursework before their expertise is acknowledged. This dynamic produces institutional displacement, reshaping professional identity and reinforcing structural hierarchies that undervalue foreign credentials.

Workplace culture also plays a significant role in shaping daily experiences of inclusion or exclusion. Early childhood settings operate within specific pedagogical and relational norms that may differ from those in newcomers' countries of origin. Immigrant women must navigate these expectations while negotiating their own identities and competencies. Supportive workplace environments can facilitate integration, while rigid or exclusionary cultures may reinforce barriers.

Continuing education emerges as both a pathway and a filter. It provides essential access to training, linguistic development, and credential recognition, enabling immigrant women to rebuild professional capital. Yet it also reproduces institutional expectations that require women to continually demonstrate readiness for the sector. This duality highlights the need for educational programs that validate prior knowledge and integrate linguistic development within pedagogical contexts.

Overall, the findings underscore the need for a more equitable integration model—one that recognizes immigrant women as essential contributors rather than conditional participants. Aligning linguistic policies with labour realities, redesigning credential recognition frameworks, fostering inclusive workplace cultures, and strengthening continuing education can collectively support immigrant women's full participation in the early childhood sector.

By synthesizing these structural dynamics, this paper contributes to broader discussions on equity, recognition, and institutional responsibility. Understanding how integration is produced at the intersection of language, regulation, gender, and institutional discourse is essential for developing policies and practices that support meaningful and sustainable inclusion within Quebec's early childhood system.

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

The author used generative AI tools only to improve the language and readability of this paper. The conceptualization, analysis, and arguments are entirely the author's own.

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Digital Pedagogy for Peace: Using Collaborative Technologies to Build Human-Centered Learning Communities

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Abstract

This paper explores the transformative role of digital pedagogy in creating peaceful environments through collaborative technologies, aiming to build human-centered learning communities. As the technology improves and leads to a more connected world, education needs to evolve to address complex social challenges, including conflict and division. The study examines key collaborative technologies such as virtual classrooms, social media platforms, and co-creation tools that improve empathy, dialogue, and mutual understanding. It highlights how these technologies can bridge cultural, social, and geographical divides. Through case studies and theoretical frameworks, the paper illustrates best practices for designing digital learning experiences that prioritize human values and encourage learners to become active contributors. The research also highlights the ethical and practical challenges of using digital tools for peace education. These issues specifically include questions of digital access, user privacy, and the potential risk of reinforcing existing biases. Therefore, it calls for thoughtful teaching practices that respect human dignity and encourage teamwork and shared problem-solving. The goal is to create learning communities where education leads to personal growth and positive change, not just the exchange of information. In the end, this paper offers teachers, decision-makers, and technology experts useful ideas and clear steps to use digital tools to support peace and education that puts people first. This can help build a fairer and kinder world.

Keywords: digital pedagogy, peace education, collaborative technologies, human-centered learning, inclusive education

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Introduction

The rapid development of digital technologies has transformed communication, learning, and social interaction across the world. Educational environments are no longer limited to physical classrooms, as learners increasingly engage through online platforms, virtual communities, and collaborative digital spaces. While these technological developments create valuable opportunities for global communication and access to information, they also raise concerns related to social division, misinformation, online hostility, and unequal access to educational resources. In this context, education has an important responsibility not only to develop academic knowledge but also to strengthen empathy, dialogue, collaboration, and peaceful coexistence.

Digital pedagogy has emerged as an important educational approach that integrates technology with meaningful teaching and learning practices. Rather than focusing only on the use of digital tools, digital pedagogy emphasizes how technology can support interaction, reflection, participation, and human connection. Human-centered learning approaches particularly highlight the importance of dignity, inclusion, collaboration, and learner well-being within digital environments. These approaches are increasingly relevant in modern education, where learners from different social, cultural, and geographical backgrounds interact through technology-mediated communication.

Peace education also plays a significant role in contemporary educational discussions. Peace-oriented education encourages learners to develop intercultural understanding, critical thinking, cooperation, and conflict resolution skills. Collaborative technologies such as virtual classrooms, social media platforms, shared digital workspaces, and co-creation tools have the potential to support these goals by connecting learners across borders and encouraging active participation in shared learning experiences.

The purpose of this paper is to examine how digital pedagogy and collaborative technologies can contribute to the creation of human-centered learning communities that promote peace, empathy, and inclusion. The study explores the educational opportunities offered by collaborative technologies while also addressing ethical and practical challenges related to digital learning environments. Furthermore, the paper provides practical implications for educators, policymakers, and technology developers who aim to create more inclusive and peaceful educational experiences.

Literature Review

Digital Pedagogy and Human-Centered Learning

Digital pedagogy refers to teaching and learning practices that meaningfully integrate digital technologies into educational environments. According to educational researchers, effective digital pedagogy is not simply the use of technology in classrooms, but the thoughtful design of learning experiences that support engagement, communication, collaboration, and critical thinking (Fullan & Langworthy, 2014). Technology becomes valuable when it strengthens interaction between learners and encourages active participation in the learning process.

Human-centered learning approaches emphasize empathy, learner agency, inclusion, and meaningful engagement. These approaches focus on creating supportive learning environments where students feel respected, valued, and connected to others. In digital

contexts, human-centered learning becomes especially important because online environments may sometimes reduce personal interaction and emotional connection. Therefore, educators must intentionally design learning experiences that support communication, reflection, collaboration, and emotional well-being.

Peace Education in Digital Environments

Peace education aims to promote values, attitudes, and skills that contribute to peaceful relationships and social harmony. It encourages learners to develop empathy, intercultural understanding, communication skills, and conflict resolution abilities (Navarro-Castro & Nario-Galace, 2019). In increasingly diverse and interconnected societies, peace education has become an important component of global citizenship education.

Digital environments provide new opportunities for peace-oriented learning. Through online communication and collaborative platforms, students can interact with peers from different cultures, languages, and backgrounds. Such interactions may help reduce stereotypes and increase intercultural awareness. Global collaborative projects, virtual exchanges, and online discussions allow learners to engage with multiple perspectives and develop greater empathy toward others.

However, digital environments may also create challenges for peace education. Social media platforms and online spaces can sometimes reinforce polarization, misinformation, cyberbullying, and exclusion. These concerns highlight the importance of ethical digital practices and responsible technology use in education. Teachers play an essential role in guiding learners toward respectful communication, critical media literacy, and constructive dialogue.

Collaborative Technologies and Peace-Oriented Learning

Collaborative technologies include digital tools that support communication, teamwork, co-creation, and shared learning experiences. Examples include virtual classrooms, learning management systems (LMS), collaborative documents, online discussion platforms, video conferencing tools, and social media applications. These technologies enable learners to participate actively in educational processes regardless of geographical location.

Virtual classrooms became particularly significant during global disruptions such as the COVID-19 pandemic, when educational institutions rapidly transitioned to online learning. These platforms allowed students and teachers to continue communication and maintain learning communities despite physical separation. In addition, collaborative technologies have supported project-based learning (PBL), peer feedback, intercultural communication, and collaborative problem-solving activities.

Co-creation tools such as shared digital whiteboards, collaborative presentations, and online project platforms encourage learners to work together creatively. These technologies support learner agency and active participation by allowing students to contribute ideas, negotiate meaning, and produce shared outcomes. Such collaborative experiences can strengthen communication skills, teamwork, and mutual respect among learners.

Virtual Classrooms

Virtual classrooms provide opportunities for synchronous communication and real-time interaction among learners and educators. Through video conferencing, live discussions, and interactive activities, learners can engage in meaningful dialogue and collaborative learning experiences. Virtual classrooms also support international educational partnerships and global learning projects that connect students from different cultural contexts.

These digital spaces may contribute to peace-oriented learning by encouraging respectful communication and intercultural understanding. Students participating in international collaborations often gain broader perspectives and become more aware of global issues and cultural diversity. When carefully facilitated, virtual classrooms can help learners develop empathy, tolerance, and communication skills.

However, virtual learning environments may also present challenges related to unequal access to technology, internet connectivity, and learner participation. Students from disadvantaged backgrounds may experience barriers that limit their ability to engage fully in online learning experiences. Therefore, equitable access remains a central concern in digital education.

Social Media Platforms

Social media platforms are increasingly used in educational contexts to support communication, sharing, reflection, and collaboration. These platforms allow learners to exchange ideas, participate in discussions, and connect with broader communities beyond the classroom. Educational use of social media may encourage intercultural dialogue and increase awareness of global social issues.

Through collaborative discussions and shared digital storytelling, learners can develop greater understanding of different perspectives and experiences. Social media also provides opportunities for student voice and participation, allowing learners to contribute actively to educational conversations and community engagement.

Despite these benefits, social media environments may also expose learners to misinformation, online hostility, and digital polarization. Educators must therefore promote digital citizenship, ethical communication, and critical media literacy skills. Responsible use of social media is essential for creating respectful and inclusive digital learning communities.

Co-creation Tools and Collaborative Learning

Co-creation tools enable learners to work together on shared tasks, projects, and creative activities. Examples include collaborative documents, digital whiteboards, shared presentations, and multimedia production platforms. These tools support active participation and collaborative problem-solving by encouraging learners to negotiate ideas and create shared outcomes.

Collaborative learning activities supported by co-creation tools may strengthen teamwork, communication, creativity, and learner engagement. Students become active contributors rather than passive recipients of information. Such learning experiences also align with

peace-oriented educational principles by promoting cooperation, mutual respect, and collective responsibility.

Project-based learning environments particularly benefit from collaborative technologies. Learners working together on real-world issues often develop stronger interpersonal skills and deeper understanding of social challenges. These experiences can encourage empathy and active citizenship while building meaningful learning connections.

One example of peace-oriented digital pedagogy emerged through “Enjoy Distance Learning” which is an international collaborative Erasmus+ eTwinning project involving students and teachers from Türkiye and Portugal. This project was written and conducted by the author in 2020–2021 academic year. Using collaborative online platforms such as Twinspace, students participated in intercultural activities such as preparing New Year cards, exchanging traditional recipes, introducing cultural traditions, and celebrating each other’s national holidays. Teachers also presented information about important cultural sites and local traditions from their countries.

These activities encouraged learners to engage in meaningful intercultural dialogue while developing empathy, curiosity, and respect for diversity. Rather than focusing only on academic content, the project created opportunities for students to build personal connections and develop mutual understanding through shared experiences. Collaborative digital interaction also helped students improve communication skills, active participation, and cultural awareness.

The experience demonstrated how human-centered digital pedagogy can support peace education by creating inclusive learning environments where learners feel connected, valued, and respected. It also highlighted the importance of designing collaborative activities that encourage authentic communication and cultural exchange rather than passive technology use.

Ethical and Practical Challenges

Although collaborative technologies offer significant educational opportunities, they also present ethical and practical concerns that require careful consideration.

Digital Inequality

One major challenge is unequal access to digital technologies and internet connectivity. Educational opportunities may become limited for learners who lack reliable devices, internet access, or digital literacy skills. These inequalities can deepen existing educational and social disparities. Policymakers and educational institutions must therefore prioritize equitable access to digital resources and support systems.

Privacy and Data Security

Digital learning platforms often collect personal data and user information. Concerns related to privacy, surveillance, and data security have become increasingly important in online educational environments. Educators and institutions must ensure that digital platforms protect learner privacy and maintain ethical standards regarding data use.

Reinforcement of Bias and Polarization

Digital technologies and online algorithms may sometimes reinforce social biases, stereotypes, and polarization. Learners may encounter misinformation, discriminatory content, or exclusionary online behaviors. Educators have an important role in promoting critical thinking, respectful dialogue, and ethical digital participation.

Teacher Preparedness

Effective implementation of digital pedagogy also depends on teacher competence and professional development. Many educators require ongoing training to integrate collaborative technologies meaningfully into teaching practices. Professional development opportunities should support teachers in designing inclusive, reflective, and human-centered digital learning experiences.

Best Practices for Human-Centered Digital Learning

Several practices may strengthen the effectiveness of digital pedagogy for peace-oriented education.

First, educators should design inclusive learning environments that encourage active participation from all learners. Collaborative activities should promote respectful communication, reflection, and mutual support.

Second, learning experiences should connect with real-world social issues and encourage learners to engage critically with global challenges. Authentic and meaningful tasks may strengthen learner motivation and social awareness.

Third, digital environments should prioritize emotional safety, respect, and empathy. Teachers should establish clear communication guidelines and encourage constructive dialogue within online spaces.

Fourth, interdisciplinary and project-based approaches may strengthen collaboration and problem-solving skills. Collaborative projects that involve learners from different backgrounds can promote intercultural understanding and shared responsibility.

Finally, continuous teacher training and institutional support are essential for effective digital pedagogy. Educators should have opportunities to develop digital competencies, ethical awareness, and collaborative teaching strategies.

Implications for Educators, Policymakers, and Technology Developers

For educators, digital pedagogy requires thoughtful instructional design that prioritizes empathy, inclusion, and collaboration. Teachers should create opportunities for meaningful interaction and encourage learners to engage respectfully with diverse perspectives.

For policymakers, equitable access to technology and digital infrastructure remains essential. Policies should support inclusive education, teacher training, digital literacy, and ethical standards for technology use.

For technology developers, educational platforms should prioritize accessibility, user well-being, privacy, and inclusive participation. Human-centered design principles may help ensure that technologies support meaningful and respectful educational experiences.

Conclusions

Digital pedagogy has significant potential to support peace-oriented and human-centered education in increasingly interconnected societies. Collaborative technologies such as virtual classrooms, social media platforms, and co-creation tools can strengthen empathy, dialogue, intercultural understanding, and active participation when integrated thoughtfully into educational practice.

However, technology alone cannot create peaceful learning environments. Ethical considerations, equitable access, digital citizenship, and thoughtful pedagogical design are essential for meaningful educational transformation. Human-centered approaches that prioritize dignity, inclusion, collaboration, and reflection remain central to effective digital learning communities.

This study highlights the importance of balancing technological innovation with human values in education. By designing inclusive and collaborative learning experiences, educators and institutions can help learners become active contributors to more peaceful, empathetic, and socially responsible communities.

Future research may further explore the long-term impact of collaborative digital learning on intercultural understanding, student well-being, and global citizenship development across diverse educational contexts.

Acknowledgements

The author would like to thank all educators, researchers, and learning communities whose work and experiences continue to inspire the development of inclusive, collaborative, and human-centered educational practices.

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.

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Appendix

“Enjoy Distance Learning” Erasmus+ eTwinning International Collaborative Digital Learning Project

Project Overview

This collaborative international project was designed to promote intercultural understanding, enhance students’ language skills, communication, and collaborative learning through digital technologies during COVID-19 pandemic. The project brought together students and teachers from Türkiye and Portugal on Twinspace which is an online learning environment where participants engaged in shared cultural and educational activities.

Project Objectives

The project aimed to:

- strengthen intercultural communication and language skills,
- encourage empathy and mutual understanding,
- promote collaborative learning experiences,
- support active student participation,
- develop digital communication competencies,
- create meaningful human-centered learning interactions.

Participants

The project included 4 teachers, 60 students and their parents from multiple schools representing different cultural and geographical backgrounds. Participants collaborated through online communication platforms and shared digital activities throughout the project period.

Digital Tools and Platforms Used

The following collaborative technologies were used during the project:

- virtual classrooms and video conferencing tools,
- collaborative presentation platforms,
- shared digital workspaces,
- educational blogs/websites,
- social media communication tools,
- multimedia sharing platforms.

Sample Collaborative Activities

Students and teachers participated in several intercultural digital activities, including:

- preparing and exchanging New Year cards,
- sharing traditional recipes from their countries,
- introducing national holidays and cultural traditions,
- presenting touristic and historical places,
- participating in collaborative discussions and reflections,
- celebrating important cultural events together online.

Educational Outcomes

The project contributed to:

- increased intercultural awareness,
- improved communication and collaboration skills,
- greater empathy and respect for cultural diversity,
- active student engagement and participation,
- stronger sense of global citizenship,
- development of digital literacy and teamwork skills.

Relevance to Peace-Oriented Digital Pedagogy

The project demonstrated how collaborative technologies can support peace-oriented and human-centered learning by creating opportunities for respectful dialogue, shared experiences, and meaningful intercultural interaction. Rather than focusing solely on academic content, the activities encouraged students to build personal connections and develop understanding across cultural differences.

Project Documentation

The project activities and the project output links:

<https://enjoydistancelearning.blogspot.com/>

<https://drive.google.com/file/d/15jdQeOGz2HJrTEXGMcxGmkreKNuzdVLj/view>

Note

This appendix is included to provide an example of how collaborative digital learning practices support empathy, inclusion, intercultural dialogue, and peace-oriented education within human-centered learning environments.

A Baseline Statistical Model for Analyzing PISA Data in Denmark

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The Washington DC Conference on Education 2026
Official Conference Proceedings

Abstract

This paper presents a baseline statistical model for analysing student performance using PISA 2022 data from Denmark. The model draws on student-level background variables, including gender, immigrant background, and socioeconomic status (ESCS), to explain variation in mathematics achievement. Descriptive results show systematic differences across groups, with higher scores observed among boys and students without an immigrant background. A multilevel regression framework is applied to estimate the contribution of individual and school-level factors. The inclusion of school-level socioeconomic composition further improves model fit. In an extended version of the model, the mathematics anxiety index (ANXMAT) is incorporated, leading to a substantial increase in explanatory power. Although the results demonstrate strong statistical associations, they do not imply causal relationships. The paper illustrates a parsimonious modelling strategy suitable as a baseline for comparative analyses of PISA data.

Keywords: PISA, socioeconomic status, immigrant background, mathematics anxiety

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Introduction

PISA (Programme for International Student Assessment) is an international survey conducted every three years by the OECD. Its purpose is to assess how well 15 to 16-year-old students apply academic competencies in real-life situations. The test covers reading, mathematics, and science, as well as a fourth domain that varies between cycles. In addition, extensive background data are collected for analyses of well-being, learning, and development.

Methodology

The analysis is based on the Danish PISA 2022 sample, comprising students born in 2006 and enrolled in formal education. The analytical sample includes approximately 6,200 students across 347 schools, representing a population of 56,909 students.

The dependent variable is the PISA mathematics score, scaled to an OECD mean of 500 and a standard deviation of 100. Independent variables include gender, immigrant background, and socioeconomic status (ESCS), which is a composite index derived from parental education, occupation, and home resources.

In addition, a school-level socioeconomic indicator (S_ESCS) is included to account for contextual effects. The model specification allows for interaction effects between immigrant background and socioeconomic status, reflecting potential heterogeneity in how resources translate into academic outcomes.

All estimates are calculated using sampling weights and replication weights. Plausible values and BRR replication weights provided by the OECD were used in all analyses.

Variables:

Gender: Female = 1, Male = 2.

Immigrant background: Based on birthplace of the student and parents (native student = 0, student with immigrant background = 1). The indicator is derived from the OECD variable *IMMIG*.

Socioeconomic status (ESCS): A standardized index based on parental education, occupation, and home resources.

Mathematics score: Scaled with an OECD average of 500 and a standard deviation of 100.

Results

Descriptive Analysis

Table 1

Mathematics Score by Gender and Immigrant Background

Group	Sample size (n)	Score	SE	Population
All students	6,200	489.3	1.84	56,909
Females	3,066	483.3	1.90	27,893
Males	3,134	495.0	2.47	29,016
Native students	4,608	496.5	1.91	48,596
Immigrant background	1,288	442.1	3.29	5,845
Missing	304	458.0	5.59	2,468

Note. OECD scale (mean = 500, SD = 100).

The results are consistent with OECD findings: male students score higher than female students in mathematics, and native students score higher than students with an immigrant background.

Statistical Model

The baseline model specifies the mathematics score as a function of gender, immigrant background, socioeconomic status, school-level socioeconomic composition, and their interaction (1):

Baseline Model:

$$score_{ij} = \alpha + \beta_1 \cdot gender_{ij} + \beta_2 \cdot immigrant\ background_{ij} + \beta_3 \cdot ESCS_{ij} + \beta_4 \cdot S_ESCS_j + \beta_5 \cdot (immigrant\ background_{ij} \cdot ESCS_{ij})$$

$$i=1 \dots 6,200 \quad j=1 \dots 347 \text{ schools.} \quad (1)$$

The score varies according to the following factors:

- Gender
- Immigrant background (two groups)
- Socioeconomic background (ESCS)
- School-level socioeconomic background (S_ESCS)
- The interaction between immigrant background and socioeconomic background

Table 2*Baseline Model Estimates (Mathematics)*

Parameter	Estimate	SE	t-value	p-value
Intercept	470.39	2.51	187.33	< .0001
Gender (Female)	-12.61	2.20	-5.55	< .0001
Student with immigrant background	-24.36	3.50	-6.96	< .0001
ESCS	31.83	1.75	18.15	< .0001
ESCS× Student with immigrant background	-13.95	3.12	-4.46	< .0001
S_ESCS	32.31	4.97	6.50	< .0001

Note. N = 5841 (out of 6,200), $R^2 = 0.17$. Weights and replication weights are applied in accordance with OECD's design.

The model estimates are largely consistent with the descriptive analysis. The difference between girls and boys in the model is 12.6 points, while in the descriptive analysis it was 11.7. The difference between students with native background and student with an immigrant background is estimated in the model to be 24.4; in the descriptive analysis it is larger, namely 54.4. The number of respondents in this model is 5,841, which means that 359 students have been omitted.

The effect of socioeconomic background is substantially stronger for native students than for student with an immigrant background. The estimated effect of ESCS is 31.9 for native students. While it is 18.0 ($= 31.9 - 13.9$) for student with an immigrant background.

Baseline Model, Reading. Denmark 2018

In the 2018 PISA study, the main domain was reading. The same model was used.

Table 3*Baseline Model Estimates (Reading 2018)*

Parameter	Estimate	SE	t-value	p-value
Intercept	457.19	2.85	160.15	< .0001
Gender (Female)	27.77	2.57	10.79	< .0001
Student with immigrant background	-34.67	3.45	-10.05	< .0001
ESCS	30.79	1.96	15.74	< .0001
ESCS× Student with immigrant background	-20.19	3.52	-5.73	< .0001
S_ESCS	36.85	4.6	8.00	< .0001

Note. N = 7364 (out of 7,657), $R^2 = 0.17$.

When using the reading score as the dependent variable, the same pattern is seen as before: Here, however, it is the girls who score higher than the boys, and correspondingly the socio-economic background has a significant effect.

This pattern is observed across nearly all countries and PISA cycles, where girls tend to outperform boys in reading.

Analysis of PISA scores should at least include gender, ethnicity, and socio-economic background.

Inclusion of Indices

In each PISA round, the organization behind PISA prepares a series of indices. The indices are based on a battery of questions. The most famous is the socio-economic index called ESCS. However, in each PISA round, the OECD prepares over 20 indices that include well-being, reading enjoyment, math anxiety, etc.

Mathematics Anxiety

ANXMAT is an index based on 6 questions, all of which address the student's relationship with mathematics.

1	I often worry that it will be difficult for me in mathematics classes.
2	I get very tense when I have to do mathematics homework.
3	I get very nervous doing mathematics problems.
4	I feel helpless when doing a mathematics problem.
5	I worry that I will get poor [marks] in mathematics.
6	I feel anxious about failing in mathematics.

The ANXMAT index is based on six items capturing students' attitudes toward mathematics. Responses are recorded on a four-point Likert scale.

Scale	Coding
Strongly agree	1
Agree	2
Disagree	3
Strongly disagree	4

ANXMAT is added into the Baseline Model for mathematics (2):

$score_{ij} =$

$$\alpha + \beta_1 \cdot gender_{ij} + \beta_2 \cdot immigrant\ background_{ij} + \beta_3 \cdot ESCS_{ij} + \beta_4 \cdot S_ESCS_j + \beta_5 \cdot (immigrant\ background_{ij} \cdot ESCS_{ij}) + \beta_6 \cdot ANXMAT_{ij} \quad (2)$$

Table 4

Estimated Coefficients From the Baseline Model, Mathematics Including ANXMAT

Parameter	Estimate	SE	t-value	p-value
Intercept	465.50	2.65	175.85	<.0001
Gender (Female)	+4.60	2.30	2.00	0.0488
Student with immigrant background	-21.52	3.73	-5.77	<.0001
ESCS	25.33	1.58	16.07	<.0001
ESCS× Student with immigrant background	-9.72	3.86	-2.52	0.0139
S_ESCS	26.62	4.52	5.89	<.0001
ANXMAT	-27.60	0.98	-28.06	<.0001

Note. N = 4886 (missing 1,314 observations) $R^2 = 0.31$.

The index ANXMAT has a significant effect, the explained variance (R^2) has nearly doubled. Furthermore, the sign of Gender (Female) has been reversed, so it is now positive. A causal relation between ANXMAT and the score cannot be established. The observed relationship between mathematics anxiety and achievement may reflect reciprocal feedback mechanisms, in which low performance contributes to increased anxiety, while elevated anxiety further suppresses academic performance.

Discussion

The findings confirm well-established patterns in PISA research, particularly the strong role of socioeconomic background and the persistent performance gap associated with immigrant status. The inclusion of school-level ESCS highlights the importance of contextual effects, suggesting that student outcomes are shaped not only by individual characteristics but also by the composition of the school environment.

The introduction of the ANXMAT index substantially improves model fit, indicating that affective factors such as mathematics anxiety play a significant role in student performance. This result aligns with existing literature emphasising the importance of non-cognitive factors in educational achievement.

However, the cross-sectional nature of PISA data limits causal inference. The observed associations should therefore be interpreted cautiously as reverse causality or omitted variable bias cannot be excluded.

Conclusion

The baseline statistical model provides a transparent and replicable framework for analysing PISA data. By combining key background variables with school-level indicators, the model captures a substantial share of variation in student performance. The analysis demonstrates that socioeconomic status remains the most important predictor, while immigrant background and gender contribute additional explanatory power. The inclusion of mathematics anxiety further improves the model, underscoring the relevance of psychological factors. Future research should explore longitudinal data and more advanced modelling approaches to better address causal relationships and policy implications.

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

AI tools (e.g., ChatGPT, Copilot) were used to support structuring, language refinement, and idea development. All generated content has been critically evaluated, revised, and verified by the author, who assumes full responsibility for the final work. AI was not used to generate empirical data or sources.

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What Went Wrong: Millennial Higher Education Failures and Lessons for Generation Alpha in the AI Era

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Abstract

Generative Artificial Intelligence (AI) stands to transform and disrupt labor markets at an unprecedented pace and scale. Estimates suggest that 80% of United States workers may see at least 10% of tasks affected by large language models, with some leading opinion leaders predicting widespread job displacement to a degree that necessitates government-sponsored universal basic income. Higher-income knowledge workers appear especially vulnerable. Generation Alpha will make post-secondary decisions during this transition, often under the same “college equals security” heuristic that contributed to Millennial misalignment: 52% underemployment among recent graduates and negative lifetime Return on Investment (ROI) in 23% of bachelor's programs. This study conducts an integrative analysis of the forces behind adverse Millennial higher-education outcomes using federal labor data (Federal Reserve Bank of New York, Bureau of Labor Statistics, Census Bureau/American Community Survey), institutional datasets (Georgetown University Center on Education and the Workforce, Opportunity Insights), and behavioral economics literature. We identify overlapping domains including stigmatizing vocational pathways, assumptions about inflated credentials, cognitive biases of teen decision making, parents with obsolete priors about labor, and gaps in the K-12 guidance programs. The paper proposes a practical decision framework to help Generation Alpha families evaluate ROI, incorporate AI task exposure, and consider alternative credentials to avoid repeating the errors that shaped Millennial outcomes.

Keywords: higher education, Generation Alpha, artificial intelligence, labor market outcomes, return on investment, career decision-making

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Introduction

Millennials made their decisions to attend higher education institutions, what specific institutions and how to finance it during an unprecedented expansion of federal student lending, against a backdrop of societal narratives that made the four-year degree the consensus pathway to job security and a happy life. The outcome was \$1.4 trillion in outstanding federal student loan debt (Federal Reserve Bank of New York, 2017), 52% underemployment for recent grads (Federal Reserve Bank of New York, 2024), and bachelor's degrees that produced negative lifetime earnings at a rate of 23% (Preston, 2021).

Generation Alpha (born 2010–2024) is approaching its own postsecondary decisions while AI is having tangible impact on the labor market while also creating a higher degree of ambiguity about the future of labor and education. Millennials have expressed a high level of dissatisfaction with the decision architecture leading to their post-secondary decisions (information asymmetries, cognitive biases, outdated parental mental models, and under-resourced K–12 guidance) and the outcomes they yielded. Despite that sentiment, they are falling into the same patterns and stand to observe worse outcomes for Generation Alpha absent a more considered approach.

This paper synthesizes evidence on the institutional, cultural, economic, and cognitive forces behind adverse Millennial higher-education outcomes and translates each into considerations for Generation Alpha families such that they can prevent replicating recent outcomes. The objective is not to retrospectively indict but to prospectively support decisions: identifying which Millennial-era patterns are most likely to recur and which Gen Alpha-specific factors, particularly AI task exposure, warrant new analytical frameworks.

Methodology

This paper is a structured narrative review and conceptual synthesis based on iterative web-based research conducted from October 2025 till final draft. Sources were identified through keyword searches and citation chaining across Google Scholar, major working paper repositories (e.g., NBER/SSRN), and official U.S. government datasets (e.g., BLS/NCES), supplemented by policy and industry reports where peer-reviewed evidence was limited. The findings of this paper were organized into repeating mechanisms then consolidated into a multi-domain taxonomy and subjected to iterative refinement rounds. It does not present original causal estimates. The conclusions are framed consistent with evidence and yield decision-relevant implications.

The Institutional Architecture of Overborrowing

The Higher Education Act reauthorization of 1992 fundamentally transformed federal student lending by creating unsubsidized Stafford loans available to all students regardless of financial need, while removing annual and aggregate limits on PLUS loans (Dynarski & Scott-Clayton, 2013). Outstanding federal student debt increased sevenfold from \$187 billion in 1995 to \$1.4 trillion by 2017 (Federal Reserve Bank of New York, 2017). The proportion of bachelor's degree recipients who borrowed rose from 49% in 1992–93 to 66% by 2007–08, a 35% increase in borrower prevalence during the core Millennial graduation window (National Center for Education Statistics, 2012).

At the same time, state funding per FTE student fell to levels 30% below that of 2000 by 2012 (State Higher Education Executive Officers Association, 2013). Universities were passing the additional financial burden onto students in the form of higher tuition knowing they had access to capital. The end result was a structural cost shift where students' share of higher education revenue doubled from 1980 to 2012.

Under these conditions the for-profit sector was exploitive. They grew enrollment from 2.9% to 9.6% from 2000 to 2010 and accounted for a disproportionate amount of financial aid relative to that enrollment (20%). The impact seen over the following twelve years was higher default rates vs. private nonprofits, 52% vs. 17% (Looney & Yannelis, 2015). Cellini and Goldin (2014) discovered that tuition at for-profit institutions eligible for financial aid were charging rates 78% higher than comparable ineligible institutions.

These default rates could have been a warning about the potential outcomes experienced at these institutions. However, prior to 2015 when The College Scorecard launched (U.S. Department of Education, 2015) no data existed that made the link between institutions, earnings, loan repayment or employment outcomes.

Gen Alpha Translation

The information environment has improved but remains inadequate. Families must demand program-level ROI data (not just institutional averages), calculate debt-to-expected-income ratios before enrollment, and recognize that federal loan access is not an endorsement of educational quality.

Cultural Narratives That Systematically Misdirected Choices

The “college-for-all” paradigm emerged from Goals 2000 (1994) and No Child Left Behind (2001), which redirected K–12 systems toward college preparation while defunding vocational education. From 2007 to 2010, 71% of schools reduced instruction time in non-tested subjects including vocational training to meet NCLB accountability requirements (McMurrer, 2007). Vocational education became, in the words of San Diego Miramar College President Patricia Hsieh, “second choice, second-class” (Rosenbaum, 2001).

Parents had anchored to expectations for college based on their lived experience, but it was an incomplete understanding of the benefits of higher education. While the college wage premium was 39% in 1980 and steadily rose 100% by 2000, the career advice instilled in parents was going to college meant higher wages despite that generality not being equally distributed (Autor, 2014).

Prestige signaling drove families toward expensive private institutions despite empirical evidence that selectivity premiums were largely illusory for advantaged students. Dale and Krueger's (2002) landmark NBER study found that students who attended more selective colleges did not earn more than students who were accepted by comparable schools but attended less selective institutions. Yet families paid substantial premiums: private college graduates earn only 3.5% more than public graduates ten years post-enrollment (\$53,366 vs. \$51,551), while PayScale data shows public university ROI is twice that of private universities on a cost-adjusted basis (PayScale, 2023).

The book *The Hidden Ivies* is attributed to skewing Millennial parental perception on the need to attend highly selective private liberal arts colleges. It outlines 63 that even today have high brand recognition and command high tuition costs but fall short of Ivy League outcomes upon examination. On average they return 49% less than actual Ivy League schools and 9% less than flagship publics (Preston, 2021).

Taking these findings together, the college wage premium and affinity for private liberal arts colleges, the logic gap is evident. While going to college can produce a premium in wages, going to a more expensive college did not correlate to better financial outcomes for students. Simply put, parents couldn't rely on selectivity and cost to determine the wage premium an institution would yield.

Gen Alpha Translation

Public universities should be a primary consideration for most middle-class students given the comparable outcomes at fractional costs. Chetty et al.'s (2017) mobility data shows mid-tier publics (Cal State, CUNY, SUNY systems) produce higher mobility rates than elite privates due to higher success rates with the complement of higher access for low income applicants. There is a benefit to some Ivy-Plus schools, but primarily for those who are disadvantaged and will see a big jump in access to a more affluent network.

Cognitive Biases That Distorted Individual Decisions

Behavioral economics research documents systematic patterns in Millennial educational decision-making. Ruder and Van Noy's (2017) survey of 2,965 students found that students from financially disadvantaged backgrounds were especially prone to overestimate potential earnings from their major and degree. Seaward and Kemp (2000) documented that students were very optimistic about their future incomes and inaccurate when it came to estimating time to loan repayment.

Financial literacy deficits were severe and systematically distributed. Artavanis and Karra's (2020) study of over 1,000 students at a Massachusetts public university found 39.5% overall, dropping to 26% for female students, 24% for minority students, and 33% for first-generation students. The critical finding: 38.2% of low-literacy students underestimated future payments by more than \$1,000 annually. High financial literacy reduced this underestimation probability by 17–18 percentage points.

Present bias, the tendency to heavily discount future consequences relative to immediate benefits, created a structural vulnerability in the loan decision. The immediate reward (college experience, prestige, social benefits) was psychologically salient; the deferred cost (debt payments beginning four or more years later) was abstract. This aligns with the quasi-hyperbolic discounting literature (Laibson, 1997; O'Donoghue & Rabin, 1999): 18-year-olds systematically underweight costs delayed beyond their immediate planning horizon.

The actions of peers were an amplifier of biases and in the case of Carrell et al. (2009) the effects were of a much larger magnitude than in previous studies of college achievement. High school seniors in Barrios-Fernández (2022) research were more likely to attend university when their closest neighbor enrolled. Whereas a neighbor can be a proxy for similar socioeconomic conditions it is not a replacement for an individual level cost-benefit analysis.

Gen Alpha Translation

Where biases are predictable, they must be counteracted with good discipline and a focus on individuals. Basic financial literacy and realistic calculations of loan repayment in best and worst case scenarios should be taken before commitments. To the extent specific job pathways can be chosen before major selection, they should be to improve the accuracy of the financial assessment.

The Labor Market Millennials Actually Entered

Millennials graduating between 2000 and 2015 faced two major recessions that caused documented scarring effects with permanent earnings consequences. Rothstein (2020) found Great Recession graduates entering the labor market in 2010 had employment rates 2 percentage points lower than predicted through 2019, indicating permanent structural damage. Census Bureau economist Kevin Rinz documented that Millennials in high-unemployment local labor markets lost 13% in cumulative earnings from 2007 to 2017, compared to 9% for Gen X and 7% for Boomers (Rinz, 2019).

The job market transformed structurally during this period. Autor et al. (2006) documented polarization, with employment expanding in high-wage and low-wage jobs while middle-wage work declined. Acemoglu and Restrepo (2022) found that 50–70% of changes in U.S. wage structure over four decades could be explained by automation displacing workers from routine cognitive tasks. This explains why recent college graduate underemployment jumped to 44% by 2012 (up from 34% in 2001) and why consequences have proven durable: graduates who start underemployed are 3.5 times more likely to remain underemployed a decade later (Abel & Deitz, 2016).

Credential inflation accelerated after 2008. Burning Glass Technologies' *Moving the Goalposts* (2014) documented widespread credentialing: 65% of executive secretary job postings required bachelor's degrees despite only 19% of current workers holding them; 60% of IT help desk postings required degrees though only 39% of current workers had them. This created a credentials trap: jobs that did not require degrees now demanded them as screening proxies, while the degrees themselves taught little relevant to job performance.

Major-level variation was enormous and systematically underappreciated. Georgetown CEW data shows architecture majors faced 12.8% unemployment versus 4.8% for nursing, a nearly threefold gap (Carnevale et al., 2015). Information Systems majors faced 14.7% unemployment. Criminal Justice majors faced 67.2% underemployment. Meanwhile, the college premium narrative cited national averages that masked these disparities: at 1,233 institutions (30%), more than half of students earned less than high school graduates ten years after enrollment (Chetty et al., 2017).

Gen Alpha Translation

The labor market no longer offers stable career paths predictable five or more years in advance. Major selection must incorporate unemployment and underemployment data by field, not just average earnings. Parents' intuitions about safe career paths are calibrated to labor markets 15–20 years obsolete. The World Economic Forum (2023) projects 39% of key skills will change by 2030; static credentials face rapid obsolescence.

Gen Z Translation

Millennials did not anticipate recessionary forces, credential inflation, and were not discerning enough with major selection. Decisions Gen Z needs to make about postsecondary school, career pathways, and majors are far more sensitive to duration risk. The acceleration of AI is narrowing windows for course correction. Dedicating significant time and resources toward a career that will not exist at graduation is a real possibility. A high degree of awareness about demand in the job market and where AI technology is being deployed is warranted.

Why Forecasting Systems Failed Catastrophically

BLS occupational projections for 2000–2010 proved systematically wrong in ways that guided counselors toward poor advice. The Bureau projected manufacturing employment near 19 million; actual employment fell to 11.5 million, a 65% overprojection (Bureau of Labor Statistics, 2012). Projected unemployment of 4.0% materialized as 9.6%. Projected nonfarm payroll growth of +1.4% annually became –0.1%, a directional failure. These projections, embedded in the Occupational Outlook Handbook, were the primary information resource counselors provided to students.

The methodological failure was structural: BLS assumed mature business cycle conditions with no recession during ten-year horizons, despite the historical frequency of recessions suggesting near-certainty of at least one. More fundamentally, projections did not incorporate routine-biased technological change (RBTC) into occupational staffing patterns, despite Autor et al.'s (2003) framework being available to policymakers.

K–12 guidance systems operated under impossible constraints. Actual student-to-counselor ratios averaged 400–500:1 versus the ASCA-recommended 250:1 (American School Counselor Association, 2019). Counselors allocated only 23% of time to postsecondary planning versus the recommended 40%. Training programs devoted approximately one course (6% of graduate credit hours) to career development. Most critically, counselors were evaluated on college enrollment rates, not graduate employment outcomes, creating systematic incentives to maximize enrollment rather than optimize fit.

Jaimovich and Siu's (2020) research identified the core forecasting error: assuming jobs lost in recessions return. Their key finding: job polarization, the disappearance of middle-skill routine jobs, occurs almost exclusively during recessions and these jobs do not return in recovery. The 1991, 2001, and 2009 recessions all produced jobless recoveries because employers used downturns to permanently eliminate routine positions through technology adoption. Time to employment recovery extended from 15 months (1975) to 31+ months (post-1991) as structural displacement dominated cyclical patterns.

Gen Alpha Translation

Historical job projections systematically overestimate employment in routine-task-intensive occupations. Current BLS projections incorporating AI effects remain preliminary. Families should evaluate occupations based on task composition (routine vs. non-routine, cognitive vs. manual, physical presence requirements) rather than job titles. Hershbein and Kahn (2018) demonstrated that MSAs hit harder by recession showed permanently elevated skill requirements; recessions accelerate rather than pause technological displacement.

Empirical ROI Data Reveals Systematic Perception Failures

Lifetime earnings by major show variance comparable to the college premium itself. Architecture and engineering majors earn \$3.8 million median lifetime; early childhood education majors earn approximately \$1.8 million, a \$2 million gap within bachelor's degree holders (Carnevale et al., 2015). Georgetown CEW data shows top-paying majors (STEM) earn \$3.4 million more over a lifetime than the lowest-paying majors.

Negative ROI is more common than the confidence in college-for-all sentiment would indicate. 23% of bachelor's programs have a negative ROI, meaning when lost wages and cost of attending are factored into lifetime earnings students would have been better off not attending. This neglects intangible benefits many attribute to attending university but resides outside the scope of this paper.

Debt-to-income ratios reached crisis levels. The Class of 2018 faced 66% debt-to-income ratios versus 39% for the Class of 2008, nearly doubling in a decade (Looney & Yannelis, 2022). The Consumer Financial Protection Bureau benchmark for healthy DTI is 36%. Master's degree holders spend 57% of their extra earnings (above bachelor's-only) on loan payments, suggesting graduate education frequently destroys rather than creates value.

The for-profit sector represents the clearest market failure. Despite enrolling only 10% of students, for-profit attendees represented 40% of all defaults (Looney & Yannelis, 2015). Twelve-year default rates at for-profits reached 52% versus 17% at private nonprofits. The Brookings analysis is stark: attending a for-profit is the strongest predictor of default, greater than major, income, or completion status.

Chetty et al.'s (2017) Opportunity Insights data reveals that elite access, not elite education, drives much of observed elite outcomes. Children with parents in the top 1% are 77 times more likely to attend an Ivy-Plus college than children from the bottom 20%. Yet conditional on attendance, low-income students achieve comparable success rates, indicating that the prestige premium largely reflects selection rather than treatment effects. Mid-tier public universities show higher mobility rates because they combine acceptable success rates (51% at SUNY Stony Brook vs. 60% at Ivy-Plus) with dramatically higher low-income access (16% vs. 4% from the bottom quintile).

Gen Alpha Translation

ROI must be calculated at the program level (specific major at specific institution), not institution or major level alone. The same major at different institutions can vary by \$80,000 in first-year earnings. Community college transfer pathways eliminate much of the debt burden while producing comparable outcomes in most fields. For-profit institutions should be avoided absent compelling evidence of specific program success.

Translational Framework for Gen Alpha Decision-Making

AI Exposure Redefines “Safe” Career Paths

Early studies from Eloundou et al. (2024) warn that 80% of U.S. workers could have at least 10% of work tasks affected by LLMs; 19% may see 50% or more task impact. For the first time higher paying jobs are seemingly at risk, those in mathematics, tax preparation, writing,

accounting and legal work. Lowest-exposure occupations include stonemasons, cooks, mechanics, meat packers, and athletes; professions characterized by presence in the physical world and tactile demands. Manning and Aguirre (2026) find that AI exposure and adaptive capacity are positively correlated ($r = 0.502$): many occupations highly exposed to AI contain workers with relatively strong means to manage job transitions. However, 6.1 million workers (4.2% of the workforce) work in occupations that are both highly exposed and where workers have low expected adaptive capacity, concentrated in clerical and administrative roles.

Confidence in STEM being a safe haven is also being challenged as generative AI continues to accelerate in coding tasks and disciplines within computer science and math. While early in the trend, Federal Reserve Bank of New York data (2025) shows computer engineering unemployment at 7.5% and computer science at 6.1%, higher than art history and philosophy.

Skills Portfolios Increasingly Trump Credentials

Skills-based hiring has gained policy momentum: twenty-plus U.S. states have eliminated bachelor's requirements for state positions (National Skills Coalition, 2024). However, employer practice lags rhetoric: Harvard Business School research finds that only 12% of companies have no degree requirements at all, and 47% of employers who removed requirements are not actually hiring more degree-less workers (Fuller et al., 2022). The gap between announced policy and hiring behavior suggests that credential signaling remains entrenched even as alternative pathways gain attention.

The vocational renaissance reflects labor market reality. Skilled trades face one million fewer workers than in 2007 (Associated Builders and Contractors, 2023). 65% of tradespeople feel their jobs are safe from AI automation (Manpower Group, 2024). Trade careers offer competitive starting salaries, AI-resistance, job security, and zero student debt. Yet 74% of Gen Z perceive stigma with vocational school, perpetuating the shortage (Strada Education Network, 2022).

Decision Framework Components

Major Choice Evaluation Criteria. AI exposure scoring (tasks being displaced and replacement propensity); physical presence requirements (hands-on work harder to automate); interpersonal intensity (empathy, persuasion, trust); underemployment rate by major (NY Fed data); and skills transferability across industries and roles (Manning & Aguirre, 2026).

Monitor jobs being displaced by AI and evaluate the propensity for replacement in the future; at the time of this paper physical presence requirements are harder to automate; reliance on interpersonal intensity (empathy, persuasion, trust and accountability); underemployment rate by major via NY Fed data; propensity for skills to be transferable to different industries and roles (Manning & Aguirre, 2026).

Institution Choice Calculation. Overcome biases of institution choice and focus on the program level ROI (Preston, 2021); limiting debt to projected first-year salary as a guideline (Hershbein & Kahn, 2018) with some discretion based on future earnings; geographic proximity to major metro areas with employment potential (Moretti & Yi, 2024); avoid for-profit institutions unless there is a clear benefit as they are rarely worth the cost (Cellini & Goldin, 2014); a community college with a transfer significantly reduces cost and yields minimal outcome differences.

Triggers to Consider Alternative Pathways. Can include but not limited to a high degree of interest or aptitude for skilled trades; clear labor shortages that can create immediate opportunities for employment; debt that exceeds an expected starting salary as a guideline; target career does not require a degree.

Preventing New Groupthink

Gen Alpha faces emerging misleading narratives that parallel “college-for-all.” The “AI-proof careers” discourse lacks empirical grounding; the technology is too new for reliable forecasting (Manning & Aguirre, 2026). The “healthcare is completely safe” narrative ignores AI augmentation of diagnostic and administrative functions. The learn to code and you’ll find a tech pathway shows 71% job placement but increasing self-employment as traditional entry-level tech contracts (Course Report, 2023).

The fundamental lesson from Millennial experience: parental intuition lags labor markets by 15–20 years. The World Economic Forum (2023) projects 39% of key skills will change by 2030. The generation ahead of Gen Alpha, Gen Z, is already seeing warning signs as they enter the workplace; 58% of graduates are looking for full-time work versus 25% of Millennials at that same stage (Handshake, 2024); 5.8% unemployment for recent graduates matching high school dropouts; 22% drop in Fortune 500 internship offers from 2022 to 2024 (NACE, 2024).

Conclusions

A confluence of factors contributed to the Millennial higher education crisis; incentive structure (enrollment over outcomes), policy failures (access to capital without protection), societal narratives (prestige seeking, stigmatizing vocational pathways), cognitive biases (optimism, bias of the present, financial literacy gaps), labor market transformation and forecasting failures (BLS over projections and misinterpretations). Each alone was problematic and in combination they produced systemic overinvestment in credentials with declining returns.

Gen Alpha is entering a highly dynamic environment where AI is automating cognitive tasks, a major departure from past technological revolutions. Entry level jobs where recent grads would perform low value tasks but learn the initial business workings are now contracting due to AI capabilities. This has not changed the decision architecture that was in place for Millennials: 17-year-olds with limited information and/or capacity to analyze it, influenced by parents with obsolete intuitions, making irreversible financial decisions to the magnitude of hundreds of thousands of dollars.

Gen Alpha families can draw three core insights from this research: First, major and program selection should be more heavily weighted than institutional prestige; there is more variance across programs within an institution by degree type than across differing institutions (Preston, 2021); second, excessive leverage will destroy future wealth regardless of credential prestige thus debt should not exceed first year earnings as a general principle (Looney & Yannelis, 2022). Third, on a risk adjusted basis many vocational and technical pathways offer better returns for students that don’t have a clear trajectory for academics or desired profession; the immediate employment, competitive wages and lack of debt provide an early resistance to AI disruption.

There are several limitations to this synthesis. Source selection was based on judgement vs. an algorithmic approach. The author provides an interpretation in the form of translational guidance for Generation Alpha that is sourced from historical patterns which is not empirically validated. ROI can be impacted by many other independent variables including discount rates, length of one's career and differences in earnings based on market trend and geography. Testing should be conducted to determine if this decision framework proposed did improve postsecondary outcomes for Generation Alpha.

The question “what went wrong?” has a clear answer: systems optimized for enrollment produced graduates optimized for obsolescence. The question “what should change?” requires recognizing that this is the time to exercise due diligence, make data-driven rather than vanity-driven decisions, and, to the extent possible at age 17 or 18, consider lifestyle design to inform educational choices. The tools exist: College Scorecard, NY Fed underemployment data, Georgetown CEW ROI rankings, and AI exposure assessments (Manning & Aguirre, 2026). Ironically, AI and large language models will themselves aid access to and analysis of this data. The Millennial experience provides the cautionary baseline. Gen Alpha's outcomes depend on whether their families learn from that experience before committing to paths that compound the same errors in a labor market changing faster than any generation has faced.

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Exploring the Correlation Between Ideation Confidence and Motivation and Its Effect on Writing Proficiency

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Abstract

This quasi-experimental research investigated the impact of collaborative writing activities on improving writing performance among college-bound twelfth grade students. The study's key finding demonstrated a statistically significant improvement in participant writing proficiency from pre-treatment to post-treatment assessments among students who self-reported motivation for writing as moderate or high. Collaborative writing activities focused on honing student motivation and building ideation confidence appears to be a beneficial pedagogical tool that enhances overall writing proficiency. Closing the achievement gap has been an emphasis in secondary educational research since 2001 as writing has become more prominent in the language arts curriculum. However, more needs to be done regarding research and policy to address the identified lack of preparedness of college-bound seniors in college and career-ready writing. This research shows that collaborative writing pedagogy can increase student motivation while bolstering the confidence in ideation necessary to be successful at the post-secondary level.

Keywords: writing, self-efficacy, ideation, process writing, motivation, active systems theory, pedagogy

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Introduction

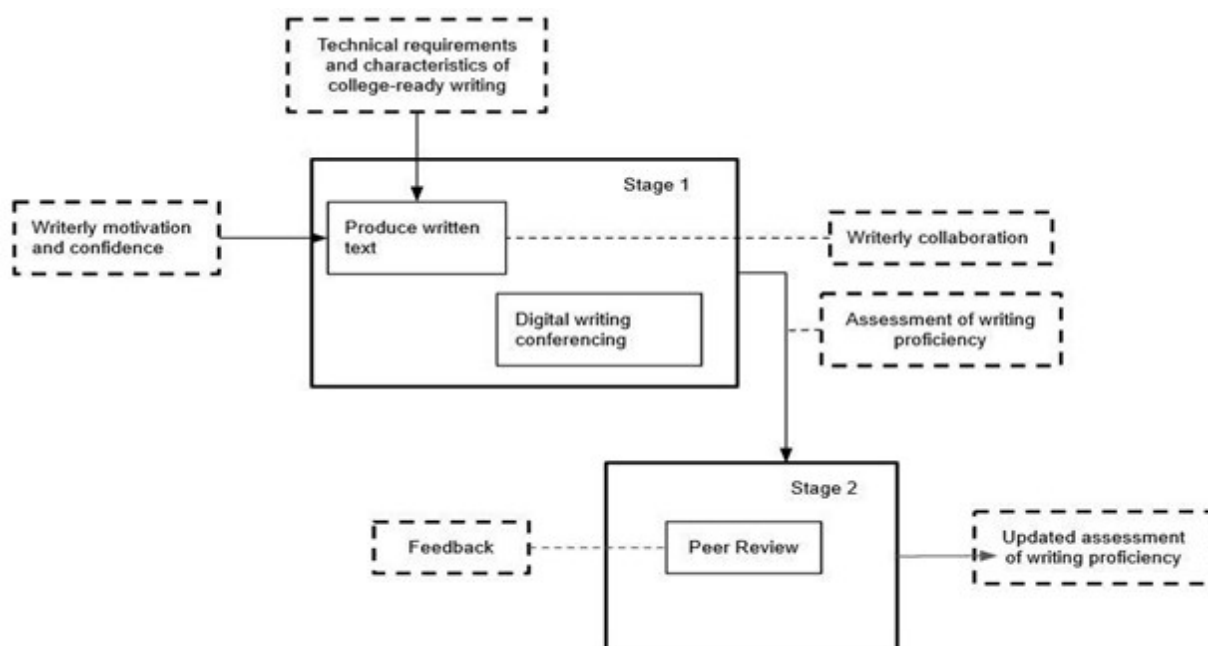
Research has emphasized that students come to class with various experiences and perspectives to shape writing outcomes (Zimmerman & Schunk, 2011). Confidence in writing ideation is a writer's belief about their abilities to generate ideas. The generation of ideas is a foundational part of the writing process (Langacker, 2008) and involves the ability to develop the content and ordering of thoughts necessary to communicate proficiently. More recent literature has focused on the importance of student motivation in prompting and nurturing more self-regulated learning in educational settings (Frankel et al., 2018). Students gain motivation and understanding of expectations and desired outcomes when actively involved in learning (McConlogue, 2020). Progressing from acclimation to competence in the domain of writing occurs from changes in students' motivation for writing (Graham et al., 2017), with writing development advancing as students become more motivated to write.

Methodology

Systems theory evaluates the interrelatedness of things—the process of resources, behaviors, or functions transforming to a product, service, or other measurable outcome—as a relationship established among a subject, object, and tool(s). Active systems theory (Engeström, 1999) emphasizes that how something is learned is part of what is learned and has a measurable effect on learning outcomes. It is most effective for students in a truly collaborative writing community to take on multiple roles: author or coauthor, observer or reader, and reviewer. The V.A. Trapeznikov Institute of Control Sciences developed an active systems approach for evaluating an object based on pairing and comparing a set of determined parameters (Zheglova & Titarenko, 2020); Figure 1 shows their algorithm adapted for this research.

Figure 1

Assessment Algorithm Based on Active Systems Theory



Systems theory has been refined and reinvented since its formal introduction in 1954. Several theorists of the 1920s viewed the whole as the sum of its parts, an open system regulating its internal environment to maintain its stability (Bohr, 1928; Cannon, 1929; Smuts, 1926). Communication and feedback among the parts of a system were further refined in the 1930s and 1940s to assist with application and recall (Ashby, 1947; Rosenblueth et al., 1943; Shannon, 1948). Simon (1955, 1956) and Nagel (1961) defined *systems theory* as a set of rules for modeling, or a logical skeleton to supply structure. Giere (1988) used systems theory to link the real world through hypotheses.

Interaction design is the intentional design of spaces for human communication and interaction (Bales, 2001). It is especially relevant in the context of technology-supported collaborative learning in the writing curriculum. Systems theory aligns with the general premise of interaction design in that it focuses on human activity with technology rather than focusing on the computer (Kaptelinin & Nardi, 2007). Applying systems theory in concrete educational research typically requires intermediate concepts, such as activity, to be applied as a lens to analyze the learner and the learning tool (Gedera & Williams, 2016).

Previous writing-based research has appropriately incorporated systems theory for pre- and post-test methodology in digital writing pedagogy to explore whether schema-oriented teaching improves students' writing proficiency (Engeström, 1999; McAvinia, 2016; Ritzer & Stepnisky, 2018; Sun, 2014). Cho and Ma (2020) similarly examined the effects of schema activation and strategy instruction on student comprehension, strategy use, motivation, and learner beliefs in a technology-rich learning environment. Their results showed that schema building and strategy implementation yielded positive results.

In Week 1 (i.e., pretreatment) of this 6-week study, participants completed a survey of motivation and confidence for ideation (see Table 1) before composing a pretreatment assessment of writing. I used released standardized prompts from a state assessment of writing to assess writing proficiency, and a pair of outside graders employed a peer-reviewed rubric to ensure validity and reliability.

Table 1
Self-Efficacy for Writing Scale

Confidence for Ideation	Pre-Test	Post-Test
I can think of many ideas for my writing	67	68
I can put my ideas into writing	69	70
I can think of many words to describe my ideas	63	68
I can think of a lot of original ideas	64	67
I know exactly where to place my ideas in my writing	49	60
Motivation for Writing	Pre-Test	Post-Test
I enjoy writing	3.3	3.3
I think it is very useful for me to write	3.8	3.9
It's fun to write	3.1	3.1
I think writing is meaningful	4.3	4.3
I think writing is interesting	3.5	3.5
It is important to me to write	3.2	3.5
I think writing is fascinating	2.8	3.0

Note. Adapted from "Self-Efficacy for Writing Scale," by M. Dempsey, D. Kauffman, C. McKim, S. Zumbunn, & R. Bruning, 2010, *Journal of Educational Psychology*, 105(1), p. 25 <https://doi.org/10.1037/a0029692>

During Weeks 2–5 (i.e., tasks/treatment) of this 6-week study, participants actively engaged in four collaborative process writing pedagogy iterations. These cycles included direct instruction, collaborating, drafting, revising and editing, corroboration, and publishing.

The survey of motivation and confidence for ideation was administered again in Week 6 (i.e., posttreatment) of this 6-week study, followed by a posttreatment writing assessment. A pair of outside graders assessed writing proficiency using the same peer-reviewed rubric to ensure validity and reliability.

Results

This study of 53 upper level (juniors and seniors) honors English students sought to determine what relationship, if any, existed among student motivation, confidence for ideation in writing, and writing proficiency. The focus of this research was raising writing scores from non-proficient (specifically, “approaches expectations,” scoring 6–10) to proficient (“meets expectations,” scoring 11–15; or “exceeds expectations,” scoring 16–20). All students who went from approaching expectations to either meeting or exceeding expectations ($n = 11$) saw a mean increase in ideation for writing (3.5) with no change in motivation (3.2); see Table 2.

Table 2

Motivation and Ideation Variables for Improved Writing Performance

Student	Pre-Writing	Motivation	Motivation Δ	Ideation Δ	Writing Δ
1307	8	4			+4
1308	10	3			+1
1309	6	3		+8	+4
1313	10	4	+1	+4	+1
1316	6	3		+14	+8
1402	8	2		+4	+4
1404	9	3	−1	−10	+3
1406	6	3		+14	+7
1418	10	3		+8	+8
1420	6	3		−2	+5
2108	9	4		−2	+3

All proficient students who saw no score change between pre- and post-writing ($n = 9$) saw a mean increase in ideation (3.3) with no significant change in motivation (.4). Similarly, all proficient writers who saw a score decrease pre- to post-writing ($n = 7$) saw a mean increase in ideation (4.2) with no significant change in motivation (.3). Of those students with negative change, 3 students scored “exceeds expectations” (19 or 20) on both pre- and post-writing assignment. Regression to the mean - the statistical fact that an individual who scores extremely well on one occasion will tend to score less extremely on the next occasion - could account for this score decline more than a legitimate change in student proficiency pre- to post-write.

In the sample, the average post-treatment self-efficacy score, $se = 70.95$, was higher than the pre-treatment self-efficacy score, $se = 68.66$. Furthermore, the difference between the two averages, -2.287 , 95% $CI [-4.728, .1538]$, was statistically significant, $(49) = -1.883$, $p = .033$. Similarly, the average post-treatment motivation score, $m = 3.17$, was higher than the pre-treatment motivation score, $m = 3.03$, and the difference between the two

averages, $-.139$, 95% *CI* $[-.2639, -.0152]$, was also statistically significant, $(52) = -2.253$, $p = .014$; see Table 3.

Table 3

Mean Differences in Academic Self-Efficacy and Motivation Following Treatment

Pair	Mean	Std. Dev.	St. Err.	95% CI	<i>t</i>	<i>df</i>	One-Sided <i>p</i>
PreSE - PostSE	-2.2875	8.59028	1.21485	(-4.728) .1538)	-1.883	49	.033
PreM - PostM	-.13962	.45121	.06198	(-.263, -.015)	-2.253	52	.014

Note. PreSE stands for pre-treatment Self-Efficacy, PostSE stands for post-treatment Self-Efficacy. PreM stands for pre-treatment Motivation, PostM stands for post-treatment Motivation. Std. Dev. stands for the standard deviation, Std. Err. is the standard error mean, CI is the confidence interval, *t* represents the t-value, and *df* represents the degree of freedom.

Discussion

Myriad studies have evaluated the effects of pedagogy, curriculum, and classroom modality on writing quality (Aminloo, 2013; Biria & Jafari, 2013; Shehadeh, 2011; Storch, 2005; Sutherland & Topping, 1999) and writing fluency (Kim, 2019; Pham et al., 2019; Storch, 2011; Zabihi et al., 2013) and research on writing performance, writing self-regulation, and writing self-efficacy has been primarily limited to language learners (Zheng et al., 2021). Collaborative writing activities help students identify and address gaps in their writing performance (Rahimi & Fathi, 2022), and the findings of this research showed a statistically significant ($p < .05$) increase in participant writing proficiency pre- to post-treatment.

The only subgroup to score below the 1.5 average increase in writing proficiency was those students who finished with a motivation score of 2 or lower (out of 5); this group saw an increase in proficiency of only 1.2 despite an incredibly high change in ideation (14.4). Similarly, of the seven students who started the study with a motivation score of 4 or higher (out of 5), all but 2 saw an increase in post-writing proficiency; furthermore, four of those five students saw an increase of at least 3 points. These students also saw gains in ideation (5.4).

A Pearson's *r* value of 0.505 indicates a positive linear correlation between increased ideation and increased writing proficiency among participants reporting at least average (3) motivation. There was also a moderate, positive linear relationship ($r = 0.481$) between student motivation and confidence for ideation in writing, suggesting that as one variable increases, the other tends to increase. Further analysis revealed that initial motivation for writing affects both writing proficiency and self-efficacy for ideation, while changes in motivation had no correlation to changes in ideation or writing proficiency.

In a similar study providing evidence-based support for the importance of promoting students' self-efficacy, Zheng (2021) examined these variables or their interrelationships as predictors of undergraduate medical students' learning outcomes in the context of flipped learning. On average, students scored highest on self-efficacy (mean = 5 out of a possible 7), followed by intrinsic motivation (mean = 4.59). Their results suggest that, while there was a direct effect of self-efficacy on learning outcomes, academic motivation did not mediate it. By unpacking the structural relationships among self-efficacy, academic motivation, and learning outcomes,

($n = 146$) their findings seem to echo that student motivation at the onset of a learning task is necessary to increase both confidence and proficiency.

Conclusion

This research seems to drive the conversation from the sphere of pedagogy to policy. If initial motivation for writing is indeed indicative of the prospect of increasing student self-efficacy for ideation and eventually writing proficiency, then more must be done in the formative years of literacy instruction to build student motivation in writing. According to Mary Wennersten (2019), third grade is the single most important year of a student's academic success because that "is the year that students move from learning to read—decoding words using their knowledge of the alphabet—to reading to learn." How impactful would the results be if this approach honed in on all elements of literacy – including writing – to help students foster ability in critical thinking and ideation, reading and writing to learn, and an overall motivation for both the input and output sides of literacy.

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.

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Generative AI's Role in Computer Science Classrooms: A Rapid Mapping Review

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Abstract

The rapid adoption of generative artificial intelligence (GenAI) tools such as ChatGPT has outstripped empirical evidence regarding their instructional value, particularly in computer science education (CSE), where learning depends on debugging, problem-solving, and iterative reasoning. This study presents a rapid review of peer-reviewed empirical research published between 2022 and 2025, after the public release of ChatGPT, synthesizing evidence on how GenAI is used and perceived in CSE contexts. A systematic search of the EBSCO platform identified nine studies examining the active use of GenAI by learners or academics. Across the included studies, GenAI use clustered into five instructional roles: general learning support; programming and debugging assistance; code comprehension and self-explanation support; feedback and revision support; and assessment-oriented instructional support. Findings indicate that GenAI is typically positioned as on-demand support embedded within existing coursework, with learning benefits reflected primarily in process-level outcomes such as engagement, revision, and evaluative judgment. Student perceptions were generally positive but qualified by concerns about over-reliance, output reliability, and academic integrity, while academic perspectives reflected cautious and conditional adoption. The review highlights the need for principled integration approaches that emphasize instructional framing, assessment alignment, and self-regulated engagement, and identifies directions for future research on durable learning outcomes and responsible use in CSE.

Keywords: generative AI, ChatGPT, computer science education, programming education, educational technology

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Introduction

Common GenAI tools such as ChatGPT have entered educational practice at an unprecedented speed, particularly in CSE. Since late 2022, students have increasingly utilized these systems for academic tasks, such as explaining difficult concepts, debugging assistance, and seeking guidance for problem-solving (Chang et al., 2023). This rapid uptake raises important pedagogical questions, as learning in CSE requires learners to coordinate code production, error tracing, computational reasoning, and higher-order problem solving. These characteristics make CSE a productive context for examining whether GenAI supports disciplinary learning processes or risks displacing the cognitive work central to skill development.

Early empirical studies documented a range of GenAI applications across computing and related domains. In CSE, GenAI tools have been used to provide feedback on programming tasks, support debugging, and help learners interpret program behaviour (Laubscher, 2024; Poitras et al., 2024). Related evidence from foundational mathematics education, which shares structured problem-solving characteristics with introductory computing courses, suggests that AI-generated hints can yield learning gains comparable to human-authored support when accuracy safeguards are in place (Pardos & Bhandari, 2024). While these findings suggest potential instructional value, the evidence remains limited. Most studies focus on short-term outcomes or task-level performance, raising questions about how GenAI use shapes learning processes, engagement, and the development of lasting competence.

Perceptions of GenAI integration reflect pedagogical tensions regarding cognitive engagement and disciplinary practices in CSE. Students value the accessibility of AI assistance (Lin & Chang, 2024), but educators express concerns about diminished critical engagement, over-reliance, and academic integrity (Chang et al., 2023; Lin et al., 2024). These perspectives highlight the need to understand how GenAI is being integrated into CSE, how learners and educators experience it, and what challenges and future directions are emerging.

This review provides an early synthesis of empirical evidence on GenAI in CSE. It characterizes how GenAI tools such as ChatGPT are being used to support learning and how students and academics perceive their integration, while also identifying challenges and future directions discussed in the literature. Given the rapid pace of technological development and the emerging nature of empirical work in this area, a rapid review approach was adopted to capture early evidence and perspectives in a timely manner. With this purpose, the review addresses the following questions:

- A. How are GenAI tools being used in CSE to support student learning and skill development?
- B. How do students and academics perceive the integration of GenAI in CSE, and what challenges and future directions are identified?

Methods

This review employed a rapid review approach guided by PRISMA principles, an appropriate method given the pace of research on GenAI in education. Rapid reviews aim to provide timely syntheses while retaining transparent and systematic procedures for search, screening, and analysis (Dobbins, 2017; Tricco et al., 2015, 2017).

The search was conducted on January 4, 2026, using the EBSCO platform, which aggregates ERIC, Education Source, PsycINFO, and Academic Search Complete. Search terms combined

GenAI and CSE concepts appearing in the title or abstract: “generative AI” OR “generative artificial intelligence” OR “ChatGPT” AND “comput* science education” OR “comput* science.” The search window was limited to studies published between 2022 and 2025, corresponding to the period following the public release of ChatGPT. Filters were applied to retain peer-reviewed articles published in English.

Studies were included if they reported original empirical research involving the active use of a GenAI tool in teaching or learning and were situated in CSE. CSE contexts were operationalized as involving learners or instructors engaged in computer science–related learning tasks, such as programming, code comprehension, or algorithmic reasoning. Review articles, conceptual papers, and studies not focused on CSE contexts were excluded.

The search yielded 55 records. After title and abstract screening, 45 records were excluded, and 10 articles underwent full-text review. One article was excluded at the full-text stage for not meeting the inclusion criterion of being situated in a CSE context. The remaining nine studies met all inclusion criteria and were included in the synthesis. Figure 1 presents the PRISMA flow diagram, and Table 1 summarizes key characteristics of the included studies.

Two independent coders sequentially reviewed each study, extracting data on instructional context, GenAI use, and learning/perception outcomes. Discrepancies were resolved through discussion, consulting senior scholars when needed. Analysis involved structured comparison to identify convergent patterns in instructional roles, stakeholder perceptions, and reported challenges, enabling synthesis across varied study designs.

Figure 1

PRISMA Flow Diagram of Article Selection

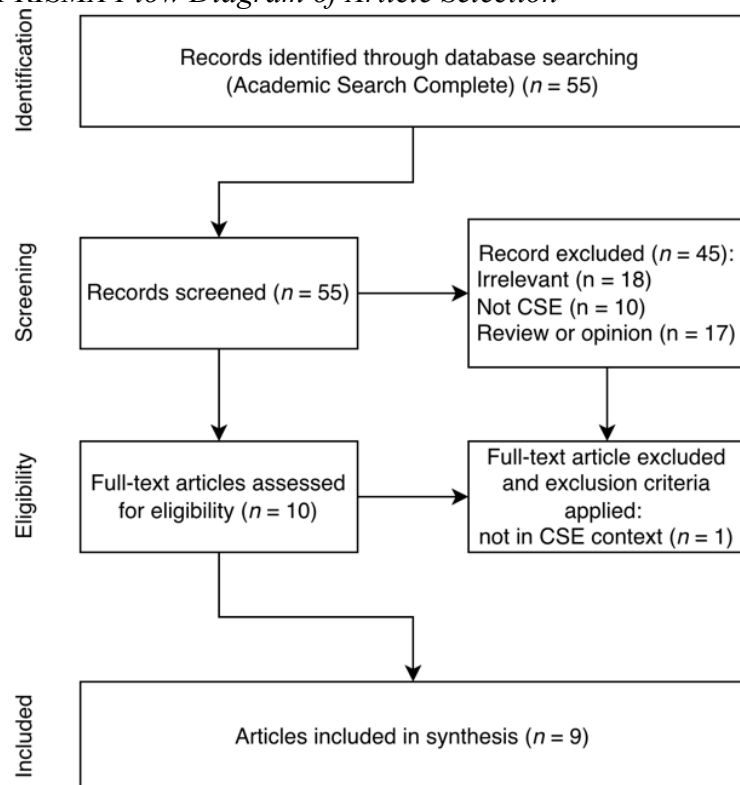


Table 1*Summary of Included Empirical Studies on the Use of GenAI Tools in CSE*

Author(s), Year	Context	Tool & Instructional Role	Primary Outcomes / Focus
Gandhi & Muldner, 2025	Undergraduate; Computer Science	ChatGPT; code comprehension and self-explanation (annotating code tracing solutions)	Learning processes and behaviours
Gimpel et al., 2025	Higher education; Information Systems	ChatGPT; assessment oriented instructional support	Perceptions and attitudes; academic evaluation
Kazanidis & Pellas, 2024	Undergraduate; Early Childhood Education & Computer Science	ChatGPT; general learning support	Course performance; perceptions and attitudes
Kosar et al., 2024	Undergraduate; Computer Science	ChatGPT; learning support plus programming and debugging assistance	Course performance; learning processes and behaviors; perceptions and attitudes
Kusper et al., 2025	Undergraduate; Informatics	ChatGPT, Copilot, Gemini; general learning support and code evaluation practices	Course performance; learning processes and behaviors; perceptions and attitudes
Lohr et al., 2025	Higher education; Computer Science	LLM pipeline; assessment-oriented instructional support (quiz item generation)	Feasibility and expert-rated quality of course-specific, semantically annotated, autogradable CS quiz questions and feedback
López-Fernández & Vergaz, 2024	Undergraduate; Computer Science	ChatGPT; learning support and programming assistance in course use	Course performance; learning processes and behaviors; student perceptions
Saúde et al., 2024	Undergraduate; Computer Science	ChatGPT; general learning support and course level adoption	Perceptions and attitudes
Ziqi et al., 2024	Undergraduate; Computer Science	ChatGPT; feedback and revision support	Learning processes and behaviors; perceptions and attitudes

Findings

RQ1: How are GenAI tools being used in CSE to support student learning and skill development?

Across the nine included studies, all research was situated in higher education, with the majority conducted in undergraduate contexts (7 of 9 studies). ChatGPT was the most examined tool, although several studies investigated alternative or complementary systems,

including GitHub Copilot, Gemini, and customized large language model pipelines. We then clustered GenAI use into five instructional roles: (1) general learning support, (2) programming and debugging assistance, (3) code comprehension and self-explanation support, (4) feedback and revision support, and (5) assessment-oriented instructional support. Individual studies often instantiated multiple roles, reflecting the flexible and overlapping ways GenAI was integrated into computer science education contexts.

The most prevalent role was general learning support and course-level adoption, reported in five studies (Kazanidis & Pellas, 2024; Kosar et al., 2024; Kusper et al., 2025; López-Fernández & Vergaz, 2024; Saúde et al., 2024). In these studies, students used GenAI tools alongside coursework to assist with studying, problem-solving, or task completion. GenAI functioned primarily as an on-demand support resource rather than a tightly scripted instructional intervention, and learning support was inferred from indicators such as engagement patterns, self-reported use, or course-related performance measures. Two studies also positioned GenAI as programming and debugging assistance (Kosar et al., 2024; López-Fernández & Vergaz, 2024), emphasizing learners' interactions with AI-generated code and their evaluative and corrective actions when reviewing model outputs. Here, learning support was framed in terms of strategic engagement with programming processes, including troubleshooting, interpretation, and refinement, rather than immediate performance gains.

More targeted instructional roles were less frequently examined. One study focused on code comprehension and self-explanation support (Gandhi & Muldner, 2025), in which ChatGPT-generated code-tracing solutions served as artifacts for student annotation and interpretation. Feedback and revision support was examined in two studies (Kosar et al., 2024; Ziqi et al., 2024), where learners engaged with AI-generated feedback to guide revision activity, making learning contingent on evaluative judgment and self-regulation. Finally, two studies examined assessment-oriented instructional support (Gimpel et al., 2025; Lohr et al., 2025), in which GenAI was used to support assessment design, generate course-aligned learning materials, or inform instructional planning.

Assessment practices across studies were heterogeneous and emphasized short-horizon indicators. Measures included course grades or assignment scores, rubric-based evaluations, surveys and questionnaires, qualitative analyses of learner artifacts or behaviors (e.g., annotations, revisions), and expert ratings of AI-generated materials. Taken together, the evidence base operationalized “learning support” primarily through performance proxies, behavioral indicators of engagement, and evaluations of output quality, with limited attention to longitudinal development or transfer beyond the immediate learning context.

RQ2: How do students and academics perceive the integration of GenAI in CSE, and what challenges and future directions are identified?

Across the nine included studies, perceptions of GenAI integration in CSE were examined predominantly through student-facing measures, with only one study explicitly capturing academic perceptions (Gimpel et al., 2025). Student perceptions were measured using instruments such as surveys, questionnaires, interviews, or reflective prompts, while academic perspectives were elicited through an instructor-facing evaluation approach in the assessment-focused study.

Student perceptions were examined in six studies (Kazanidis & Pellas, 2024; Kosar et al., 2024; Kusper et al., 2025; López-Fernández & Vergaz, 2024; Saúde et al., 2024; Ziqi et al., 2024).

Across these studies, students generally perceived GenAI tools as useful and supportive for learning activities such as clarifying concepts, assisting with programming tasks, and supporting revision or task completion. These positive evaluations were consistently accompanied by student-expressed reservations, including concerns about overreliance on AI tools, uncertainty regarding the accuracy of AI-generated outputs, and ambiguity around appropriate boundaries of use. Taken together, student perceptions reflected conditional endorsement rather than unqualified acceptance of GenAI in CSE contexts.

In contrast, the academic-facing perspective reported by Gimpel et al. (2025) treated GenAI primarily as a tool for assessment-oriented instructional support, emphasizing potential efficiency and utility for assessment design and instructional planning. At the same time, this perspective foregrounded pedagogical constraints, including the need to align AI-generated materials with learning objectives and to preserve assessment validity and fairness. Academic perceptions in the dataset are therefore best characterized as pragmatic and cautious, oriented toward conditional adoption under clear design and governance conditions.

Beyond perceptions, the reviewed literature consistently identified challenges associated with GenAI integration in CSE. These challenges clustered around four recurring themes: risks of overreliance and weakened independent problem solving; concerns about the accuracy and trustworthiness of AI-generated outputs; issues related to academic integrity and boundary-setting for appropriate use; and insufficient instructional and institutional guidance to support coherent integration. These concerns underscore persistent tensions between the perceived utility of GenAI and its implications for disciplinary learning and assessment practices.

Correspondingly, future directions emphasized the need for more rigorous empirical research designs that move beyond self-report measures to examine learning processes and outcomes over time. The literature also highlighted the importance of developing clearer pedagogical frameworks and course-level guidance to support critical evaluation, self-regulation, and responsible use of GenAI in CSE contexts, alongside institutional policies that clarify expectations for both students and instructors.

Discussion

The Role of GenAI in Supporting Learning and Skill Development

This review suggests GenAI serves primarily as a learning resource in CSE, not a replacement for instruction. Studies show GenAI integrated into five instructional roles, mainly for general learning support and programming/debugging assistance. Learners use AI tools alongside coursework for clarification, exploration, or feedback, consistent with prior work on iterative and feedback-driven learning processes (Barak & Shachar, 2008; McCormick, 2004; Williams, 2000). Evidence indicates changes in learning processes and engagement, especially in student interaction with problems, feedback, and revisions, rather than broad learning gains.

In studies examining programming and debugging assistance (Kosar et al., 2024; López-Fernández & Vergaz, 2024), GenAI appeared to support iterative engagement with programming tasks, including cycles of code generation, evaluation, debugging, and refinement. Although performance advantages over comparison conditions were not consistently observed, learners' interactions with AI-generated code frequently emphasized explanation-seeking, troubleshooting, and corrective action. From a learning sciences perspective, such behaviors align with productive engagement in structured problem spaces,

where feedback is immediate and solution paths can be articulated stepwise. In programming education, these conditions are especially salient, as novices benefit from rapid feedback that supports planning, monitoring, and adjustment of strategies during task execution. Consistent with prior work, the instructional value of GenAI in these contexts appears to lie in supporting metacognitive processes such as self-monitoring and reflection, particularly when AI outputs are treated as prompts for evaluation rather than as final solutions (Park et al., 2025).

GenAI was also frequently used as a general learning support tool, particularly in course-level adoption scenarios where students consulted AI systems to assist with studying, concept clarification, or task completion. This form of use emphasizes accessibility and immediacy, allowing learners to test ideas and receive responses without waiting for instructor intervention. Prior work similarly shows that students use AI to calibrate comprehension and regulate their learning (Poitras et al., 2024, 2026). However, the instructional value of such support appears contingent on how learners interact with AI outputs. When students engage critically by comparing alternatives, requesting explanations, or justifying revisions, GenAI can function as a resource that supports self-regulated learning processes. Conversely, when outputs are accepted uncritically, the tool becomes a shortcut that may weaken understanding (Park et al., 2025). These findings underscore the importance of instructional framing that positions GenAI as a complement to cognitive work, not a shortcut that bypasses it (Seo et al., 2021).

More targeted instructional roles, including code comprehension and self-explanation support and feedback and revision support, were less frequently examined in CSE but point to additional pathways through which GenAI may contribute to learning. In these configurations, AI-generated artifacts such as code-tracing solutions or feedback served as prompts for interpretation, annotation, and revision, foregrounding learners' evaluative judgment. Such uses align with instructional approaches that emphasize explanation, reflection, and revision as mechanisms for durable skill development (Arega & Hunde, 2025). Nevertheless, across these roles, assessment practices remained largely short-term and task-bound, limiting conclusions about longer-term learning trajectories or transfer.

Finally, assessment-oriented instructional support emerged as an instructor-facing role in which GenAI was used to generate learning materials or support assessment design. While these uses do not directly target student learning processes, they shape the instructional conditions under which learning occurs. The inclusion of this role highlights that GenAI integration in CSE is unfolding simultaneously at the levels of learner activity and instructional infrastructure. Taken together, the early evidence suggests that GenAI's educational value in CSE lies less in automated solution provision and more in how it is embedded within learning activities that preserve planning, evaluation, and revision as central learner responsibilities.

Challenges Related to Critical Thinking, Over-Reliance, and Output Reliability

Across the reviewed literature, the integration of GenAI in CSE was accompanied by recurring concerns about its potential impact on learners' cognitive engagement and disciplinary practices. While students valued GenAI's accessibility and responsiveness, they also expressed unease about over-reliance and the risk that uncritical use could weaken independent problem solving, reasoning, or creativity (Kim et al., 2025; Malik et al., 2023; Smolansky et al., 2023). These concerns highlighted tensions between GenAI's perceived utility and the need to preserve learner responsibility for sense-making and verification (Rusandi et al., 2023; Spector & Ma, 2019).

Concerns related to the reliability and trustworthiness of AI-generated outputs further shaped these perceptions. Students expressed uncertainty about the correctness and completeness of GenAI responses, especially in technical contexts where plausible but flawed outputs can be difficult for novices to detect. As a result, learning support was often framed as contingent on learners' capacity to evaluate, question, and verify AI-generated information. This emphasis on verification aligns with disciplinary expectations in CSE, where errors may propagate if left unchecked (Kohen-Vacs et al., 2025).

Academic integrity is another prominent concern, particularly given the fluency of GenAI outputs and the risk of students inappropriately substituting AI-generated work for their own. Prior work emphasizes explicit disclosure expectations and assessment designs that prioritize learning processes over polished products (Chan, 2023; Chang et al., 2023). Clearer instructional and policy guidance is needed to support transparency and fairness in CSE contexts, where the line between learning support and task completion can blur (Laubscher, 2024). Together, these concerns highlight the challenge of aligning GenAI use with assessment practices that prioritize process, justification, and method over output alone.

Finally, several studies pointed to instructional and institutional uncertainty as a barrier to coherent integration. Students reported ambiguity regarding when and how GenAI use was appropriate, while instructors faced challenges associated with rapidly evolving tools and limited guidance (Chan, 2023; Laubscher, 2024). These findings suggest that many challenges associated with GenAI integration stem not from the technology itself, but from gaps in instructional framing, assessment alignment, and shared understanding of educational purpose.

Implications for Instructional Design and Research

Embedding GenAI use within structured learning sequences can help preserve learners' responsibility for planning, monitoring, and evaluation. This aligns with self-regulated learning principles, in which learners articulate goals, engage strategically with resources, and reflect on outcomes (Chang et al., 2023; Zimmerman, 2000). In programming and problem-solving contexts, GenAI interactions can be organized around routines—for example, prompting learners to plan, request explanations, evaluate outputs, and reflect on revisions. Such designs shift GenAI from answer-generation to a scaffold for inquiry and iterative improvement.

Teaching prompting as a learning strategy rather than a technical skill further supports this orientation. Prompts that emphasize explanation, justification, or self-critique help maintain a focus on reasoning and mitigate the risk of uncritically relying on AI outputs. Prior work therefore emphasizes designing AI-supported activities that foreground reflection, comparison, and evaluative judgment as explicit learning practices (Lin & Chang, 2023; Yusuf et al., 2024). Conceptually, frameworks such as CHAT-ACTS emphasize the learner's role as an active planner and evaluator of AI interactions within self-regulated activity (Ballantyne et al., 2025; Lin & Chang, 2023).

These implications extend to assessment and institutional practice. Method-focused assessment designs that value intermediate artifacts—such as prompt logs, annotations, or revision histories—can help align GenAI use with disciplinary expectations while supporting transparency and integrity. Future research should build on these design principles by examining how instructional framing, assessment alignment, and institutional guidance shape learners' engagement with GenAI over time, moving beyond short-term or self-reported

outcomes to investigate learning processes, transfer, and durability of skill development (Kong & Yang, 2024; Lin et al., 2025; Ruiz-Rojas et al., 2023).

Conclusion and Limitations

This rapid review provides a structured snapshot of how GenAI is currently being integrated into CSE and how such use is understood by learners and educators. The reviewed studies collectively indicate that GenAI is being adopted primarily as a supportive component within existing instructional arrangements, with its educational relevance shaped by how it is framed, constrained, and evaluated. These findings point toward the value of principled integration, in which the use of AI is coupled with requirements for process evidence and reflection so that students remain active agents who plan, monitor, and evaluate their work (Chang et al., 2023; Lin & Chang, 2023). The contribution of this review lies in clarifying emerging patterns of use and concern, and in distinguishing between exploratory adoption and evidence-informed integration in a rapidly evolving research landscape.

The findings must be interpreted in light of several limitations. As a rapid review, the search scope was necessarily limited, and the included studies varied substantially in design, context, and outcome measures (Dobbins, 2017; Tricco et al., 2017). Most evidence relied on short-term or perception-based indicators, with limited attention to longer-term learning, transfer, or instructional decision-making at scale. These constraints underscore the need for future research that examines GenAI-supported learning across extended timescales, considers instructional framing and assessment alignment, and systematically investigates how learners regulate and evaluate AI use. Thus, the present review does not offer prescriptive solutions, but instead delineates a research agenda for future work. Within this space, frameworks grounded in self-regulated learning—such as CHAT-ACTS—can be productively explored and empirically tested.

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

The authors declare that Grammarly was used to support proofreading and language refinement, including correction of grammatical and spelling errors and minor rephrasing to improve clarity. In addition, ChatGPT was used as an AI-assisted tool to support language editing, structural organization, and clarity of expression during manuscript preparation. The use of these tools was limited to assisting with writing quality and organization and did not involve generating original scholarly content. All ideas, research design, data extraction, analysis, interpretation, and conclusions presented in this manuscript are the authors' own and are based on the systematic conduct of the review.

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Comparing ChatGPT and Traditional Online Search for Learning R Programming and RStudio Visualization: A Pilot Study

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Abstract

This pilot study explores the comparative effectiveness of ChatGPT versus Traditional Online Search (TOS) methods in supporting novice second-year undergraduates with no prior R or RStudio experience in completing a data visualization assignment. Participants ($n = 20$) were randomly assigned to two groups ($n = 10$ each) and given approximately 1 hour and 50 minutes across two class periods to load a built-in dataset, explore its structure, and create visualizations using either ChatGPT or TOS. Assignments were graded on code accuracy, use of RStudio features, visualization quality, documentation, and presentation. Post-assignment surveys assessed perceived ease of use, clarity of guidance, engagement, and understanding of R programming and visualization techniques. Preliminary results indicate the ChatGPT group significantly outperformed the TOS group in assignment scores and survey ratings (e.g., higher means in ease of use and understanding), aligning with expected effects of large language models in reducing cognitive load through personalized guidance. Qualitative feedback underscored ChatGPT's interactivity versus TOS's information overload. Distinct from broader meta-analyses, this pilot provides initial classroom-specific insights into AI advantages for short-term programming learning. Implications include hybrid AI-TOS frameworks to address overreliance, but these frameworks have limitations, including a small sample size and no long-term assessment. Future studies should be scaled with controls and pretests.

Keywords: study effectiveness, ChatGPT, artificial intelligence, R programming, R visualization learning

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Introduction

The increasing ubiquity of data-driven decision making across sectors has intensified the demand for graduates proficient in statistical reasoning, programming, and data visualization. Tools such as R and RStudio have become foundational to modern analytics curricula, yet they pose steep learning curves for students encountering coding for the first time. Despite instructors' efforts to scaffold learning, novice programmers frequently seek supplemental guidance through external digital resources.

For decades, Traditional Online Search (TOS) methods—general search engines, forums, blogs, and community Q&A platforms—have served as primary self-directed learning tools. These resources offer breadth and accessibility, but they also require students to navigate heterogeneous content, evaluate credibility, reconcile conflicting explanations, and synthesize fragmented information. The cognitive burden associated with these tasks can impede early learning, particularly for students with limited programming background.

Concurrently, rapid advancements in artificial intelligence have generated new opportunities for personalized, context-aware learning support. Large language models (LLMs) such as ChatGPT are capable of generating tailored explanations, step-by-step debugging guidance, and adaptive examples. Prior research highlights the promise of such tools in reducing cognitive load, promoting engagement, and enabling novices to progress more quickly through early conceptual and syntactic hurdles. Yet valid concerns remain regarding accuracy, potential misinformation, and the risk that students may adopt AI-generated solutions without fully understanding underlying logic.

Against this backdrop, there is a growing need for empirical classroom-based comparisons of AI-driven tools and traditional online research practices. While conceptual discussions of AI in education are increasingly common, there remains limited research directly evaluating the educational impact of ChatGPT relative to TOS tools within authentic instructional settings—particularly in programming domains where detail-oriented error resolution and conceptual clarity are essential.

This study investigates how ChatGPT and TOS tools influence novice learners' performance, perceptions, and learning experiences during R programming and data visualization tasks. By combining quantitative performance metrics with qualitative insights into learners' cognitive strategies and resource interactions, this research provides evidence-based guidance for educators considering the integration of AI-driven tools into analytics curricula. The findings also illuminate pedagogical opportunities and risks associated with LLM-supported instruction in technical domains.

Literature Review

Traditional Online Search as a Learning Resource

For decades, Traditional Online Search (TOS) tools—such as Google, Bing, Yahoo, and legacy engines like AltaVista—have supported self-directed learning across disciplines. These platforms grant students broad access to tutorials, academic articles, coding forums, and videos, facilitating autonomy in navigating unfamiliar concepts (Greenhow et al., 2009; Head & Eisenberg, 2009). In introductory programming contexts, learners frequently turn to TOS methods to locate syntax examples, troubleshoot errors, and explore visualization techniques.

The flexibility and immediacy of these tools make them appealing for resolving targeted questions during homework or laboratory activities.

However, TOS methods also introduce notable challenges. Research shows that novice learners often encounter information overload, inconsistent resource quality, and conflicting explanations (Chen et al., 2020; Yim & Su, 2024). These issues require users to independently evaluate credibility, reconcile contradictory advice, and synthesize fragmented content across multiple sources—tasks that impose substantial extraneous cognitive load. For beginners in R programming, even small inconsistencies across tutorials may hinder progress, slow debugging, and reduce conceptual clarity. The unstructured nature of TOS-mediated learning may also encourage surface-level engagement, where students adopt code samples without fully understanding underlying logic or design principles (Adel & Ahsan, 2024).

While TOS tools remain foundational for open-ended exploration, their limitations become particularly acute in early programming education. As R and RStudio demand precision, unfamiliar syntax, and iterative problem-solving, novice learners may struggle to navigate the breadth of online content effectively, highlighting a need for more adaptive and context-sensitive guidance.

Emergence of AI and Intelligent Tutoring Systems in Education

Artificial intelligence (AI) has gained increasing attention as a means to enhance personalized learning and reduce cognitive barriers in complex subjects. Intelligent Tutoring Systems (ITS) and AI-enhanced instructional platforms have demonstrated the ability to offer real-time feedback, diagnose misconceptions, and support iterative mastery of skills (Chen et al., 2020). In STEM fields, AI-based tools have been shown to guide students through multi-step reasoning tasks, clarify errors, and provide tailored support aligned with learners' individual needs (Yim & Su, 2024). These adaptive systems reduce the burden of navigating disparate resources and allow learners to focus on core conceptual understanding.

The scalability of AI tools further benefits institutions by supporting large student cohorts while freeing educators to focus on higher-order instruction and individualized coaching (Adel & Ahsan, 2024). Despite these advantages, concerns persist regarding data privacy, model transparency, and the risk that AI-guided learning may supplant rather than strengthen critical thinking (Bender et al., 2021). These tensions underscore the need for empirical research clarifying the conditions under which AI enhances, complements, or potentially undermines traditional learning practices.

Large Language Models and the Pedagogical Role of ChatGPT

Large language models (LLMs), such as GPT-3 and GPT-4, represent a major evolution in AI capabilities. Trained on massive corpora of text, these models generate contextually relevant and syntactically coherent responses, enabling applications ranging from writing assistance to real-time conversational tutoring (Bommasani et al., 2021; Brown et al., 2020). Their flexibility makes them uniquely suited for novice programmers who require immediate, interpretable, and example-driven explanations.

ChatGPT, one of the most widely adopted LLM tools, provides several affordances relevant to programming education. First, it can explain syntax and functions in plain language, offering scaffolded support for learners encountering R commands, visualization libraries, or data

structures for the first time. Second, ChatGPT can debug code by identifying likely error sources and generating corrected versions or annotated explanations (Rudolph et al., 2023). Third, by leveraging few-shot learning, the model adapts its responses to user-provided context, enabling personalized guidance on assignment-specific tasks.

Early empirical studies suggest that ChatGPT enhances learning efficiency, reduces confusion, and helps students persist through error-prone coding exercises (Dempere et al., 2023). Its conversational format encourages iterative exploration and lowers the barrier to asking clarifying questions—an advantage over traditional search tools where novices may struggle to phrase queries using domain-appropriate terminology. However, LLM reliability remains uneven, and ChatGPT may produce plausible but incorrect outputs. These “hallucinations” pose risks for learners who lack the expertise to validate technical accuracy (Bender et al., 2021).

Thus, while ChatGPT offers transformative instructional potential, its integration into education requires balancing efficiency with safeguards that encourage critical verification.

Cognitive Load Considerations and Technology Acceptance

The effectiveness of both TOS and AI-driven tools can be interpreted through Cognitive Load Theory (Sweller, 1988) and the Technology Acceptance Model (Davis, 1989). According to Cognitive Load Theory, learning improves when extraneous cognitive burdens are minimized. TOS methods often increase such load by requiring learners to reconcile conflicting information and navigate multiple sources. In contrast, ChatGPT reduces extraneous load by providing unified, context-specific guidance, enabling students to allocate cognitive resources toward meaningful learning (Mayer & Moreno, 2003).

The Technology Acceptance Model suggests that perceived usefulness and ease of use are central determinants of whether learners adopt new tools. ChatGPT’s intuitive conversational interface, rapid feedback, and personalized support align strongly with these determinants, potentially increasing student confidence and engagement (Siau & Yang, 2017). Conversely, TOS tools offer autonomy but may frustrate novices who lack experience evaluating complex or inconsistent resources.

Together, these frameworks help explain the observed variance in learner experience between AI-assisted and traditional search-based approaches, and they highlight why empirical evidence is needed to guide educators in selecting and integrating technological tools.

Identified Gaps and Rationale for This Study

Despite a growing body of conceptual literature on AI in education, empirical comparisons between ChatGPT and TOS tools remain limited—especially within authentic classroom environments. Most existing work is anecdotal, small-scale, or focused on generalizable AI capabilities rather than direct performance outcomes in programming assignments (Almasri, 2024; Zawacki-Richter et al., 2019). Furthermore, research rarely examines R programming specifically, despite its importance for data literacy and analytics education.

This study addresses these gaps by providing:

- A controlled comparison of ChatGPT and TOS tools in a real university classroom
- An analysis of both performance outcomes and learner perceptions
- Thematic insights into students' strategies, challenges, and cognitive workload
- Evidence-based implications for curriculum design and AI integration

By synthesizing the strengths of AI support with the realities of novice programming behavior, the study advances ongoing conversations about how LLMs can be responsibly and effectively incorporated into higher education.

Methods

Research Design

This study employed a quasi-experimental, mixed-methods design to compare the effectiveness of ChatGPT and Traditional Online Search (TOS) tools in supporting novice learners' completion of R programming tasks. The design integrates quantitative measures of student performance with qualitative insights into learner experiences, reflecting recommended approaches for evaluating emerging educational technologies in authentic contexts (Adel & Ahsan, 2024; Chen et al., 2020).

A mixed-method framework was chosen for three reasons:

1. performance on programming assignments provides objective evidence of learning outcomes;
2. surveys capture students' perceived ease of use, clarity, engagement, and conceptual understanding; and
3. open-ended reflections reveal cognitive strategies, frustrations, and resource-mediated behaviors not captured in quantitative metrics.

The study spans two consecutive class sessions, each lasting 1 hour and 50 minutes. Both groups completed the same assignment in the same timeframe, ensuring consistent conditions aside from the designated research tool.

Participants and Setting

Participants were 20 second-year undergraduates enrolled in a data analytics course at a four-year institution. None had prior experience with R or RStudio. The sample reflects the university's status as a minority-serving institution, with a large proportion of Hispanic students and a mix of male, female, and non-binary participants.

After providing informed consent, students were randomly assigned to one of two conditions:

- **ChatGPT group (n = 10):** Students used ChatGPT exclusively for all conceptual and troubleshooting queries.
- **TOS group (n = 10):** Students relied solely on traditional online resources such as Google, Bing, Yahoo, and instructional blogs.

Random assignment minimized self-selection bias and facilitated clearer attribution of differences in performance or perceptions to the tool condition (Almasri, 2024).

To ensure compliance, students were instructed to document their information sources—ChatGPT transcripts for the AI group, and URLs for the TOS group. Instructor monitoring further discouraged cross-use of tools during the study period.

Assignment Task

The assignment required students to complete a sequence of foundational R programming tasks designed to evaluate data loading, exploration, visualization, and documentation skills. Students were instructed to:

1. Load a built-in dataset in R.
2. Explore the dataset using functions such as `head()`, `str()`, and `summary()`.
3. Construct multiple visualizations (e.g., scatterplots, bar charts, histograms, boxplots) using base R or `ggplot2`.
4. Save and submit their R scripts and resulting figures.

This assignment structure reflects common early-course expectations in statistics and data analytics education (Wang et al., 2017). The tasks were equally accessible to both groups but required sufficient comprehension and troubleshooting skills to avoid common syntax errors and plotting issues.

Assessment Rubric

Assignments were evaluated prior to reviewing survey responses to maintain objectivity. A rubric scored students across five criteria:

1. **Code accuracy (30%)**—correctness and reliability of R code, including successful execution without errors.
2. **Use of RStudio features (20%)**—effective use of script files, data exploration tools, and relevant packages.
3. **Visualization quality (20%)**—clarity, variety, labeling, and relevance of graphical outputs.
4. **Documentation and explanation (10%)**—use of comments, explanations of steps, and overall clarity.
5. **Overall presentation (10%)**—professionalism, layout, and completeness of submitted materials.

Scores were scaled to 100 points. This rubric aligns with best practices in evaluating introductory programming assignments in higher education.

Data Collection Instruments

Two forms of data were collected.

Surveys

Students completed a post-assignment survey consisting of single-item Likert-scale measures (1 = strongly disagree; 5 = strongly agree) assessing:

- Perceived ease of use
- Clarity of guidance
- Engagement
- Perceived understanding of R programming and visualization

Single-item measures were used for efficiency and are consistent with exploratory educational technology research (Yim & Su, 2024). Students also provided short, open-ended reflections on the strengths, challenges, and desired improvements of the tool they used.

Assignment Submissions

The graded assignments provided the primary quantitative outcome measure. These scores were later used for between-group comparisons and correlation analyses.

Data Analysis Procedures

Quantitative Analysis

Descriptive statistics (means, medians, standard deviations) were computed for both survey items and rubric scores. Since the small sample size ($n = 10$ per group) violated assumptions of normality and homogeneity of variance, Mann-Whitney U tests were used to compare groups across survey metrics. Effect sizes were interpreted using standard thresholds ($Z/(n_1 + n_2)$): small < 0.3 ; medium $0.3\text{--}0.5$; large > 0.5).

Qualitative Analysis

Open-ended responses were analyzed using thematic analysis. A single researcher coded recurring patterns such as:

- Perceived strengths
- Challenges and frustrations
- Cognitive strategies
- Desired improvements

Keyword frequency tables and word cloud visualizations were used to support theme identification. As this was an exploratory classroom study, inter-rater reliability was not computed, consistent with comparable studies (Zawacki-Richter et al., 2019).

Ethical Considerations

All participants provided informed consent. Tool restrictions applied only during the study period and had no bearing on course grades beyond the assignment itself. Data were anonymized and stored securely within institutional data systems. No external funding supported this research.

Results

Descriptive Statistics

Survey responses across the four Likert-scale measures—ease of use, clarity of guidance, engagement, and perceived understanding of R programming and visualization—revealed distinct differences between the ChatGPT and TOS groups. Within each group, response variability was minimal, which reflects both the small sample size ($n = 10$ per group) and the consistency of participants' experiences.

Across all measures, students in the ChatGPT group reported markedly higher scores. Their ratings clustered around the upper end of the scale (primarily 4s and 5s), indicating uniformly positive experiences with the AI-based tool. In contrast, TOS participants recorded substantially lower scores, concentrated between 2 and 3, with few ratings above 4.

These descriptive patterns were visually represented in box plots (Figure 1), which demonstrated a clear separation between groups. Even prior to inferential testing, the visualized distributions suggested significant differences in user experience across the two tool conditions. The results are summarized in Table 1 below.

Table 1

Descriptive Statistics by Tool Group

Metric	Group	Mean	Median	Std. dev.	Range
1. Ease of use	Traditional search	3.3	3	1.42	1–5
	ChatGPT	4.9	5	0.32	4–5
	Δ	+1.6	+2	-1.10	Lesser
2. Clarity of guidance	Traditional search	3.3	3.5	1.57	1–5
	ChatGPT	4.8	5	0.42	4–5
	Δ	+1.5	+1.5	-1.15	Lesser
3. Engagement	Traditional search	3.1	3	1.37	1–5
	ChatGPT	4.9	5	0.32	4–5
	Δ	+1.7	+2	-1.05	Lesser
4. Understanding R	Traditional search	3.0	3	1.05	1–4
	ChatGPT	4.7	5	0.48	4–5
	Δ	+1.7	+2	-0.57	Lesser

Note. Descriptive statistics for the two research groups show that students consistently and significantly reported improved ease of use, clarity of guidance, engagement, and understanding of R programming and RStudio skills using ChatGPT over Traditional Online Search engines. Δ denotes the difference in scores between the two groups.

Inferential Statistics: Mann-Whitney U Tests

To statistically assess differences in survey responses between conditions, Mann-Whitney U tests were conducted for each of the four metrics. Given the limited sample size and non-normal distributions, the U test provided an appropriate non-parametric alternative to independent-samples t-tests.

Across all four metrics, the analyses yielded statistically significant differences at $\alpha = 0.05$, with the ChatGPT group outperforming the TOS group:

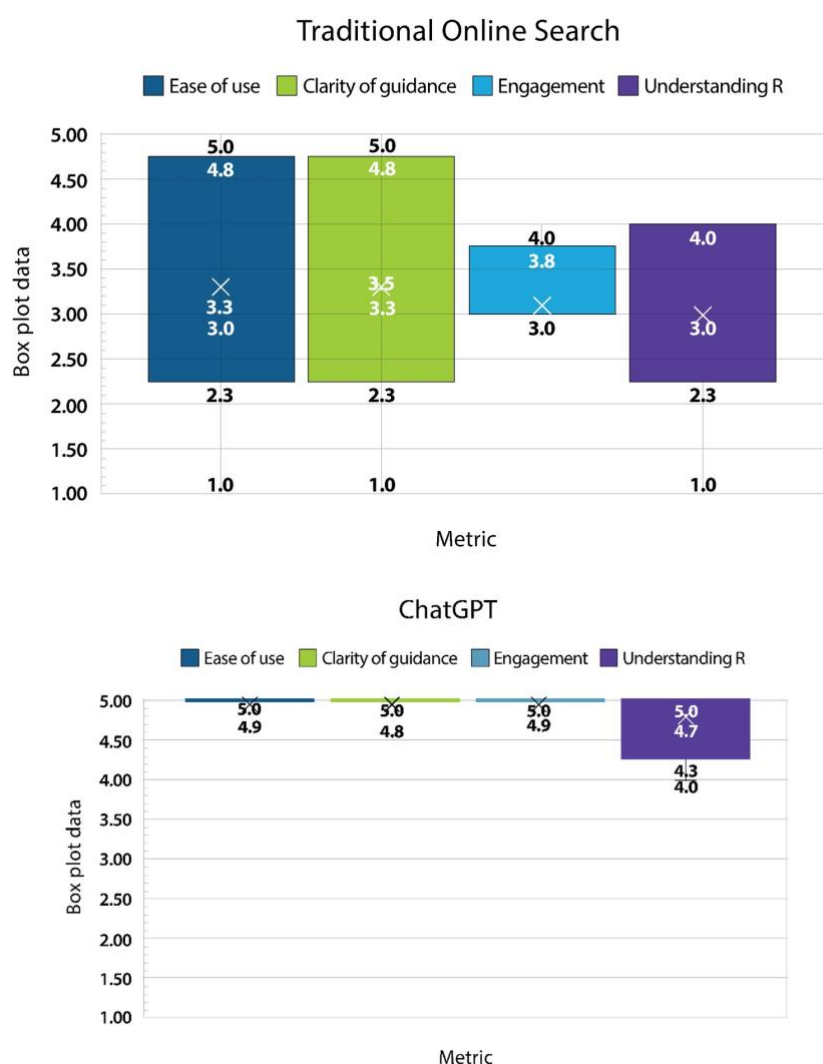
- **Ease of use:** Higher ratings in the ChatGPT group; large effect size
- **Clarity of guidance:** Consistently elevated scores for ChatGPT; large effect size
- **Engagement:** Significantly greater engagement among ChatGPT users
- **Understanding of R programming and visualization:** Robust advantage in favor of ChatGPT

Effect sizes, computed via standardized Z-values, exceeded conventional thresholds for “large” effects. This suggests that the differences between groups were not only statistically significant but educationally meaningful. Table 2 summarizes the corresponding U statistics, p-values, and standardized effect sizes.

Table 2*Mann-Whitney U-Test Parameters by Metric*

Metric	P	U (x1>2ave)	Z	Std. effect size
1. Ease of use	0.54%	17%	-2.78	0.62 (large)
2. Clarity of guidance	1.4%	20%	-2.45	0.55 (large)
3. Engagement	0.15%	12%	-3.18	0.71 (large)
4. Understanding R	0.1%	6%	-3.44	0.77 (large)

Note. Inferential statistics for the two research groups are based on students' respective scores for the different metrics calculated at $\alpha = 0.05$. The p-value shows the probability of a type I error (rejecting a correct null hypothesis), while the U value represents the probability that a random rating from a student from the Traditional Online Search group will exceed the average score from the ChatGPT group. The standardized effect size, $Z/\sqrt{(n1+n2)}$, is considered small when it is <0.3 , medium when $0.3-0.5$, and large when > 0.5 .

Figure 1*Survey Rating Distributions by Tool Group*

Note. Box-and-whisker plots show scores for the four research questions posed to the two groups of students using the data in Table 1. Metrics are distinguished by color; the left chart pertains to Traditional Online Search survey results, and the right chart presents the equivalent for the ChatGPT group using the same scale for both charts. The feedback scores from the ChatGPT group students, even before the statistical analysis, clearly outperform those from the group using traditional online search methods.

Graded Assignment Performance

Assignment scores further supported the superiority of ChatGPT in promoting successful task completion. Across all five rubric criteria—code accuracy, use of RStudio features, visualization quality, documentation, and overall presentation—the ChatGPT group achieved higher mean scores, with tighter variation and fewer errors.

Figure 2 illustrates overall score distributions, demonstrating that ChatGPT users produced more accurate code, cleaner visualizations, and more complete documentation. Figure 3 presents mean scores by rubric category, highlighting consistent performance advantages. The exact values of all scores are shown in Tables 3–4.

Key differences include:

- **Code Accuracy:** ChatGPT users generated correct and efficient code with fewer execution errors, likely due to real-time debugging support.
- **Visualization Quality:** ChatGPT users produced more complete and informative plots, correctly labeled and aligned with the dataset context.
- **Documentation:** Although documentation improved modestly in both groups, ChatGPT users provided clearer explanations of code steps.
- **Presentation:** Submissions from ChatGPT users displayed more consistent structure and formatting.

Assignment results show that the advantages of ChatGPT were not limited to perceived ease or engagement but translated directly into measurable improvements in academic performance.

Table 3

Assignment Score Summary by Tool Group

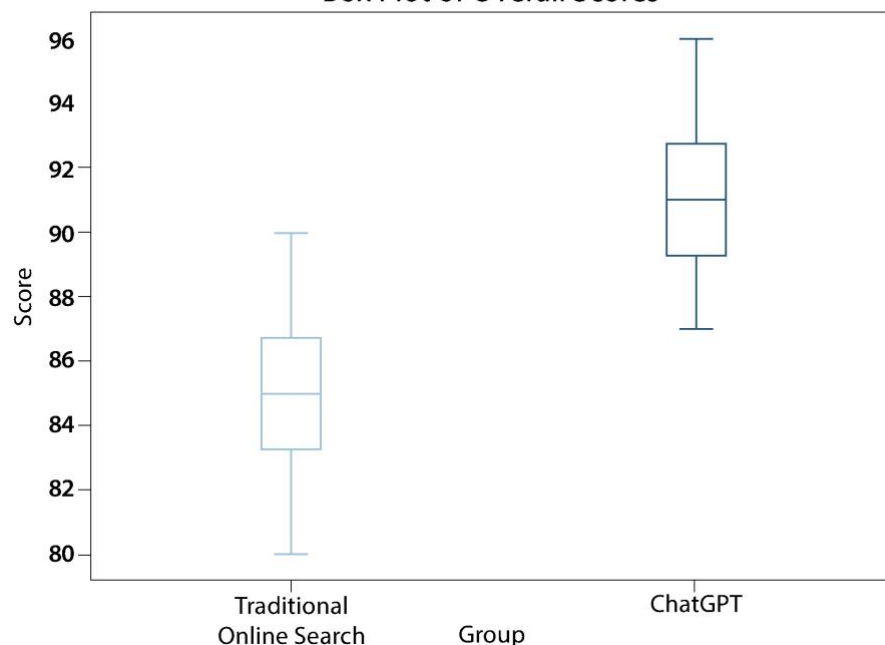
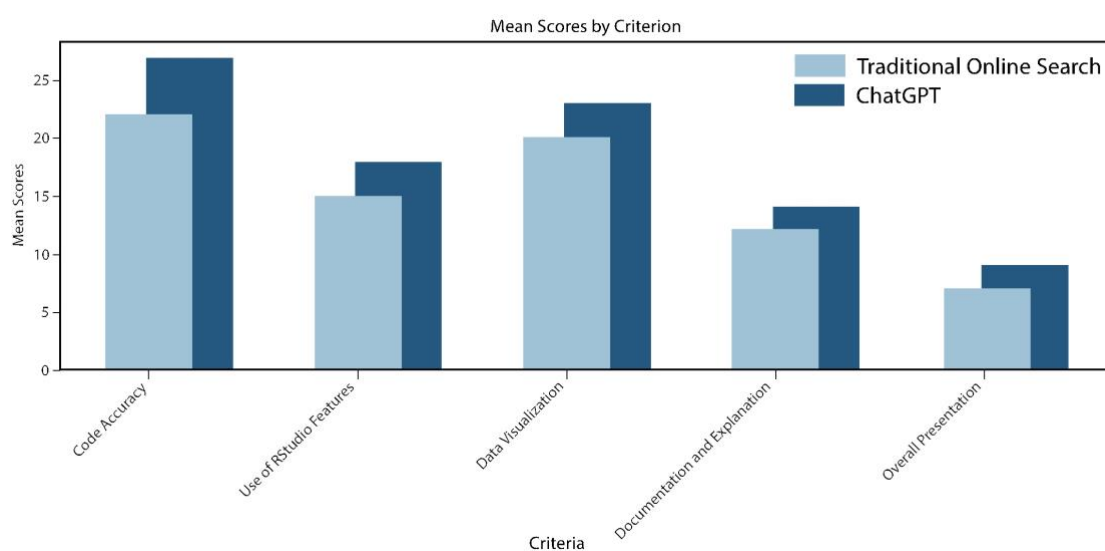
Group	Mean	Median	Std. dev.	Range
Traditional Online Search	85	85	7.58	75–99
ChatGPT	91	91	6.23	76–100
Δ	+6	+6	-1.35	Higher

Table 4

Assignment Grading Criteria and Weight Factors

Criterion	Group	Mean	Median	Std. dev.
Code accuracy (30%)	Traditional Online Search	22	21.5	2.5
	ChatGPT	27	27	1.0
	Δ	+5	+5.5	-1.5
Use of RStudio features (20%)	Traditional Online Search	15	15	1.5
	ChatGPT	18	18	1.0
	Δ	+3	+3	-0.5
Data visualization (20%)	Traditional Online Search	20	19.5	2.0
	ChatGPT	23	23	1.5
	Δ	+3	+4.5	-0.5
Documentation & explanation (10%)	Traditional Online Search	12	12	1.25
	ChatGPT	14	14	0.75
	Δ	+2	+2	-0.5

Criterion	Group	Mean	Median	Std. dev.
Overall presentation (10%)	Traditional Online Search	7	7	1.0
	ChatGPT	9	9	0.5
	Δ	+2	+2	-0.5

Figure 2*Overall Assignment Score Distributions**Box Plot of Overall Scores***Figure 3***Mean Assignment Scores by Criterion*

Correlation Analysis

Correlation matrices were constructed to evaluate relationships between survey metrics (ease of use, clarity, engagement, understanding) and assignment outcomes (code accuracy, feature use, visualization quality, documentation, overall score) within each group.

TOS Group Correlations

In the TOS group, correlations between survey responses and performance metrics were generally moderate and positive, suggesting that students who felt more comfortable and engaged with TOS tools tended to perform slightly better on the assignment. However, the correlations were uneven across categories, reflecting the inconsistent nature of resource quality in traditional search methods. Most notable, we find that:

- Ease of use correlated moderately with code accuracy
- Clarity of guidance correlated with visualization quality
- Engagement showed weak correlations with documentation (consistent with prior findings that documentation skills may be more procedural)

Table 5 presents the correlation coefficients.

Table 5

Correlation Matrix for the Traditional Online Search Group

Metric	Code accuracy	RStudio	Visualization	Documentation	Overall
1. Ease of use	0.45	0.43	0.41	0.40	0.42
2. Clarity of guidance	0.42	0.45	0.43	0.41	0.42
3. Engagement	0.41	0.42	0.44	0.40	0.41
4. Understanding R	0.46	0.44	0.48	0.42	0.45

ChatGPT Group Correlations

In contrast, correlations within the ChatGPT group were uniformly strong and positive. Students who rated ChatGPT highly on any survey dimension almost universally produced stronger assignment performances across all rubric criteria. These strong correlations likely resulted from:

- Highly consistent user experiences with ChatGPT
- Stronger alignment between perceived clarity and actual task success
- Reduced variability in both survey and performance metrics

The correlation matrix for the ChatGPT is shown in Table 6 below.

Table 6

Correlation Matrix for the ChatGPT Group

Metric	Code accuracy	RStudio	Visualization	Documentation	Overall
1. Ease of use	0.82	0.81	0.80	0.79	0.81
2. Clarity of guidance	0.81	0.83	0.82	0.80	0.82
3. Engagement	0.80	0.81	0.82	0.79	0.80
4. Understanding R	0.83	0.82	0.84	0.81	0.83

Interpretation Across Groups

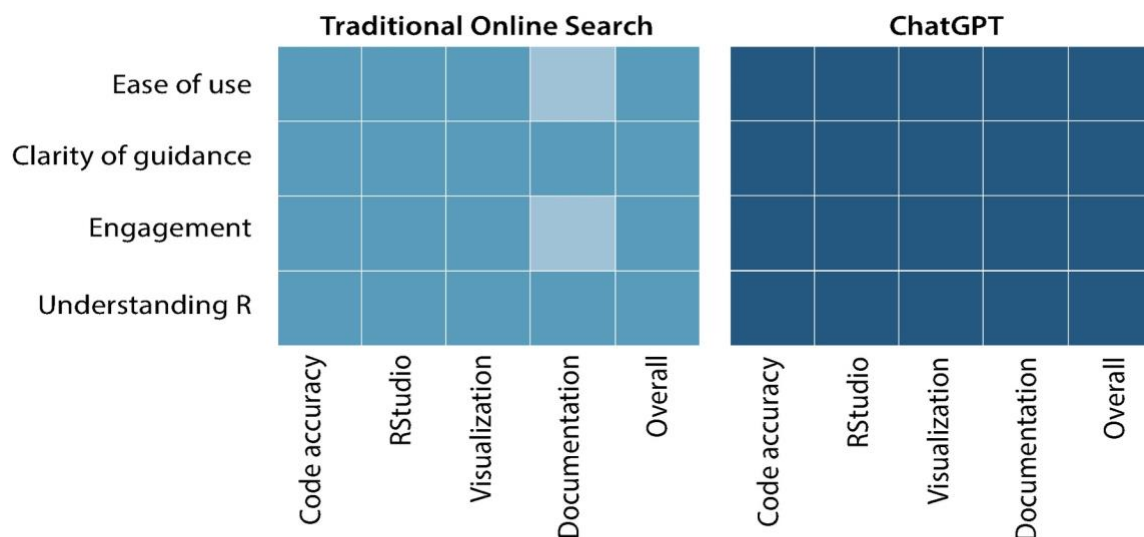
Comparing the two matrices reveals that:

- Positive associations exist in both groups
- Correlations are substantially stronger and more homogeneous for ChatGPT
- Higher clarity and ease of use translate more directly into improved programming outcomes with AI-based support

This finding underscores ChatGPT’s potential not only to enhance subjective user satisfaction but also to directly support objective skill development—at least in short-term, assignment-based tasks. Figure 4 vividly illustrates the considerable overall correlation strengths between the two groups by way of a heat map.

Figure 4

Correlation Coefficient Heat Map by Tool Group



NEGATIVE				POSITIVE		
Strong	Moderate	Slight	Negligible	Slight	Moderate	Strong
$[-1.0, 0.7)$	$[0.7, -0.4)$	$[-0.4, 0.1)$	$[-0.1, 0.1]$	$(0.1, 0.4]$	$(0.4, 0.7]$	$(0.7, 1.0]$

Qualitative Analysis of Open-Ended Feedback

To deepen the analysis, students’ written reflections were coded thematically. Distinct patterns emerged between the two groups.

Themes in ChatGPT Feedback

ChatGPT users frequently highlighted:

- Immediate assistance (e.g., rapid explanations, instant debugging)
- Clarity and step-by-step reasoning
- Reduced cognitive load when troubleshooting errors
- Higher confidence in their final submissions

Representative comment: “When I made an error, I pasted the code into ChatGPT and it showed me exactly how to fix it. I usually get stuck and wait for help, but ChatGPT solved issues instantly.”

Themes in TOS Feedback

TOS users expressed challenges such as:

- Information overload
- Difficulty filtering credible sources
- Conflicting explanations
- Slow and frustrating error resolution
- Reliance on trial-and-error copying from websites

Representative comment: “Search results were overwhelming and often contradicted each other. I could not find a resource that helped me fix my graph the way I wanted.”

Suggested Improvements

Students in both groups requested:

- More visualization examples
- Clearer instructions or more guided scaffolding
- Better integration between class instruction and outside tools

Figure 7 illustrates the frequency of improvement-related themes.

These qualitative patterns reinforce the quantitative findings, demonstrating that ChatGPT reduces frustration and increases comprehension, while TOS approaches create substantial cognitive overhead for novice learners.

Summary of Findings

Across all quantitative and qualitative measures, the ChatGPT group exhibited superior outcomes:

- Higher assignment scores across every rubric category
- Significantly better survey ratings
- Stronger correlations between perceived support and performance
- More positive reflections and fewer reported challenges

These results point to ChatGPT’s capacity to enhance short-term learning and performance in R programming tasks, provided students engage with the tool critically and thoughtfully.

In Table 7 we provide keyword search tabulation by frequency among the two groups, noting significantly more positive correlations among the ChatGPT users vs. the TOS ones, and vice versa for the keywords we affiliate with negative feedback. Table 8 shows similar results when we tabulate the keywords and frequency by theme. Figures 5–7 provide a visualization of the keyword and theme results.

Table 7*Theme Frequency Keywords by Research Group*

Metric	Frequency TOS	Frequency ChatGPT	Δ
Positive attributes			
Error resolution	2	8	+6
Coding assistance	3	7	+4
Efficiency	4	6	+2
Engagement	3	8	+5
Detailed instructions	2	9	+7
Specific questions	2	7	+5
Complexity of questions	3	6	+3
Code accuracy	4	5	+1
Understanding responses	2	4	+2
Limitations of ChatGPT	0	3	+3
Minor errors	1	2	+1
Simplifying language	0	5	+5
Enhanced interaction	0	4	+4
Visual and format improvements	0	3	+3
Real-life application	2	2	0
Negative attributes			
Overwhelming information	7	0	-7
Lack of guidance	8	0	-8
Time-consuming	7	0	-7
Variability in quality	6	0	-6

Note. Theme frequency keywords use student feedback from the two research groups; Δ denotes the difference in keyword frequency between the ChatGPT and TOS group participants.

Table 8*Keyword Frequency by Category and Theme*

Category / Theme	TOS	ChatGPT	Δ
1. Most helpful aspects			
a. Immediate problem resolution	3	8	+5
b. Quality of explanations	4	7	+3
c. Code assistance	5	8	+3
d. Interactive learning	2	6	+4
e. Resource accessibility	5	5	0
2. Challenges encountered			
a. Time to find solutions	7	3	-4
b. Understanding responses	6	4	-2
c. Information overload	7	2	-5
d. Query formulation	6	5	-1
e. Technical issues	5	3	-2
3. Suggested improvements			
a. Enhanced visualization	4	6	+2
b. Better examples	6	5	-2
c. Clearer instructions	7	4	-3
d. More context aware	3	5	+2
e. Resource organization	7	2	-5

Note. Keywords are tabulated by frequency of mention between the two student groups and sorted by general category and themes within each category.

Figure 5
Most Helpful Aspects by Feedback Frequency

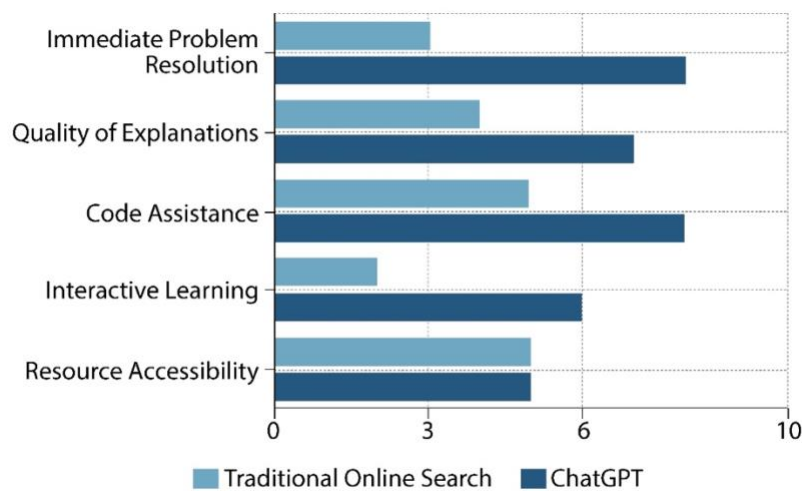


Figure 6
Challenges Encountered by Feedback Frequency

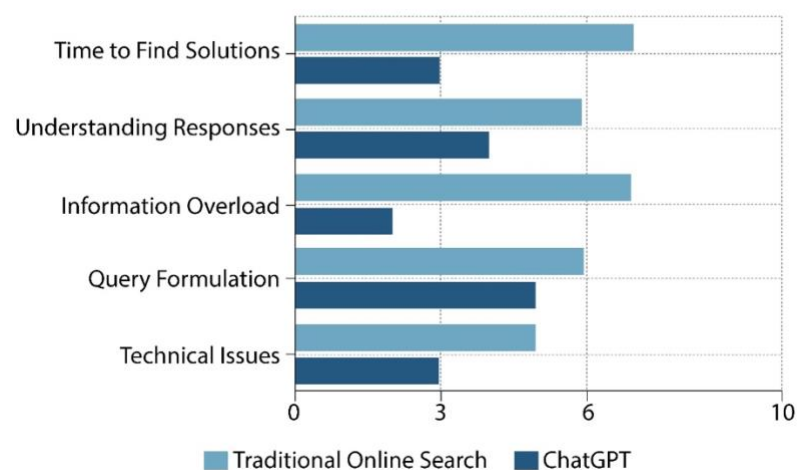
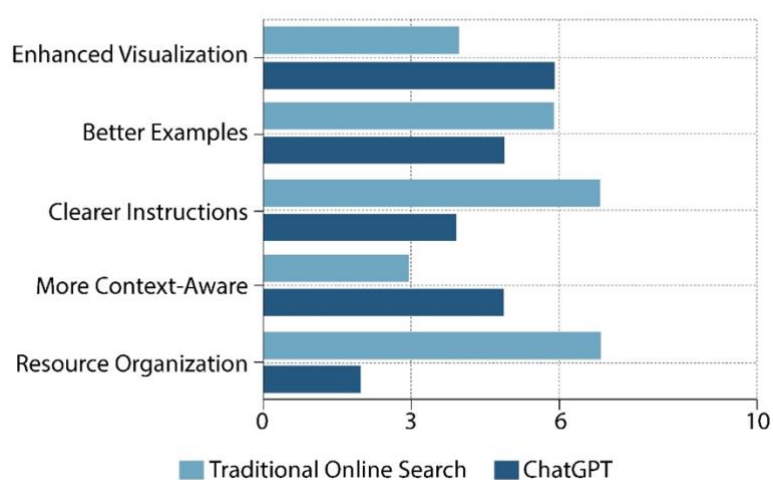


Figure 7
Suggested Improvements by Feedback Frequency



Discussion

The findings of this study provide clear and compelling evidence that ChatGPT offers significant short-term advantages over Traditional Online Search (TOS) methods for novice learners completing R programming and visualization tasks. Across all performance metrics and survey measures, students using ChatGPT demonstrated markedly higher proficiency and more positive learning experiences. These results contribute to ongoing discussions regarding the role of AI-driven tools in higher education by clarifying not only their potential benefits but also the pedagogical risks and design considerations required for responsible integration.

Interpretations of Quantitative Findings

The substantial performance gap between ChatGPT and TOS users is noteworthy. ChatGPT's superiority across every rubric category—from code accuracy to visualization quality and documentation—suggests that LLM-assisted learning meaningfully accelerates early-stage programming success. This aligns with prior research indicating that AI tutoring systems can streamline error resolution, reduce cognitive load, and support learners at precisely the points where they struggle most (Chen et al., 2020; Dempere et al., 2023).

Survey results further reinforce this interpretation. ChatGPT users consistently reported greater ease of use, clearer guidance, higher engagement, and stronger perceived understanding. These perceptions were not merely subjective; they correlated strongly with objective assignment scores. The homogeneity and strength of correlations within the ChatGPT group indicate that learners' experiences with the AI tool translated directly into improved output, suggesting a highly aligned relationship between instructional support and performance outcomes.

In contrast, TOS users faced predictable barriers such as information overload, inconsistent resource quality, and difficulty identifying reliable or context-appropriate solutions. These challenges have been widely documented in the literature on digital search habits (Purcell et al., 2012; Yim & Su, 2024), especially among novice programmers lacking the domain expertise needed to filter or evaluate online content efficiently.

Pedagogical Advantages of ChatGPT

Several features of ChatGPT likely contributed to its effectiveness in this study:

- 1. Context-Sensitive Debugging**
Students using ChatGPT could paste problematic code directly into the interface and receive specific, actionable corrections. This bypasses the trial-and-error process common in forum-based troubleshooting.
- 2. Reduction of Extraneous Cognitive Load**
By providing unified, coherent explanations, ChatGPT removes the need to reconcile fragmented or conflicting sources, aligning with Cognitive Load Theory's emphasis on reducing extraneous demands (Sweller, 1988).
- 3. Enhanced Engagement**
The conversational interface encouraged iterative refinement of code and deeper questioning, resulting in stronger task persistence.
- 4. Scaffolding of Conceptual Understanding**
ChatGPT generated step-by-step reasoning, analogies, and tailored examples that helped novices grasp foundational R concepts.

Taken together, these features suggest that LLM-based tools may function as highly accessible, on-demand tutors for early-stage programming learners.

Risks and Limitations of AI-Assisted Learning

Despite its clear advantages, the use of ChatGPT also presents risks requiring careful pedagogical mitigation.

Overreliance on AI-Generated Solutions

Qualitative data revealed that several students worried about relying too heavily on ChatGPT, particularly when the tool produced complete code blocks. While these solutions accelerated task completion, students questioned whether they fully understood the underlying logic. This aligns with existing literature cautioning that AI tools may inadvertently promote superficial learning if students fail to verify or contextualize model outputs (Adel & Ahsan, 2024; Bender et al., 2021).

Potential for Inaccurate or Overconfident Outputs

Although less commonly reported in this study, LLM responses can at times be incorrect or misleading—especially in technical contexts where subtle errors may go unnoticed. Beginners may lack the expertise to evaluate correctness, reinforcing the need for instructor guidance and explicit verification strategies.

Shifts in Student Learning Strategies

TOS users tended to synthesize information across multiple sources, building transferable search and evaluation skills. ChatGPT users, by contrast, often relied on immediate answers rather than deeper exploration. While this increased efficiency, it may limit opportunities to develop metacognitive strategies traditionally cultivated through research-based problem-solving.

Implications for Instructional Design

The results suggest several instructional strategies that can optimize AI integration while maintaining academic integrity and conceptual mastery:

- 1. Structured Verification Tasks**
Assignments can require students to annotate AI-generated code, explaining each line and justifying modifications to ensure deeper processing.
- 2. Balanced Tool Ecosystems**
Educators may combine ChatGPT with curated TOS resources, encouraging students to cross-reference explanations and compare reasoning patterns.
- 3. AI Usage Guidelines**
Clear expectations regarding permissible use of AI tools—especially in graded assignments—can help maintain fairness and promote thoughtful engagement.
- 4. Instructor-Led Demonstrations**
Modeling how to critique AI outputs can help students develop essential evaluative skills, reducing passive adoption of generated solutions.

5. Designing Assessments That Emphasize Reasoning

Tasks requiring interpretation, annotation, or modification of code may reduce the risk of overreliance on generated solutions.

These strategies align with broader recommendations for integrating emerging technologies into STEM curricula while maintaining rigorous learning standards (Yim & Su, 2024).

Integration With Broader Literature

The superiority of ChatGPT in this study mirrors trends observed across AI-in-education research indicating that LLMs can accelerate novice learning and enhance student engagement. However, this study extends the existing literature by providing a direct classroom-based comparison with TOS tools, rather than relying on simulated or anecdotal cases. It also focuses specifically on R programming—an area underrepresented in empirical AI studies despite its importance for data literacy.

Moreover, the findings provide nuance to existing work by showing that the instructional benefits of AI do not eliminate the need for careful scaffolding. While ChatGPT excels at providing clarity and reducing cognitive barriers, it must be paired with pedagogical structures that promote reflection, verification, and the development of independent programming skills.

Overall Interpretation

Taken together, the results indicate that ChatGPT is a highly effective support tool for novice R programmers, improving both perceived and actual performance. However, the tool's strength—providing efficient, high-quality solutions—also constitutes a primary pedagogical risk if it leads to overreliance or insufficient conceptual engagement. The challenge for educators is thus not whether to incorporate AI tools, but how to design instructional environments where such tools enhance rather than undermine learning.

Limitations

Several limitations constrain the generalizability and scope of the present study. First, the sample size was small ($n = 20$) and drawn from a single minority-serving institution. While this context provides valuable insights into the experiences of a diverse undergraduate population, the limited sample restricts statistical power and may not represent broader learner demographics or institutional types.

Second, the study measured only short-term learning outcomes—specifically, performance on a single R programming assignment conducted over two class sessions. Longer-term impacts such as knowledge retention, transfer of learning, or sustained changes in study behavior were not assessed. Because AI tools may reduce cognitive load, they could either accelerate early learning or inhibit deeper conceptual engagement; this study cannot adjudicate between these possibilities over extended timeframes.

Third, ChatGPT users may have benefited from the novelty effect associated with emerging technologies. Enthusiasm or curiosity about AI-based tools may temporarily elevate engagement and perceived ease of use, inflating survey scores relative to TOS methods.

Fourth, the reliability of ChatGPT responses was not independently verified for every student interaction. Although no major inaccuracies were reported in this study, large language models are known to occasionally produce incorrect or overly confident outputs. Novice learners, who often lack the expertise to identify subtle errors, may be particularly susceptible to adopting incorrect solutions without sufficient verification.

Finally, qualitative data were coded by a single researcher, which limits intercoder reliability. While the thematic patterns aligned well with quantitative findings, future studies should incorporate multiple coders to strengthen validity.

Taken together, these limitations highlight the need for additional large-scale, multi-institutional, and longitudinal research to more fully evaluate the educational role of ChatGPT and related AI tools.

Future Research

The findings from this exploratory study highlight several opportunities for continued investigation into the role of AI-driven tools in programming education. First, future research should employ larger and more diverse samples across multiple institutions to enhance the generalizability of results and to examine whether student demographics, academic preparedness, or technological familiarity shape the effectiveness of ChatGPT relative to TOS methods.

Second, longitudinal studies are needed to assess the persistence of learning gains associated with AI-assisted instruction. While ChatGPT significantly improved short-term performance, it remains unclear whether such support promotes long-term conceptual understanding, skill retention, or independent problem-solving. Tracking students throughout a semester—or across multiple courses—would provide insight into whether early reliance on AI strengthens or diminishes deeper learning.

Third, future studies should compare multiple AI tools, including specialized coding assistants or domain-specific models, to determine whether certain systems are particularly effective for R programming or data visualization tasks. Comparative analyses could help clarify which features (e.g., debugging precision, example generation, scaffolding) most strongly influence novice success.

Fourth, researchers should explore how instructional design shapes AI-mediated learning. Experiments incorporating structured reflection prompts, code-explanation tasks, or verification checkpoints could illuminate how pedagogical scaffolding might mitigate risks of overreliance. Conversely, studies examining open-ended or self-directed tasks may reveal how students naturally adapt AI tools to their learning strategies.

Finally, future work should examine ethical and academic integrity considerations, including students' perceptions of acceptable AI use, the impact of AI on assessment design, and the development of guidelines that balance innovation with fairness. As AI tools become increasingly embedded in educational ecosystems, such research is essential for establishing responsible and equitable practices.

Conclusion

This study provides empirical evidence that ChatGPT offers substantial advantages over Traditional Online Search methods for novice learners completing R programming and visualization tasks. Students who relied on ChatGPT not only achieved higher performance across every rubric category—code accuracy, visualization quality, documentation, and overall presentation—but also reported significantly greater ease of use, clarity, engagement, and perceived understanding. These findings reinforce emerging research indicating that large language models can serve as powerful scaffolding tools, helping students navigate early conceptual and syntactic hurdles while reducing cognitive load.

At the same time, the results highlight important pedagogical considerations. While ChatGPT efficiently guides learners toward correct solutions, its effectiveness may inadvertently encourage overreliance or passive code adoption if not balanced with opportunities for verification and deeper reflection. Traditional Online Search methods, though less efficient for beginners, promote resource evaluation and synthesis skills that remain valuable for long-term development as independent programmers.

The challenge for educators is therefore one of intentional integration. AI tools such as ChatGPT should not replace foundational instruction or critical inquiry but rather complement them, functioning as accessible, on-demand tutors that support rather than supplant learning. With appropriate scaffolding—such as requiring students to annotate AI-generated code, compare outputs with traditional resources, or justify their reasoning—AI-driven assistance can significantly enhance both the efficiency and quality of early programming education.

As the educational landscape continues to evolve in response to rapid advances in artificial intelligence, this study contributes timely insights into how AI tools can be used responsibly and effectively. By demonstrating the short-term benefits and outlining the structural supports needed to mitigate potential risks, the findings offer a foundation for educators, researchers, and institutions seeking to thoughtfully integrate AI within analytics and computing curricula.

Author's Note

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request. The data is located in controlled access data storage at the School of Business and Computing, Modesto Junior College, 435 College Avenue, Modesto, CA 95350, USA and University of the Pacific, Eberhardt School of Business, 3601 Pacific Avenue, Stockton CA 95211.

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Autonomous Learning Enhanced by Digital Pedagogy: Final Year Pre-service Teachers' Perceptions

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The Washington DC Conference on Education 2026
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Abstract

Educators should harness the full potential of digital pedagogy to produce autonomous learners fit for the 21st century demands. Therefore, it is fundamental to assess digital competencies of pre-service teachers because they should be empowered to teach and produce a 21st century learner who is autonomous, intrinsically motivated, one who is a lifelong learner. A qualitative approach was utilised with semi-structured interviews to collect data from eighty (8) final year pre-service teachers at a University of Technology in South Africa. Participants were purposively selected to include four pre-service teachers training to teach in primary schools (BEd GET) and four pre-service teachers training to teach in secondary schools (BEd FET). Technological Pedagogical Content Knowledge (TPACK) framework was employed to assess pre-service teachers' digital technological competences. TPACK constructs were used to formulate interview questions. For robust, rigor and replicability of results data was coded, and themes were developed using thematic analysis. It was found out that pre-service teachers possess good technological knowledge but lack pedagogical knowledge to promote autonomous learning. It is recommended that Initial Teacher Education (ITE) should integrate digital pedagogy into their programmes and prepare the 21st century teachers with appropriate digital strategies to produce autonomous learners. Education as a vehicle for personal development and self-actualisation should provide tools that equip learners with autonomous learning. Autonomous learning does not only improve education results but also influences future career development.

Keywords: digital pedagogy, autonomy, learner, pre-service teachers, perceptions

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Introduction

Digital technologies are rapidly influencing all the sectors of the economy and education is no exception. In terms of education digital technologies have altered the pedagogical strategies gradually replacing the traditional ways of teaching. Several researchers have agreed that technological advancement is revolutionising education by encouraging autonomous learning (Panagou et al., 2025).

Initial teacher education plays a fundamental role in developing pre-service teachers' technological pedagogical expertise (Weisberg & Dawson, 2023). Teachers' digital competence is a vital research area because teachers play a key role in influencing future career development. While other studies focused on, leveraging technology in teaching, learning as well as technology's roles in education and society this research focused on how autonomous learning can be enhanced by digital pedagogy. The perceptions of pre-service teachers are also paramount to this research. Research has found that integrating digital technologies in teaching and learning significantly improves learning outcomes (Juan & Nagappan, 2025; Pratiwi & Waluyo, 2023). There is no single sector of the economy which is not positively affected by technological advancement. Investigating if pre-service teachers are competent to use digital pedagogy is relevant and aligns with current priorities in teacher education. Currently the aim of education should be to produce an autonomous learner, intrinsically motivated, one who is a lifelong learner (Hassan et al., 2020).

Like the constructivism collaborative epistemology's ideological philosophy digital pedagogy aims to produce autonomous learners (Mohammed & Kinyo, 2020). The apex in the acquisition of knowledge is dependent on the ability of the teacher to impact that knowledge using the type of pedagogy that excites learners. Digital pedagogy is believed to have the capabilities of exciting and promoting autonomous learners. Learner autonomy as defined by Sinclair (2008) can mean a learner who is intrinsically motivated and learns outside the classroom alone without any support from the teacher or the parent. Learner autonomy develops in the learning process which is stimulated by digital pedagogical strategies (Hafner & Miller, 2011). Digital pedagogy shifts the responsibility for learning onto learners which motivates them to take ownership of their learning. The teacher provides a learning space that enables learners to exercise their capacity for autonomous. Teaching has been made a bit simpler and enjoyable using digital tools. Research has demonstrated that technology as a pedagogical tool enables educators to produce learner-autonomy.

The development of open and collaborative web technologies contributed immensely towards the emergence of digital pedagogy. Waddell and Clariza (2018) postulate that digital pedagogy has become a method of empowerment whereby learners are motivated and encouraged to explore the learning space at their own capabilities. In the same rational digital pedagogy makes a significant contribution to participation and civic engagement through critical digital literacy (Istrate, 2022; Polizzi, 2022).

Digital pedagogy has made teaching an ideal composition of both art and science (Dhakal, 2022). Currently the art and the science of teaching involve the interplay between educators and machines. This interplay between educators and machines provides opportunities for learners to be creative, independent and autonomous. The fostering of autonomy skills enables learners to be aware of their learning needs and make decisions which are aligned to their learning goals. In terms of definition educationalists and linguists haven't reached consensus as to what autonomy really is. However, earlier researchers like Crome et al. (2009) defined

autonomous learning as the capacity to think for oneself as an acquired habit. Autonomous learning is not confined to the classroom settings only it contributes to learners' future careers.

Teaching strategies that promote autonomous learning provides a roadmap for innovation in the teaching and learning environment (Juan & Nagappan, 2025). Education as a vehicle for personal development and self-actualisation should provide tools that equip students with autonomous learning. Autonomous learning does not only improve education results but also produces learners who actively apply learning tasks and knowledge to the real world (Zhou et al., 2024). Autonomous learning promotes self-directed learning thereby improving learning outcomes (Slimi, 2020). Furthermore, digital pedagogy motivates learners to explore new content as well as enabling learners to be accountable for their own learning (Romanyshyn & Freiuk, 2024).

Digital Pedagogy

The study made use of the Technological Pedagogical Content Knowledge (TPACK) to critically evaluate the digital competences of pre-service teachers to promote autonomous learning at a University of Technology in South Africa. Croxal (2012) defines digital pedagogy as the use of electronic elements to enhance or change the experience of teaching strategies. While Howell (2013) refers to digital pedagogy as a study of how to use digital technologies to effect teaching and learning. Recent researchers define digital pedagogy as the pedagogical use of digital technologies (Shaikh, 2026; Väättäjä & Ruokamo, 2021). Digital pedagogy can also entail the pedagogical orientation which depends on curriculum goals (Väättäjä & Ruokamo, 2021). In terms of epistemological considerations digital pedagogy is a pedagogy of digitalisation of education (Istrate, 2022). Digital pedagogy has changed the landscape of education in many ways one of them is the enhancement of learner's understanding of the content being taught the same way the constructivist views deep learning. As constructivism point digital pedagogy encourages learner-centeredness, virtual facilities and asynchronous lessons (Istrate, 2022). In this vein digital pedagogy is that part of pedagogy that encompasses the design, implementation of the components of digital technologies and the utilisation of learning management platforms and tools.

The principal emphasis of digital pedagogy is on promoting motivated learners, learners who are autonomous. Teachers on the other hand gradually break away from the traditional teacher-centred teaching strategies. Masood and Haque (2021), as well as Agus (2026), also applause digital pedagogy by taking it as an ideal teaching strategy that gives students an open access to deconstruct, elaborate and critique information. In support, Shaikh (2026) maintains that digital pedagogy if used accurately can act as an efficient mechanism in promoting critical and analytical thinking of the students. The central focus is on how learners construct their own knowledge (Milton & Vozzo, 2013). Initial teacher education should pay attention to these new digital pedagogy practices and redesign their curriculum to meet these changes. The teaching approach should be aligned with the learning styles of the digital learner. Hence the subject matter must be delivered properly by using information technology (Absari et al., 2020; Juan & Nagappan, 2025). Pre-service educators must therefore be equipped with both subject knowledge and digital skills to promote learner autonomy.

Autonomous learning mechanisms in education involve learner initiatives and self-management skills (Juan & Nagappan, 2025). In a separate line of research Butler et al. (2017) also found out that digital technologies support students' collaboration, problem solving, and knowledge -construction. This study is significant because it establishes the exposure of the

pre-service teachers to digital pedagogy in the cultivation of autonomous learning. The study also informs Initial Teacher Education (ITE) on how to equip pre-service teachers with digital pedagogical tools which are aligned to autonomous learning.

Digital Pedagogy and Initial Teacher Education (ITE)

It is imperative that the Initial Teacher Education should empower pre-service teachers with relevant pedagogical skills. This is critical because digital tools are now the norm in teaching and learning. Teacher Education should be intentional in equipping student teachers with digital competences that enable them to produce autonomous learners. In agreement Sheikh and Nath (2026) argue that the fast-evolving digital technologies have significantly reshaped the education system coercing teachers to learn specific digital skills necessary for steering modern classrooms with greater agility. This is in accordance with the 21 st century learner who learns better with the aid of educational machines and digital tools.

Pre-service teachers lack required digital competencies, and this has been documented in several research publications (Dolezal et al., 2025; Sheikh & Nath, 2026). Teacher education should integrate digital literacy into their programmes. To make this a success a digital competence framework for educators should be developed. This was also proposed by Caena and Redecker (2019) who stressed the importance of a digital framework by pointing out that it is of paramount importance to align teacher competences to 21 st century teaching needs and challenges. Caena and Redecker (2019) recommend the use of the European Framework for the Digital Competence of Educators (DigCompEdu).

The European Framework for the Digital Competence of Educators can serve several purposes at different stages in Initial Teacher Education in promoting autonomous learners. The framework will not support teachers only but higher education institutions in terms of professional development. This empowerment can pave a way for institutional collaboration and the establishment of professional learning hubs. Initial Teacher Education should rethink the way they are preparing pre-service for digital classrooms. The integration of digital pedagogy in education is a significant trend that requires equipping pre-service teachers with new emerging digital pedagogies (Caena & Redecker, 2019). The new digital pedagogies stimulate new ways of thinking and improve learning outcomes (Binkley et al., 2011). The framework is needed to empower educators with relevant skills to meet the demands of the modern classrooms (Griffin et al., 2012). This should not be a framework for digital skills only but should be aligned to content and assessment to suit the needs of diverse learners. Additionally, the framework should be context based since national needs are culturally different.

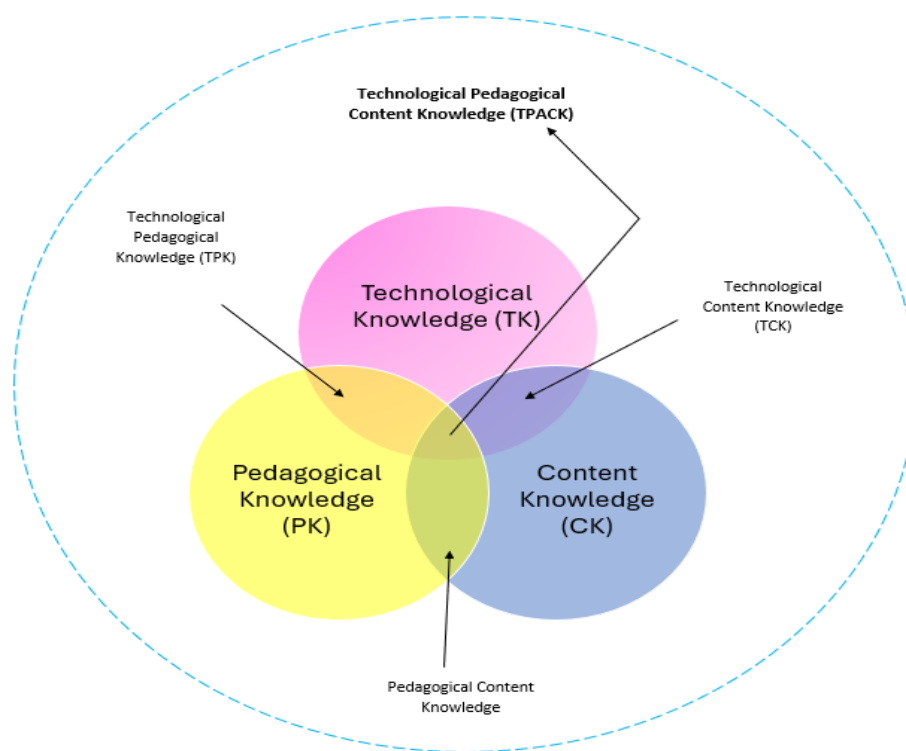
The European Framework for the Digital Competence of Educators (DigCompEdu) has been integrated into training programmes and guidelines in several countries such as Portugal, Spain Saarland in Germany (Caena & Redecker, 2019). South African Teacher Education institutions where this research was conducted should adopt this framework to empower pre-service teachers with digital competences required for the 21 st century teaching and learning environment. The Technological Pedagogical Content Knowledge (TPACK) is the framework which was used to find out if pre-service teachers at a University of Technology in South Africa were equipped with digital pedagogical skills to produce autonomous learners. The following section briefly illustrates the Technological Pedagogical Content Knowledge (TPACK).

Theoretical Framework

Technology is improving the quality of education by providing creative and innovative digital pedagogical tools. It is of critical importance to assess technological competences of both in-service teachers and pre-service teachers. However, this research focuses on pre-service teachers. To assess the digital pedagogical competencies of pre-service teachers the research utilised Technological Pedagogical Content Knowledge (TPACK). TPACK framework was developed by Mishra and Koehler (2006) to assist teachers to effectively integrate technology into teaching and learning. Researchers like Absari et al. (2020) ascertained that TPACK model has gained recognition among educational researchers because the model provides clear guidance on how teachers can use technology to improve the quality of learning. It is critical to assess pre-service teachers using the same instrument. The diagram below depicts the framework as proposed by Mishra and Koehler (2006).

Figure 1

Technological Pedagogical Content Knowledge (TPACK)



Note. Adopted from Punya Mishra and Matthew J. Koehler in (2006)

Currently effective teaching does not only require the understanding of content, what to teach and pedagogy how to teach but also how to integrate technology to enhance content and pedagogy. The 21st century learning environment is viewed as a learning space where, pedagogy, content and technology intersect (Bahtiar et al., 2023). The Technological Pedagogical Content Knowledge (TPACK) framework tries to integrate the three main components of teacher knowledge, content knowledge, pedagogical knowledge and technological knowledge. The intersection of TPACK and autonomous learning brings a valuable insight to teaching and learning. Technological, Pedagogical Content Knowledge (TPACK) is a respected framework for technology integration in education (Deb et al., 2026). TPACK stemmed from the work of Shulman's Pedagogical Content Knowledge (PCK), which was expanded to incorporate technology (Gudmundsdottir & Shulman, 1987, as cited in Deb

et al., 2026). The inclusion of technology gives the framework more credits considering its relevance in this digital world. However, very few studies have aligned the framework with autonomous learning. The combination of autonomous learning and TPACK is commendable because this contributes to deep learning and cultivates the culture of lifelong learning. The research contributes immensely to the body of knowledge by unveiling the importance of digital pedagogy in promoting autonomous learning. TPACK has three components/ constructs which include Technological Pedagogy Knowledge (TPK), Pedagogy Content Knowledge (PCK) and Technology Content Knowledge (TPK). This research focused on Technological Pedagogy Knowledge (TPK). Technological Pedagogy Knowledge interacts with pedagogy and content to enhance learning experiences.

Research questions formulated for this study are as follows:

1. What is autonomous learning?
2. How familiar are you with digital tools that support autonomous learning?
3. How would you integrate digital pedagogical tools to promote autonomous learning?
4. What challenges or barriers do you foresee in using digital pedagogical tools?
5. What assistance do you need to be comfortable with pedagogical digital tools?

Methodology

Participants were selected from the Faculty of Education at a University of Technology in South Africa. A qualitative approach was utilised with semi- structured interviews to collect data from final year students. Participants were purposively selected to include four pre-service teachers training to teach in primary schools (BEd GET) and four pre-service teachers training to teach in secondary schools (BEd FET). Pre-service secondary teachers and pre-service primary school teachers were interviewed to find out if they are both well-equipped to employ digital pedagogy in their teaching with an attempt to promote autonomous learning. Technological Pedagogical Content Knowledge (TPACK) framework was employed to assess pre-service teachers' digital technological competences. The model was found to be appropriate for this study because of its major construct Pedagogy Content Knowledge (PCK), Content Knowledge (CK) and Technological Pedagogy Knowledge (TPK). The framework was used to identify if pre-service teachers are ready to integrate technology in their teaching. TPACK constructs were used to formulate interview questions. Data was analysed using systematic thematic analysis which enabled the research to develop themes and sub-themes. Each participant was assigned a pseudonym to conceal their identity for ethical reasons. Primary pre-service teachers' names were, P1, P2, P3 and P4, the letter P represents primary. Secondary pre-service teachers were S1, S2, S3 and S4, letter S represents secondary.

Data Analysis

Qualitative data were analysed thematically. The researcher started the analysing process with multiple readings of the transcribed interviews. Multiple readings enabled the researcher to be deeply familiar with the narratives of all the eighty participants. The extracted data were coded and categorised into themes according to research questions. The categorisation of data led to the development of 5 themes.

Theme 1: Autonomous Learning

Participants showed a clear understanding of autonomous learning. S4 pointed out that autonomous learning is when learners identify their own educational needs and manage their

time and the learning pace to make meaning of the world. P2 added that autonomous learning is where learners take full responsibility of their learning. Pre-service teachers displayed a general understanding of autonomous learning.

Theme 2: Digital Tools

Pre-service teachers are aware of digital pedagogy tools. P2 gave an example of Kahoot which offers quizzes and enables teachers to create flash cards and practical tests. Most of the participants mentioned tools like, Padlet, ClassPoint and Google Forms. They also pointed out that they haven't used any of the tools. P4 said that they should be taught how to use Socrative to create exercises and educational games. Participant S2 shared that she was not familiar with any digital pedagogical tools. She added that she was still loyal to the use of textbooks and traditional teaching methods. However, she stressed that she was curious to learn more about them and how they can empower self-directed learning.

Theme 3: The Promotion of Autonomous Learning

Most of the participants knew digital pedagogy promotes autonomous learning. P3 explained with excitement that digital pedagogy assists learners on how to tackle difficult concepts. S1 said he would use digital pedagogy in creating lesson plans that focus on learner-centred approaches and activities that can stimulate learners' interest. Participants showed a fair understanding of autonomous learning especially in self-directed learning. P1 shared that the promotion of autonomous learning is essential in empowering learners with critical thinking skills and competitive knowledge, skills needed for the 21st century. Almost all the participants agreed that they should be equipped with digital pedagogy that enhances autonomous learning. They showed a higher level of awareness of the benefits of digital pedagogy as well as autonomous learning.

Theme 4: Challenges of Digital Pedagogy

The main predicament most of the participants pointed out was lack of professional training and poor internet connectivity especially in rural areas. P2 pointed out that in remote areas where most pre-service teachers will be teaching has limited access to digital devices and internet connectivity is also a challenge. They also stressed lack of exposure when it comes to digital pedagogy. Some of the participants blamed lecturers who are not modelling digital pedagogy properly.

However, participants showed willingness to acquire new skills and keep abreast of emerging digital pedagogical skills. Participant S3 pointed out that professional training would refine their technological pedagogical skills and improve learning outcomes. An overview of the responses given by most of the participants showed that they were aware of the challenges but also cognizance of the opportunities presented by the digital pedagogy, aiming to prepare learners for a technological environment and interconnected world.

Theme 5: Professional Assistance Needed

The main concern which stood out was the need for training. P3 stressed that pre-service teachers are willing to learn and implement new ways of teaching if they can be equipped to use such teaching methods. Pre-service teachers need formal training on how to integrate digital tools meaningfully into the curriculum.

Since the research was carried out in the South African context most of the participants said that they needed training in aligning digital tools with CAPs outcomes. The training should be aligned to the South African context. Participants stressed the importance of context as opposed to one-size fits all type of training. Context is critical in South Africa where resources and accessibility vary from region to region and totally different from the Global North. P1 and S3 alluded that student teachers need step-by-step tutorials that are designed for absolute beginners, showing users exactly where to click and what to do without assuming prior knowledge. This would remove the anxiety of exploring unfamiliar interfaces.

Discussion of Results

Participants showed a clear awareness that digital pedagogy can make teaching fun and interesting. This was also pointed out by Dhakal (2022), who is of the opinion that digital pedagogy has made teaching an ideal composition of both art and science. Most of the participants pointed out that they need proper training so that they would use digital pedagogy properly as also pointed out by several researchers (Absari et al., 2020; Avsec & Ferik Savec, 2021; Nagappan, 2025; Shaika, 2026). Pre-service teachers were also aware of digital pedagogical tools that enhances autonomous learning. This aligns well with what several researchers found out. Shaikh (2026) and Masood and Haque (2021) stated that digital pedagogy acts as a powerful tool in promoting critical and analytical thinking of the students. therefore, pre-service teachers should be empowered with technological pedagogy knowledge (TPK).

To make this successful a framework should be developed and be integrated into Teacher Education programmes. The framework should provide teachers with digital teaching competences. The framework will not only assist teachers to identify their strength and weaknesses but it's real power as a catalyst for change is displayed in collective applications (Bashir & Jimmy, 2023; Caena & Redecker, 2019). A framework like this also encourages teachers to be reflective practitioners. The acquisition of this knowledge would give teachers the opportunity to set up learning environment for deep learning experiences that would uncover and boost learner autonomy.

One of the participants S4 pointed out that as student teachers they should be professionally developed through workshops and seminars on how to use digital pedagogical tools properly. S4 is supported by researchers like Fullan and Langworthy (2014) and Shaikh (2026), who postulated that learning partnerships of students and teachers, tapping on their intrinsic motivation and integrating system-change knowledge, pedagogy and technology would catalyse the development of indispensable competences, collaboration and creativity. This would tremendously enhance teachers' technological pedagogy knowledge and teach with the intention of producing autonomous learners (Sheikh & Nath, 2026). This will in turn help learners to take ownership of their learning through ongoing assessment and continuous engagement with digital learning tools. One of the participants also pointed out that they need step- by step kind of training this is also in agreement with Caena and Redecker (2019) who are of the opinion that the digital pedagogical framework should engage its end-users from grassroots level and use professional activities which teachers can relate. This will motivate and encourage pre-service teachers to use digital tools and boost their confidence. This is supported by Dolezal et al. (2025) who said that pre-service teachers need profound professional digital competences to be able to effectively foster learners' digital skills. Moreover, Ros (2024) is of the view point that benchmarks are ideal for best practices. Such strategies will assist Initial Teacher Education to identify and actualise proven technological

teaching practices that amplify digital pedagogy in the classroom and enhance autonomous learning.

Conclusion

This research offers valuable insights for Initial Teacher Education to integrate digital pedagogical tools into the learning programmes. Thematic analysis revealed that pre-service teachers are not adequately prepared to foster digital competences and let alone to promote autonomous learning. Education as a vehicle for personal development and self-actualisation should provide tools that equip learners with autonomous learning. Autonomous learning does not only improve education results but also influences future career development. It is critical for teachers to encourage learners to be independent learners and lifelong learners.

More importantly Initial teacher Education should develop a framework to integrate digital pedagogical skills into the teacher education curriculum and foster digital competences. The European Framework for the Digital Competence of Educators (DigCompEdu) might be relevant to implement since other countries have adopted it and proved to be useful. The focus should not only be on subject content but also on technological pedagogical knowledge which is now an important integral part of teacher education. Pre-service teachers should be equipped with operational skills, ethical awareness, data literacy and the ability to use digital pedagogy effectively. It should be emphasised that taking advantage of the emerging digital technologies in education calls for a change in pedagogical practices, curriculum design and implementation. Additionally, the study highlights the need for context-based frameworks, professional support and inclusive practices.

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Negotiating Gender in Childhood: Insights From Third Graders' Classroom Experiences

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Abstract

Drawing on Butler's (1990) concept of gender as performative, this ethnographic case study examines how traditional gender norms shape classroom interactions and responses to students who demonstrate nontraditional gender behaviors. Conducted in a third-grade classroom, the study focuses on two students, Chris and Tracy, whose behaviors challenged dominant constructions of masculinity and femininity. Data were collected over a five-month period through observations, student work samples, and interviews with students and the teacher. Findings indicate that although both students engaged in gender-nonconforming behaviors, their actions were interpreted through dominant gender expectations. Chris's emotional sensitivity was often framed as immaturity, while Tracy's assertiveness was perceived as bossy and socially undesirable. These responses influenced peer interactions and teacher perceptions, reinforcing traditional gender norms within the classroom. The study highlights the persistence of binary gender expectations and underscores the role of educators in fostering more inclusive environments. Implications suggest that critical literacy and intentional classroom dialogue can support students in recognizing and challenging limiting gender norms.

Keywords: gender norms, classroom interactions, early childhood education, gender identity, critical literacy

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Introduction

Drawing on Butler's (1990) concept of gender as performative, this study examines how gender is not an inherent trait but something constructed and enacted through social interaction. While gender remains a highly visible component of identity, it is often treated as a taken-for-granted binary category in classroom settings. As a result, students and educators may rarely question how these categories are formed and maintained.

Recent research continues to emphasize that gender development is shaped not only by individual cognition but also by social and environmental influences, including classroom interactions and expectations (Halim & Ruble, 2016; Martin & Ruble, 2019). Although children embody diverse forms of masculinity and femininity, these expressions are often constrained by socially defined expectations of what it means to be a "boy" or a "girl" (Paechter, 2017).

This case study explores how educators can challenge traditional gender categories and acknowledge gender variance in the classroom. Specifically, it examines how dominant gender norms shape peer and teacher responses to students who demonstrate nontraditional gender behaviors. In doing so, the study contributes to ongoing conversations about the importance of inclusive and responsive pedagogy in supporting diverse student identities (Meyer, 2018; Shelton & McDermott, 2018).

Conceptual Framework

This study is informed by Butler's (1990) concept of gender as performative, which positions gender as a socially constructed and enacted identity rather than a fixed trait. Within classroom contexts, gender is often reinforced through everyday interactions, expectations, and social norms. Research suggests that children actively construct their understanding of gender through both cognitive processes and social experiences (Halim & Ruble, 2016; Martin & Ruble, 2019).

Additionally, gender expectations in school settings are shaped by broader cultural discourses that define appropriate behaviors for boys and girls (Paechter, 2017). These norms often influence how students' behaviors are interpreted and responded to by both peers and teachers. Drawing on this framework, the present study examines how gender norms are maintained or challenged through classroom interactions.

Study Context

This study was conducted in a third-grade classroom in a public elementary school in a Midwestern city. The classroom teacher, Mrs. B, was a White female with over twenty years of teaching experience. When discussing gender dynamics in her classroom, Mrs. B noted that students' understandings of appropriate gender behaviors are formed at an early age, suggesting that challenging these norms at this stage can be difficult due to their deeply embedded nature.

The classroom consisted of twenty students (eight girls and twelve boys). Through ongoing observations, interviews, and analysis of student work, two focal participants—Chris and Tracy—were identified as students who resisted traditional gender expectations through their behaviors and interactions.

Data collection occurred over a five-month period, with classroom observations conducted two to three times per week for approximately three hours per visit. Observations focused primarily on literacy instruction, including reading and writing workshop, as well as informal settings such as recess and lunch when possible. Data sources included field notes, student work samples, audio and video recordings, and both formal and informal interviews with students and the teacher.

Data were analyzed using ethnographic methods, with attention to recurring patterns in students' behaviors and interactions. Initial coding categories such as "crossing gender boundaries" and "immature boy and bossy girl" were refined into broader themes that guided the analysis. Triangulation across multiple data sources and member-checking with participants were used to strengthen the credibility and trustworthiness of the findings.

Chris: "He is so different"

Chris drew the researcher's attention early in the observations. He frequently kept photographs of his family on his desk and carried them with him during recess and lunch. When asked why, he explained, "Because I miss my mom. My mom works, so I have to be alone for hours before she comes home." Chris was warm and affectionate, often greeting the researcher and occasionally offering hugs. Although he struggled with reading, he enjoyed listening to others read and often asked classmates—particularly girls—to read to him.

Chris's behaviors, including expressing emotions openly and forming close relational connections, contrasted with dominant expectations of masculinity in the classroom. Such behaviors are often viewed as gender nonconforming, as boys who demonstrate emotional sensitivity may be perceived as deviating from traditional masculine norms (Coyle et al., 2016; Martin & Ruble, 2019). His teacher, Mrs. B, described him as "immature," suggesting that his behaviors did not align with what she perceived as developmentally appropriate for boys his age. While she acknowledged that some boys may be "nice and gentle," she distinguished this from what she interpreted as Chris's lack of maturity.

Despite the teacher's concerns, Chris was generally well-liked by many classmates, particularly girls. During recess, he often chose to play in mixed-gender groups, engaging in imaginative play rather than competitive sports. He also demonstrated strong empathy toward peers, such as comforting classmates who were upset or including children who were often excluded. These behaviors, often associated with femininity in traditional gender discourse, positioned Chris as both "different" and socially accepted within certain peer groups.

Chris's writing further reflected his emotional openness and strong attachment to his family. Unlike many boys who wrote more detached descriptions, Chris's narratives were highly expressive and relational. However, he was also aware that his topics differed from those of his peers and expressed hesitation about sharing his work publicly, fearing a lack of interest rather than direct criticism. This awareness highlights the subtle social pressures that regulate gender expression in the classroom.

Although Chris's behaviors challenged traditional gender norms, they did not significantly disrupt dominant gender expectations within the broader peer group. His actions were often interpreted as signs of immaturity rather than as alternative forms of masculinity. As a result, while Chris occupied a unique social position, his behavior did not necessarily lead to broader shifts in how gender was understood by others.

Tracy: Can a Smart Girl Be Popular?

Tracy, in contrast, demonstrated behaviors that challenged traditional expectations of femininity. Academically strong and highly confident, she often took on leadership roles in the classroom. However, her assertiveness was frequently interpreted by peers as “bossy.” For example, when assisting classmates, Tracy would provide direct instructions, which some students perceived as controlling rather than helpful.

The teacher was aware of Tracy’s tendency to be directive and often corrected her behavior publicly, emphasizing the importance of allowing others to contribute. While Tracy’s academic strengths were evident—she consistently performed at a high level and participated in a gifted program—her assertive communication style was not equally valued.

Tracy’s assertiveness and leadership behaviors challenged traditional expectations of femininity, which often emphasize quietness, compliance, and cooperation. Research suggests that girls who demonstrate confidence and assertiveness in academic settings may be perceived negatively by peers and teachers, as these behaviors are seen as inconsistent with gender norms (Freeman, 2019; Raby & Pomerantz, 2015). This reflects broader gendered expectations in which girls are often expected to be cooperative, quiet, and accommodating. Tracy’s refusal to conform to these expectations made her highly visible in the classroom, but not necessarily well-liked.

Despite her intelligence and influence, Tracy struggled with peer acceptance. She was recognized as “smart” by her classmates but was not widely considered popular. In some cases, her academic success and strong personality appeared to contribute to her social marginalization. This aligns with research suggesting that girls who demonstrate high competence and assertiveness may be perceived as violating gender norms and, as a result, may experience negative peer responses.

Tracy’s experiences highlight the complexities of navigating gender expectations in academic settings. While her behaviors positioned her as a capable and influential student, they also placed her at odds with both peer and teacher expectations regarding appropriate feminine conduct.

Discussion

The cases of Chris and Tracy illustrate how children actively negotiate gender identities within the constraints of dominant social norms. Both students demonstrated behaviors that challenged traditional gender expectations; however, their experiences also reveal how strongly these expectations continue to shape classroom interactions.

Chris’s emotional sensitivity and preference for relational interactions positioned him outside traditional constructions of masculinity. While he was accepted by some peers, particularly girls, his behavior was often interpreted as immaturity rather than as a legitimate expression of alternative masculinity. Tracy, in contrast, challenged norms of femininity through her assertiveness and academic confidence. However, her behaviors were frequently framed negatively, suggesting that girls who do not conform to expectations of quietness and compliance may face social and institutional resistance.

These findings highlight the persistence of binary gender norms in classroom contexts and demonstrate how both peer and teacher responses contribute to reinforcing these expectations. Although Chris and Tracy exhibited gender-nonconforming behaviors, their actions did not significantly disrupt dominant gender discourse. Instead, their experiences suggest that gender norms remain deeply embedded in everyday classroom practices and interpretations.

Implications

The findings from this study suggest that educators play a critical role in either reinforcing or challenging traditional gender norms in classroom settings. Simply allowing diverse expressions of gender is not sufficient; rather, teachers must take an active role in creating learning environments that critically examine and question these norms (Meyer, 2018; Paechter, 2017).

One effective approach is the use of critical literacy pedagogy, which encourages students to explore how social norms and power structures shape their understanding of identity (Lewison et al., 2002; Vasquez, 2017). Through the use of classroom discussions, children's literature, and reflective activities, educators can support students in recognizing and challenging restrictive gender expectations.

Additionally, creating inclusive classroom environments that affirm diverse gender identities is essential. Recent research highlights the importance of intentional and responsive teaching practices that validate students' experiences and promote equity (Shelton & McDermott, 2018). By providing opportunities for students to engage with multiple perspectives and by fostering open dialogue, teachers can help expand students' understanding of gender beyond binary frameworks.

Ultimately, classrooms should serve as spaces where diverse identities are acknowledged and valued. Through intentional instructional practices and ongoing reflection, educators can support more inclusive and equitable learning environments that allow all students to explore and express their identities more freely.

Conclusion

In conclusion, this study underscores the importance of recognizing and addressing the subtle ways gender norms are reinforced in everyday classroom interactions. While students like Chris and Tracy demonstrate the potential to expand traditional understandings of gender, their experiences also reveal the limits of individual resistance within established social structures. Therefore, meaningful change requires intentional and sustained efforts by educators to create inclusive spaces that challenge binary thinking and support diverse identities. By doing so, teachers can foster learning environments that not only promote academic success but also affirm the full range of students' social and emotional development.

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

The author used ChatGPT (OpenAI) for language editing and formatting assistance. All substantive content, analysis, and conclusions are the author's own.

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Social and Academic Factors That Foster Inequality and Discrimination Against Students With Disabilities in Public Schools in the New Amsterdam, Berbice Area

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Abstract

Inequality and discrimination significantly affect the social and academic development of students with disabilities, limiting their ability to access equitable and inclusive education. These challenges can negatively influence self-esteem, academic performance, and opportunities for upward mobility. This quantitative study investigated the social and academic factors that contribute to inequality and discrimination against students with disabilities in public schools in the New Amsterdam, Berbice area. Critical Disability Theory served as the theoretical framework guiding the research, while a conceptual framework was developed to guide the data collection process. A sample of 80 students was selected from public schools within the New Amsterdam area. Data were collected through a Likert-scale questionnaire and analyzed using descriptive and inferential statistics with the Statistical Package for Social Sciences (SPSS) version 22. Findings revealed that curriculum and pedagogical barriers, inadequate physical accessibility, and negative societal attitudes and cultural beliefs were major contributors to discrimination experienced by students with disabilities. The study recommends strengthening inclusive education practices, improving school infrastructure, increasing access to assistive technologies, and implementing awareness programs to challenge societal stereotypes regarding disability.

Keywords: disability, discrimination, inequality, inclusion education, learning difficulties

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Introduction

Globally, the main objective of education in any democratic society is to provide learners with quality education that enlightens them to be productive members of the society Kundu and Tutoo (2000).

Education plays a pivotal role in shaping individuals' personal, social, and economic development. However, many students with disabilities encounter barriers that prevent them from fully participating in the educational system. These barriers often lead to inequality and discrimination, which can negatively affect their academic achievements and social integration.

Inequality and discrimination in schools continue to affect the achievement of inclusive education and equitable education. These issues affect students' academic performance, emotional well-being, and overall development.

Addressing these challenges requires a collaborative effort from educators, policymakers, and communities inclusive of parents, caregivers and guardians. By advocating for or promoting equality, improving accessibility, and fostering positive attitudes, schools can create a learning environment where all students may have the opportunity to succeed.

Background to the Problem

Students with disabilities frequently face challenges such as inaccessible school facilities, lack of specialized educational support, and negative societal attitudes. These challenges not only limit their access to quality education but also impact their self-esteem and future opportunities. In many educational systems, including those in developing regions, policies supporting inclusive education may exist but are not always effectively implemented.

In the New Amsterdam, Berbice area, concerns have been raised regarding the level of inclusion experienced by students with disabilities in public schools. Understanding the factors that contribute to discrimination and inequality is essential for creating policies and practices that support equitable education.

This study therefore seeks to investigate the social and academic factors that foster inequality and discrimination against students with disabilities in public schools in the New Amsterdam, Berbice area.

Research Questions

The following questions were constructed to gather data on the social and academic factors that foster inequality and discrimination against students with disabilities in public schools in the New Amsterdam, Berbice area.

1. What are the major social factors that contribute to discrimination against students with disabilities in public schools?
2. To what extent do curriculum structure and teaching pedagogy influence the level of inclusion of students with disabilities in public schools?
3. To what extent does the physical accessibility of school's impact students with disabilities?

Literature Review

Conceptual Framework

This study is guided by a conceptual framework that explains how academic and social factors contribute to the inequality and discrimination experienced by students with disabilities in public schools. The framework identifies three independent variables: curriculum and pedagogical barriers, physical accessibility of school infrastructure, and societal attitudes and cultural beliefs. These factors are believed to directly influence the dependent variable, which is the inequality and discrimination experienced by students with disabilities.

Independent Variables

- Curriculum and pedagogical barriers
- Physical accessibility of school infrastructure
- Societal attitudes and cultural beliefs

Dependent Variable

- Inequality and discrimination experienced by students with disabilities

These variables were measured through questionnaire responses and analyzed to determine their relationship with discrimination in schools.

Figure 1

Independent and Dependent Variables

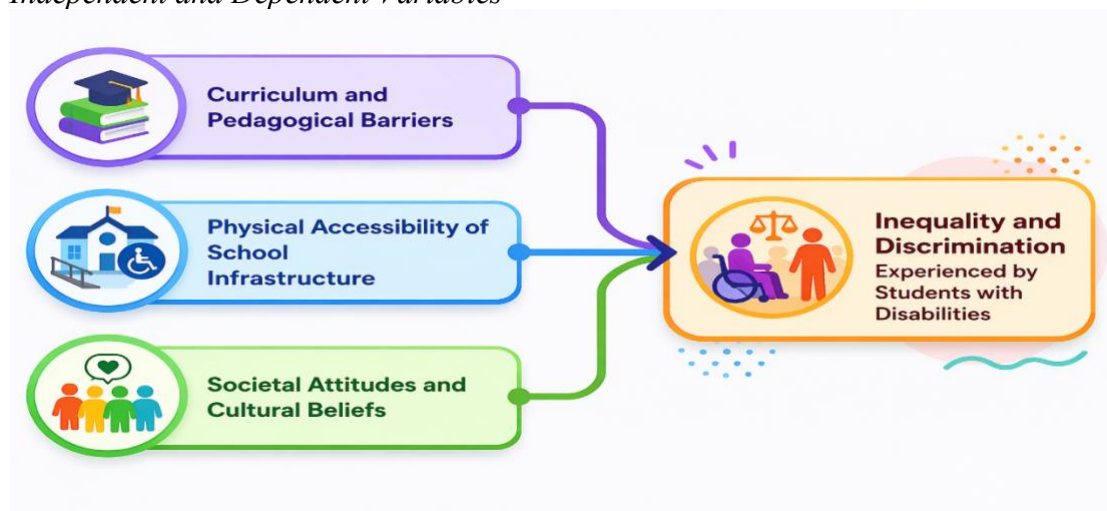


Figure 1 shows the Independent and Dependent Variables that were used in the study.

Curriculum and Pedagogical Barriers

Pedagogy

Teachers are considered important role models for students because they have an impact on helping shape, create, support and, establish students' strengths, goals and knowledge.

Therefore, it is essential to be aware of the knowledge, skills, methodologies and characteristics that one brings into a learning environment that caters for all categories of learners.

A research conducted by Karaouglu (2008) highlighted that the learning environment significantly affected a student's motivation and how students perceive the learning environment could have significant implications on how they are stimulated or willing to achieve the course outcomes. In support of the findings by Karaouglu, a study conducted by Ebata (2008) also concluded that a friendly atmosphere characterized by student-centered learning where specific student needs are met and are sufficiently motivates encourages the student to learn more.

Curriculum and pedagogy play an important role in shaping students' educational experiences but, when they are not inclusive or adaptable, they can create barriers that contribute to inequality and discrimination for learners with disabilities and those from marginalized backgrounds. Flexible teaching strategies, adapted learning materials, and individualized support systems are essential for promoting academic inclusion.

Effective classroom practice that is based on inclusive pedagogy, continuous assessment and evaluation, high expectations, and direct instruction and feedback significantly contributes to learner success and the realization of inclusive classrooms (Faubert, 2012).

Faubert (2012) further explain that it is important that teachers try out a range of pedagogical approaches that they can use flexibly in different situations, in order to improve their everyday classroom practice. Support in inclusive classrooms should fit into the on-going details of the daily classroom instruction; be perceived by teachers as effective for students with disabilities as well as other students in the classroom, and enhance and build on the teacher's current repertoire of instructional practices (Waldron & McLeskey, 2010).

Teachers may lack adequate training in differentiated instruction, making it difficult to support students with disabilities. To ensure that quality education is provided to students with disability to improve outcomes, it is necessary that educators do not only rely on classroom practices they have experienced or observed when determining what are effective classroom practices, as there may be inadequate empirical support to demonstrate their effectiveness in improving student outcomes.

Inclusive Education

Inclusive education is a means of creating effective classrooms where the educational needs of all children, including children with special needs, are addressed (Priyadarshani & Thangarajathi, 2017). The inclusion of students with special educational needs into regular mainstream classrooms has been a focal point of debate in education systems across the world (Schmidt & Cagran, 2023; Zakaria, 2017).

Inclusive education according to Bui et al. (2010), is when all students, regardless of any challenges they may have, are placed in age-appropriate general education classes that are in their own neighborhood schools. It receives high-quality instruction, interventions, and support that enable them to meet success in the core curriculum.

Further, Sharma and Singh (2008), clarify that inclusion is not just about providing students with disabilities access to regular classrooms; instead, it means providing all children,

regardless of race, language, class, geographical location and disability, equitable and practical education that responds to their needs as learners. This emphasizes that inclusion is an educational approach and philosophy providing all students with outstanding academic and social achievement opportunities. These opportunities can be described as participating in the full range of social, recreational, arts, and academia. Additionally, Allan (2014) noted that inclusive education is presented as an ideology that guides practice to respect the right of all learners to quality education.

According to the United Nations Educational, Scientific and Cultural Organization, inclusive education ensures that schools accommodate the diverse learning needs of all students and that inclusive education benefits both students with disabilities and their peers by promoting diversity, empathy, and equal opportunities.

Physical Accessibility

The World Health Organization (2025) highlights that accessible environments are necessary for ensuring equal participation for individuals with disabilities. Physical accessibility is a human right which mandates guaranteeing inclusive and equitable spaces in public schools. This is also in keeping with the Sustainable Development Goals, especially with goal 4, that speaks of inclusive and equitable quality education, goal 10, which aims to reduce inequalities by promoting the inclusion of people with disabilities, and goal 11 which seeks to create sustainable and accessible environments (World Health Organization, 2025). All formal educational institutions must adhere to the principles of universal accessibility to ensure that all individuals, regardless of their abilities, can navigate and use their facilities independently and safely.

An increasing number of countries are trying to make their educational systems inclusive for persons with disabilities, removing barriers and addressing discrimination on the grounds of disability. In particular, many countries have included protections in their constitutions, laws or policies. Physical infrastructure accessibility has many components, both within and outside the school. It includes things like signage, accessible entrances, corridors, toilets with grab bars, switches and controls, ramps, elevators, accessible desks, playgrounds, canteens, water taps, as well as the design of outdoor facilities like roads, footpaths, and transport that is needed to reach the school. For a school to be accessible, it must allow all children, teachers and parents to safely enter, use all the facilities including recreational areas, participate fully in all learning activities with as much autonomy as possible.

Physical accessibility is a fundamental component of inclusive education, whereby students with disabilities can independently access and participate in all aspects of the school environment. It involves the design and modification of physical structures such as buildings, classrooms, and facilities to accommodate diverse mobility and sensory needs. According to the United Nations Educational, Scientific and Cultural Organization, inclusive schools must remove physical barriers that prevent equal participation and learning opportunities for all students.

Physical barriers remain one of the most visible forms of discrimination against persons with disabilities. Many schools lack ramps, elevators, accessible bathrooms, and other structural accommodations required for students with mobility challenges.

Accessible infrastructure includes features such as ramps, elevators, wide doorways, and handrails that support students with mobility impairments. Classrooms should be organized with adequate space for movement, adjustable furniture, and appropriate lighting to accommodate students with visual challenges. In addition, sanitation facilities must be designed with accessibility in mind, including grab bars, wheelchair-accessible toilets, and non-slip flooring to ensure safety and independence.

It is noted that many schools, particularly in developing regions such as New Amsterdam, Berbice, face challenges in providing adequate physical accessibility. These challenges include limited funding, outdated infrastructure, and a lack of awareness regarding inclusive design standards. As a result, students with disabilities often experience restricted access to classrooms, libraries, and other essential facilities, which negatively impacts their academic performance and social integration.

Societal Attitudes and Cultural Beliefs

Societal attitudes and cultural beliefs toward students with physical disabilities impacts their educational experiences and overall development. In many societies, disability is often misunderstood and viewed through a lens of stigma, pity, or limitation rather than capability and diversity. Negative stereotypes for example, students with physical disabilities are less competent or require constant assistance which can lead to discrimination, social exclusion, and reduced expectations from teachers, peers, and even their family members. Cultural beliefs may also reinforce these attitudes, particularly in communities where disability is associated with misfortune, dependency, or shame. Because of such belief, students with physical disabilities may experience isolation, bullying, or lack of participation in classroom and extracurricular activities, which can negatively impact their self-esteem, academic performance, and their socialization.

Cultural beliefs and stereotypes may lead to social exclusion and reduced educational opportunities. A study conducted by Consiglio et al. (2015) found that students who had contact with students with a disability held more positive and less prejudicial views about people with a physical disability when compared to students who had not had such contact. The study also revealed that non-disabled students attending inclusive schools demonstrated less prejudice, patronizing, or pitying behaviors toward students with a disability when compared to students attending non-inclusive schools. Tafa and Manolitsis (2003) in their study noted that children educated in inclusive programs with children with special educational needs have increased respect, awareness, and acceptance of their peers' needs, develop fewer prejudices, and learn to be more helpful and supportive toward people with disabilities, according to parents' perspectives.

Societal perceptions can influence policy implementation and resource allocation, leading to inadequate support systems within schools. Addressing these issues requires a shift in mindset through awareness campaigns, inclusive education policies, and the promotion of positive representations of individuals with disabilities, ensuring that all students are valued, respected, and given equal opportunities to succeed.

Theoretical Framework

A theoretical framework is a structure that identifies and describes the major elements, variables, or constructs that organize your scholarship. In addition, it is an empirical study that

refers to the system of concepts, assumptions, expectations, beliefs, and theories that informs the research (Ennis, 2024).

For the purpose of this research, the Critical Disability Theory was used. Critical Disability Theory (CDT) is an interdisciplinary framework that examines disability as a socially constructed phenomenon influenced by power, inequality, and systemic barriers rather than solely as a medical condition. CDT challenges traditional perspectives that locate disability within the individual and instead emphasizes how social, political, and economic structures contribute to the marginalization of persons with disabilities (Goodley, 2017).

A central idea in CDT is that disability is shaped by societal conditions rather than purely biological impairments. According to Oliver (1990), disability arises when environments, institutions, and attitudes fail to accommodate diverse needs. For example, inaccessible school infrastructure or rigid curricula can disable students more than their impairments themselves.

Critical Disability Theory focuses on issues such as power and inequality, highlighting how institutions such as the education system may unintentionally perpetuate discrimination against students with disabilities and occurs when institutions fail to accommodate diverse needs. These inequalities are often reinforced through limited access to inclusive educational resources, lack of assistive technologies, and insufficient teacher training in inclusive practices. As a result, students with disabilities may limit their participation affecting their academic achievement.

Summary of the Literature Review

The literature review highlights that inequality and discrimination against students with disabilities in public schools are influenced by three major factors: curriculum and pedagogical barriers, physical accessibility, and societal attitudes.

Firstly, the curriculum and teaching methods can either support or hinder inclusion. Research shows that student-centered teaching, flexible instructional strategies, continuous assessment, and individualized support improve learning outcomes for students with disabilities. However, when teachers lack training in inclusive pedagogy or rely on rigid teaching methods, students with disabilities may be excluded from full participation.

Secondly, physical accessibility is identified as a key requirement for inclusive education. Schools must provide ramps, elevators, accessible toilets, wide doorways, signage, and safe pathways so students with disabilities can move independently and participate fully. Many schools, especially in developing regions, still lack these facilities due to limited funding and outdated infrastructure, creating barriers to education and social interaction.

Also, the review discusses how societal attitudes and cultural beliefs often create stigma and stereotypes toward students with disabilities. Negative perceptions may cause bullying, exclusion, low expectations, and limited participation in school activities. In some communities, disability is associated with shame or dependency, which further affects students' confidence, academic performance, and social development. Overall, the literature review shows that addressing these three barriers is essential to creating equitable and inclusive schools for all learners.

In addition, the Critical Disability Theory (CDT) as the theoretical framework, views disability as a social issue shaped by power, inequality, and systemic barriers rather than only a medical

condition. It argues that disability is often created when institutions and environments fail to accommodate diverse needs. In education, barriers such as inaccessible buildings, inflexible curricula, lack of assistive technology, insufficient teacher training, and negative societal attitudes can lead to discrimination and exclusion for students with disabilities. CDT helps explain how these structural factors limit equal opportunities, participation, and academic success. Therefore, this theory is appropriate for the study because it highlights how systemic conditions contribute to inequality in educational settings.

Methodology

Research Design

This study used a quantitative research design to analyze the factors contributing to discrimination against students with disabilities. According to Bryman (2001), the quantitative approach entails the use of statistical data as a tool that saves time and resources. The use of statistical data for the research descriptions and analysis reduces the time and effort spent on completing the study. This data collection technique is also advantageous because it enhances the development of ideas for a study and allows flexibility in the study.

The data which includes numbers, percentages, and measurable figures can be calculated by a computer using a Statistical Package for Social Science (SPSS) (Connolly, 2007; Gorard, 2001) which saves a lot of energy and resources.

Population and Sample

The target population for this study consisted of students enrolled in the secondary public schools in the New Amsterdam, Berbice area. These students included both those with disabilities and those without disabilities, as the study aimed to assess inclusive practices within the general classroom environment. Also, a sample of 80 students was selected from the target population. The study utilized a simple random sampling technique to ensure that each student had an equal chance of being selected. This method helped to reduce bias and ensured that the sample was representative of the population.

Data Collection Instrument

Data were collected using a structured questionnaire based on a 5 point Likert scale. This format allowed for easy quantification and statistical analysis of responses. Participants responded to statements using the following scale:

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

The questionnaire included sections addressed the following variables:

- Curriculum and pedagogical barriers
- Physical accessibility of school infrastructure
- Societal attitudes and cultural beliefs

Validity of the Instrument

To ensure content validity, the questionnaire was reviewed by experts in education and research methodology. Their feedback was used to refine the items to ensure that they accurately measured curriculum and pedagogical barriers, physical accessibility of school infrastructure and, societal attitudes and cultural beliefs. Further, the instrument was aligned with the study's research objectives and questions.

Reliability of the Instrument

The reliability of the instrument was assessed using Cronbach's Alpha to determine internal consistency. A reliability coefficient of 0.70 or higher was considered acceptable, indicating that the questionnaire items consistently measured the intended variables.

Data Collection Procedure

Permission was obtained from relevant s authorities before the distribution of questionnaires and the actual data collection process. The questionnaires were distributed to students and completed under supervision to ensure clarity and accuracy. Respondents were informed about the purpose of the study and assured of confidentiality.

Data Analysis

Data collected were analyzed using the **Statistical Package for the Social Sciences (SPSS) version 22** and the following statistical techniques were used to summarize and describe the data. Inferential statistics were also used to identify relationships between variables.

Descriptive Statistics –These includes; Frequencies, Percentages, Means, and Standard deviations.

Results From the Variables

Figure 2

Bio Data: Respondents According to Their Gender

Gender Distribution of Participants (n=80)

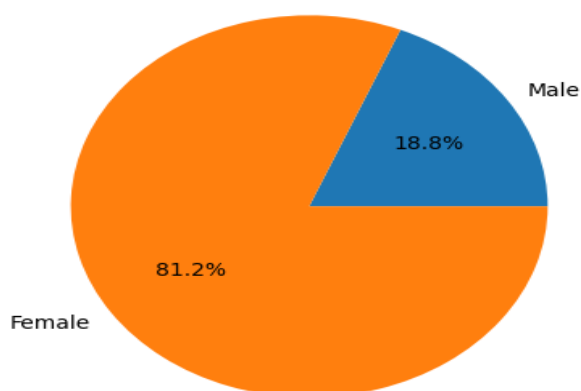
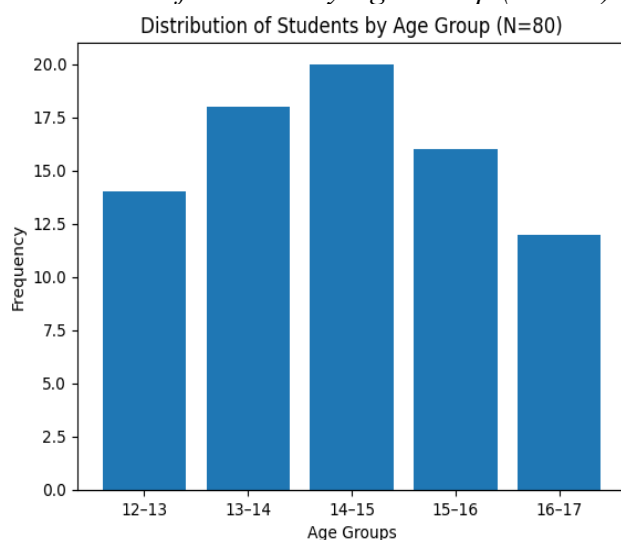


Figure 2 shows the percentage breakdown of the participants according to their gender. From the 80 participants, 15 were male and 65 females. This indicates that a significant number of participants were females.

Figure 3

Distribution of Students by Age Group (N = 80)



The data above shows that the largest proportion of students (25.0%) falls within the 14–15 age group, indicating that most respondents are in the middle adolescent stage. The 13–14 age group (22.5%) and 15–16 age group (20.0%) also represent a significant portion of the sample, suggesting a fairly balanced distribution across early to mid-adolescence.

However, the 12–13 age group (17.5%) and 16–17 age group (15.0%) have slightly lower representation, indicating fewer respondents at the youngest and oldest ends of the sample.

Table 1

Perception of Curriculum and Pedagogical Barriers

Response	Frequency	Percentage
Strongly Agree	30	37.5%
Agree	28	35%
Neutral	12	15%
Disagree	6	7.5%
Strongly Disagree	4	5%

Table 1: The data show that most respondents expressed a positive view toward the statement being measured. Out of the total responses, 30 students (37.5%) strongly agreed and 28 students (35%) agreed, giving a combined 72.5% of respondents who held a favorable opinion. This indicates that nearly three-quarters of the participants supported the statement, suggesting that the issue being examined is widely accepted or recognized by the group.

A smaller portion of the respondents, 12 students (15%), selected neutral, which suggests that some participants were either uncertain, undecided, or did not feel strongly one way or the other. Meanwhile, only 6 students (7.5%) disagreed and 4 students (5%) strongly disagreed,

for a total of 12.5% expressing a negative opinion. This relatively low percentage of disagreement shows that opposition to the statement was limited.

Table 2
School Infrastructure Accessibility

Response	Frequency	Percentage
Strongly Agree	32	40%
Agree	25	31%
Neutral	10	12.5%
Disagree	8	10%
Strongly Disagree	5	6.5%

The data above shows the responses from participants regarding the variable accessibility. All 80 participants responded to the statement. 32 respondents (40%) strongly agreed with the statement, representing the largest proportion of responses. 25 respondents (31%) agreed, therefore, these two categories account for 71% of the total responses, indicating a strong overall agreement among participants.

Also, a smaller proportion of respondents, 10 individuals (12.5%), selected a neutral position, suggesting that they neither strongly supported nor opposed the statement. This may indicate uncertainty, lack of sufficient information, or indifference toward the issue being measured.

On the other hand, 8 respondents (10%) disagreed, while 5 respondents (6.5%) strongly disagreed. Together, these negative responses make up 16.5% of the sample, which is significantly lower than the proportion of positive responses. This indicates that only a minority of participants held unfavorable views.

Table 3
Societal Attitudes Toward Disability

Response	Frequency	Percentage
Strongly Agree	27	34%
Agree	29	36%
Neutral	13	16%
Disagree	7	9%
Strongly Disagree	4	5%

The data revealed that the majority of respondents expressed positive views toward the statement. Out of the total responses, 29 students (36%) selected Agree, 27 students (34%) selected Strongly Agree. Together, these two categories account for 70% of all responses, indicating that most participants held a favorable opinion. However, a smaller proportion of respondents gave neutral or negative responses. 13 students (16%) selected Neutral, 7 students (9%) selected Disagree and 4 students (5%) selected Strongly Disagree, giving a combined 14% negative response rate. The findings suggest a largely positive trend, with the responses heavily concentrated in the “Agree” and “Strongly Agree” categories, while neutral and negative opinions were less common.

Discussion and Findings

This study examined the social and academic factors contributing to inequality and discrimination against students with disabilities in public schools in the New Amsterdam, Berbice area. The findings indicate that discrimination against students with disabilities in public schools is influenced by multiple interconnected factors. It was revealed that curriculum barriers, inaccessible infrastructure, and negative societal attitudes significantly contribute to the marginalization of these students. These results are consistent with global research, which highlights that rigid curricula, lack of appropriate teaching materials, and insufficient teacher training often prevent students with physical disabilities from participating in the teaching and learning process effectively. Curriculum barriers limit the ability of students with disabilities to engage fully in academic activities. In addition, these barriers significantly limit the ability of students with physical disabilities to fully engage in academic activities. Many traditional curricula are developed with the assumption that all students can participate in the same way, without considering diverse physical needs. In addition, teaching methods often lack flexibility and inclusivity. Teachers may not incorporate differentiated instruction strategies, such as alternative ways of completing assignments or demonstrating understanding. For instance, a student who has difficulty writing due to a physical disability may not be provided with options like oral presentations, assistive technology, or modified tasks. This rigidity can result in reduced participation, lower academic performance, and feelings of exclusion.

Furthermore, curriculum barriers are often reinforced by a lack of teacher training and awareness. Educators who are not equipped with the knowledge and skills to implement inclusive teaching practices may unintentionally exclude students with physical disabilities. This can lead to a cycle where students are less engaged, may become demotivated, receive fewer opportunities to participate, and ultimately achieve less academically.

Based on the data collected, physical inaccessibility particularly at secondary schools such as poorly designed school buildings and limited assistive resources remains a major obstacle to inclusive education, further restricting students' ability to engage meaningfully in the learning environment. Physical structure and accessibility play a pivotal role in shaping educational inequality, particularly for students with physical disabilities. When public schools are not designed with inclusivity in mind, they create barriers that prevent equal participation in academic and social activities. Inaccessible physical environments not only hinder movement but also restrict participation in classroom activities. Desks that cannot accommodate wheelchairs, poorly arranged classrooms, and inaccessible learning resources reduce engagement and interaction. This can lead to lower academic achievement, reduced confidence, and feelings of isolation. Over time, these disadvantages contribute to a widening gap between students with disabilities and their peers.

Apart from the physical accessibility of school infrastructure, societal attitudes and cultural beliefs play a critical role in reinforcing discrimination. Studies show that stigma and misconceptions about disability can lead to exclusion, low expectations, and reduced opportunities for students with disabilities both inside and outside the classroom setting.

Societal attitudes and cultural beliefs often times impact how individuals are perceived, treated, and included within public schools. In many societies, disability is still misunderstood and often associated with stigma, pity, or even fear. These negative perceptions can lead to discrimination, exclusion, and low expectations from teachers, peers, and the wider community. For example, some cultural beliefs may view disability as a sign of weakness,

misfortune, or dependence, which can result in students being marginalized or not given equal opportunities to participate in academic and social activities. Such attitudes significantly impact students' self-esteem and motivation.

When students with disabilities are constantly exposed to stereotypes or are treated as incapable, they may internalize these beliefs, leading to reduced confidence and lower academic performance. Additionally, peers may exclude them from group work or social interactions, further reinforcing feelings of isolation. Teachers, influenced by societal norms, may also unintentionally lower their expectations or fail to provide appropriate support, limiting students' potential for growth and achievement.

Likewise, cultural beliefs can also affect not only the learner but the family. In some cases, families may feel ashamed or reluctant to send children with disabilities to school due to fear of judgment or discrimination. This can result in reduced enrollment and attendance, denying these students access to education altogether. Furthermore, communities that lack awareness about disability rights and inclusion may not advocate for necessary changes in school systems, such as inclusive policies or accessible infrastructure.

To summarize, promoting inclusive education and improving accessibility can significantly reduce inequality and discrimination, ensuring that all learners regardless of their ability physically, have equal opportunities to succeed academically and socially. Inclusive education not only benefits students with disabilities but also fosters diversity, empathy, and social cohesion within the wider society, contributing to more equitable and just educational systems in the New Amsterdam area. According to the UNESCO Global Education Monitoring Report (2025), inclusive education requires addressing not only physical and academic barriers but also the social and cultural norms that hinder full participation and belonging for all learners regardless of a disability or not.

Recommendations

The following recommendations are made following the conclusion of this study:

1. The government should consider the implementation of inclusive curriculum strategies that caters for diverse learners. This involves adapting teaching methods, materials, and assessments to ensure that all students can be active participants in the teaching and learning process. When teachers incorporating differentiated instruction, flexible lesson plans, and alternative assessment methods, educators can create a more supportive and engaging academic environment that promotes equal opportunities for success.
2. Improve school infrastructure to ensure accessibility for students with disabilities. Many students with disabilities face physical barriers that affect their access to classrooms, restrooms, laboratories, and other facilities. Schools must invest in accessible designs such as ramps, elevators, wide doorways, and appropriate seating arrangements to ensure that all students can move freely and safely.
3. Educate teachers on inclusive teaching practices through professional development sessions and other formal training programs. When this is done, they will be equipped with the requisite knowledge and skills to address the unique needs of students with disabilities in general. Professional development programs should focus on strategies such as differentiated instruction, classroom management, and the use of assistive technologies. Well-trained teachers are better prepared to create inclusive classrooms that support all learners.

4. Conduct public awareness campaigns to change societal attitudes toward disability. By educating communities about the rights and abilities of individuals with disabilities, these campaigns can promote acceptance, reduce stigma, and encourage inclusive practices both within and beyond the school setting. Public sensitization campaigns, inclusive policies, and teacher training programs can help challenge stereotypes and promote acceptance. Encouraging positive representation of individuals with disabilities and fostering inclusive school cultures can also help break down these societal and cultural barriers, ensuring that all students are valued and supported equally.

Conclusion

Addressing these challenges therefore requires coordinated and sustained efforts from policymakers, educators, and communities. Governments must implement inclusive policies, allocate adequate funding, and ensure teacher training programs emphasize inclusive pedagogies. Schools must adapt curricula, provide assistive technologies, and create accessible learning environments. At the community level, awareness campaigns are essential to challenge stereotypes and promote acceptance of individuals with disabilities.

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Appendix

Section 1-Bio data

1. Gender male ☐ female ☐
2. Age range
 - 12-13 ☐
 - 13-14 ☐
 - 14-15 ☐
 - 15-16 ☐
 - 16-17 ☐

Section 2

Likert-Scale Statements: Curriculum and Pedagogical Barriers

Instructions: Please indicate your level of agreement with each statement using the scale below:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

1. The school curriculum does not adequately meet the learning needs of students with disabilities.
2. Teachers rarely adapt lessons to accommodate students with disabilities.
3. Students with disabilities experience difficulty understanding lessons because teaching methods are not inclusive.
4. Learning materials are not modified to support students with disabilities.
5. Teachers lack adequate training in inclusive teaching practices.
6. Students with disabilities are often excluded from classroom activities because of unsuitable teaching methods.
7. The pace of teaching is too fast for some students with disabilities to follow.
8. Assessment methods do not fairly measure the abilities of students with disabilities.
9. Teachers do not provide enough individual support to students with disabilities during lessons.
10. Classroom instructions are not presented in ways that all students can understand.
11. Students with disabilities face challenges because assistive learning tools are unavailable.
12. Teachers show limited patience when working with students with disabilities.
13. Group activities are not structured to include students with disabilities effectively.
14. The curriculum places students with disabilities at a disadvantage compared to other students.
15. Improving teaching strategies would reduce discrimination against students with disabilities.

Likert-Scale Statements: Physical Accessibility

Instructions: Please indicate your level of agreement with each statement.

1 – Strongly Disagree | 2 – Disagree | 3 – Neutral | 4 – Agree | 5 – Strongly Agree

1. My school has ramps that allow easy access for students with mobility impairments.
2. Classrooms are spacious enough to accommodate students who use wheelchairs or mobility aids.
3. There are elevators or alternative access options for students in multi-story buildings.
4. Doorways and hallways are wide enough for easy movement of all students.
5. Handrails are available along staircases and walkways for support.
6. Classroom furniture is adjustable to meet students' needs.
7. Seating arrangements allow students with disabilities to participate comfortably.
8. Lighting supports students with visual impairments.
9. Restrooms are accessible to students with disabilities.
10. Safety features such as grab bars are available in restrooms.
11. Signs in the school are clear and easy to understand.
12. There are braille or tactile paths for visually impaired students.
13. Emergency exits are accessible to all students.
14. The school provides an environment that supports students with disabilities.
15. Improvements are needed to make my school more accessible.

Likert-Scale Statements: Societal Attitudes and Cultural Beliefs Toward Students with Disabilities

Instruction: Please indicate your level of agreement with each statement using the scale below:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

1. Students with disabilities are often treated unfairly because of negative societal attitudes.
2. Cultural beliefs in the community influence how students with disabilities are accepted in schools.
3. Some people believe that students with disabilities are less capable than other students.
4. Negative stereotypes about disability affect students' confidence and self-esteem.
5. Students with disabilities are sometimes excluded from social activities because of cultural beliefs.

6. Parents' attitudes toward disability can influence how children treat classmates with disabilities.
7. Teachers' personal beliefs may affect how they interact with students with disabilities.
8. Society does not do enough to promote positive attitudes toward persons with disabilities.
9. Students with disabilities often face discrimination because of traditional beliefs.
10. Community awareness programs can help reduce negative attitudes toward disability.
11. Cultural stigma surrounding disability creates barriers to equal education opportunities.
12. Students without disabilities are encouraged to include students with disabilities in activities.
13. Misunderstanding about disability contributes to bullying and teasing in schools.
14. Respect for diversity can improve the treatment of students with disabilities.
15. Changing societal attitudes is necessary to achieve inclusive education.

Social Support, Work–Family Conflict, and Well-being Among Vocational School Teachers: Differential Effects by Gender and Career Stage

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Abstract

Vocational education contexts present occupational demands distinct from general education settings, requiring educators to integrate theoretical instruction with practical skill development, manage technical equipment and safety protocols, and facilitate industry-education partnerships. This complex environment contributes to substantial workloads, role ambiguity, and competing professional and family demands. Drawing on social support theory and occupational well-being perspectives, this study theorized that workplace social support buffers the detrimental effects of work–family conflict (WFC) on vocational teachers' well-being. Three central propositions guided the investigation: collegial, principal, and supervisory support would positively predict job and life satisfaction; WFC would negatively predict both outcomes; and social support would attenuate WFC's adverse effects. Survey data were collected from 518 vocational school teachers across northeastern Thailand. Separate hierarchical multiple regression models were estimated for each dependent variable, examining the sequential contribution of demographic variables, social support dimensions, WFC, and their interaction terms. ANOVA examined differential effects across gender and career stage. Workplace social support explained substantial variance in both outcomes, with collegial support emerging as the strongest predictor. WFC demonstrated robust negative associations with well-being indicators. Male teachers reported significantly higher WFC than female colleagues, and early-career teachers experienced elevated WFC alongside diminished well-being compared with experienced instructors. These findings identify peer networks as protective factors and work–family strain as a critical vulnerability, particularly for male and early-career vocational educators. Targeted interventions addressing gender-specific work–family pressures are essential for enhancing retention and well-being in vocational settings.

Keywords: social support, work–family conflict, teacher well-being, vocational education, job satisfaction, life satisfaction, Thailand

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Introduction

Teacher well-being matters. Across the world, educators who feel unsupported, overworked, or undervalued are leaving the profession at alarming rates and the students they leave behind pay the price. Most of the research on this crisis has focused on general school teachers, quietly overlooking a group that faces some of the bad working conditions in education: vocational school teachers. These are the instructors standing in workshops and laboratories, not just teaching from textbooks but keeping machinery running safely, staying current with new technology industry standards, and personally building the bridges between their schools and local employers so their students actually get hired after graduation (Billett, 2011; Nylund et al., 2020). Low administrative support, heavy workloads, and the persistent social stigma that vocational work is somehow “less than” academic education all chip away at their sense of professional worth and their willingness to stay in the job (Freedman & Appleman, 2009; Skaalvik & Skaalvik, 2017). What makes this particularly concerning is how little attention it receives. While general education teachers have been studied extensively, vocational educators remain largely invisible in the well-being literature a gap this study sets out to address.

In the Thai context, this challenge is particularly acute. The Office of the Vocational Education Commission (OVEC) oversees vocational education across approximately 429 public and 484 private colleges, serving nearly one million vocational students across nine major fields of study, including industry, commerce and business administration, fine and applied arts, home economics, agriculture, fisheries, tourism and hospitality, textiles, and ICT (Equitable Education Fund [EEF], 2023). Despite this scale, studies have identified persistent problems in both public and private vocational colleges, including poor quality and inexperienced teachers, out-of-date curricula that are mostly not competency-based, and obsolete equipment (Chalamwong, 2019). The system is further strained by a critical national skills gap: the Eastern Economic Corridor (EEC) Development Plan under Thailand 4.0 estimated the need for 173,705 people with vocational qualifications, yet the country remained 55,642 workers or 32% short of that target (Chalamwong, 2019). This deficit places enormous pressure on frontline vocational educators to compensate for systemic shortfalls through intensified individual effort.

Behind the policy reports and workforce statistics, there are real people struggling. Thai teachers are not just overworked many are financially stretched to a breaking point, with individual debt reportedly reaching as high as three million baht, and salaries that lag well behind what teachers earn in neighboring countries like Malaysia or Singapore. It is hard to show up fully for students when you are worried about paying your own bills. And the psychological toll runs deep. Research on Thai school teachers has found that burnout, depression, anxiety, and stress are shaped not just by what happens in the classroom things like class size but also by how secure teachers feel at home financially and how supported they feel in their personal relationships (Ratanasiripong et al., 2022). In other words, the pressures of life outside school walls do not stay outside. They follow teachers in. Among university-level educators, the picture is equally concerning: a recent study found that Thai higher education teachers reported high levels of emotional exhaustion, detachment from their work, and a reduced sense of personal achievement, alongside heavy workloads and poor sleep (Pakdee et al. (2025). Perhaps most troubling is where these pressures fall hardest. Teacher shortages in Thailand hit rural schools far more severely than urban ones (Pholphirul et al., 2023) and it is in those same rural and regional areas that most vocational colleges, including the northeastern institutions at the heart of this study, are located.

Here is the uncomfortable truth: Thailand has big ambitions for vocational education, but the people being asked to deliver on those ambitions are not always being looked after. The Thai vocational system has long tried to do two things at once give students solid academic foundations while also equipping them with real, hands-on industry skills (EEF, 2023). That dual mission puts enormous responsibility on teachers, who must be both credible classroom educators and up-to-date industry practitioners. And yet, despite how central teachers are to making this work, vocational education has repeatedly been deprioritized in both policy funding and public conversation. Since 2014, OVEC has rolled out wave after wave of reform pushing schools toward dual vocational training, raising English proficiency standards, integrating digital learning platforms, and more (EEF, 2023). Each of these changes, however well-intentioned, lands as yet another demand on teachers who are already stretched thin. Nobody asked them if they had the bandwidth. The honest gap in Thailand's reform agenda is this: there has been plenty of attention on what teachers should teach and how, but very little on whether teachers themselves are actually okay whether they are supported, sustainable, and planning to stay in the profession (Ratanasiripong et al., 2022; Wongsricha & Kulapichitr, 2021). That is precisely the gap this study is designed to speak to.

A central question driving this study is what protects teachers when occupational demands become excessive. Social support theory offers a well-established answer. First articulated by Cobb (1976) and extended across decades of occupational health research, the theory proposes that interpersonal resources in the workplace—from collegial relationships to supervisory guidance to principal leadership—buffer individuals against the psychological costs of chronic stress. In educational settings, this buffering effect has been documented consistently, with peer support and administrative support both emerging as significant predictors of teacher well-being and retention (Skaalvik & Skaalvik, 2017; Viswesvaran et al., 1999).

What remains less understood is whether these dynamics hold in vocational education, where the occupational demands are structurally distinct. Thai vocational teachers carry formal teaching loads of 21–40 hours per week (OVEC, 2021), alongside the less visible demands of equipment maintenance, industry liaison, and technical assessment—all of which encroach significantly on personal and family time. When professional demands persistently compete with family responsibilities, work–family conflict (WFC) becomes not an occasional stressor but an embedded feature of the role. Drawing on social support theory and occupational well-being perspectives, this study examines how different sources of workplace support interact with WFC to shape vocational teachers' job satisfaction and life satisfaction in northeastern Thailand, with particular attention to whether these effects differ by gender and career stage.

This study looked at how four sources of workplace support from colleagues, principals, supervisors, and mentors work alongside work–family conflict to shape how satisfied vocational school teachers in northeastern Thailand feel about their jobs and their lives, and whether that picture looks different depending on gender or career stage. What the findings reveal is surprising in places and uncomfortable in others. For anyone responsible for teacher welfare, school policy, or the future of vocational education in Thailand, the patterns uncovered here are difficult to ignore.

Literature Review

Vocational Education as a Distinct Occupational Context

Vocational and technical education occupies a distinctive niche within national educational systems, preparing students for direct entry into skilled trades, technical professions, and semi-professional occupations. Unlike general secondary teachers, vocational educators are expected to maintain dual competencies as both pedagogical practitioners and domain experts in fields characterized by ongoing technological change (Isopahkala-Bouret, 2010). This dual mandate generates occupational demands that are qualitatively distinct from those experienced by general educators, including the management of technical laboratories and workshops, compliance with workplace health and safety regulations, supervision of student practical assessments, and the cultivation of ongoing relationships with industry partners.

Research on vocational teachers in Southeast Asian contexts has documented elevated rates of occupational burnout, role conflict, and turnover intention relative to their counterparts in general education (Chairat & Therawiwat, 2019; Wongsricha & Kulapichitr, 2021). The Thai vocational education system, administered by the Office of the Vocational Education Commission, encompasses over 400 institutions serving approximately 800,000 students, with teacher retention identified as a persistent systemic challenge (OVEC, 2021). Understanding the psychological and social determinants of vocational teacher well-being is therefore a matter of considerable policy urgency.

Social Support Theory and Occupational Well-being

The theoretical foundation of the present study draws on the stress-buffering model of social support (Cohen & Wills, 1985), which proposes that social support attenuates the adverse effects of stressors on well-being outcomes by providing individuals with informational, emotional, and tangible resources needed to cope with challenging circumstances. In workplace contexts, this model predicts that individuals with high levels of social support will be relatively protected against the well-being consequences of occupational stressors such as WFC (Viswesvaran et al., 1999).

Empirical research has consistently identified multiple distinct sources of workplace social support that may operate independently and interactively on well-being outcomes. Collegial support—the provision of emotional encouragement, professional assistance, and social validation by workplace peers—has been identified as a particularly potent resource for educators, given the social and collaborative nature of teaching work (Skaalvik & Skaalvik, 2017). Principal and supervisory support, while structurally distinct, represent vertical support flows within organizational hierarchies and may influence teacher well-being through mechanisms including resource provision, performance feedback, and the modeling of organizational values (Leithwood et al., 2019). Mentored support, particularly during early career stages, has been theorized to facilitate socialization and competence development (Ingersoll & Strong, 2011), though its effects on established well-being indicators remain less consistently documented.

Work–Family Conflict

Work–family conflict is defined as a form of interrole conflict in which the demands of work and family roles are mutually incompatible, such that participation in one role is made more

difficult by participation in the other (Greenhaus & Beutell, 1985). WFC has been consistently associated with reduced job satisfaction, lower life satisfaction, greater burnout, and elevated turnover intention across diverse occupational contexts (Byron, 2005; Kossek & Ozeki, 1998). Within education, teaching has been identified as an occupation with particularly high WFC risk, given the tendency for work demands to encroach on personal and family time through activities such as lesson preparation, marking, and administrative duties conducted outside formal working hours.

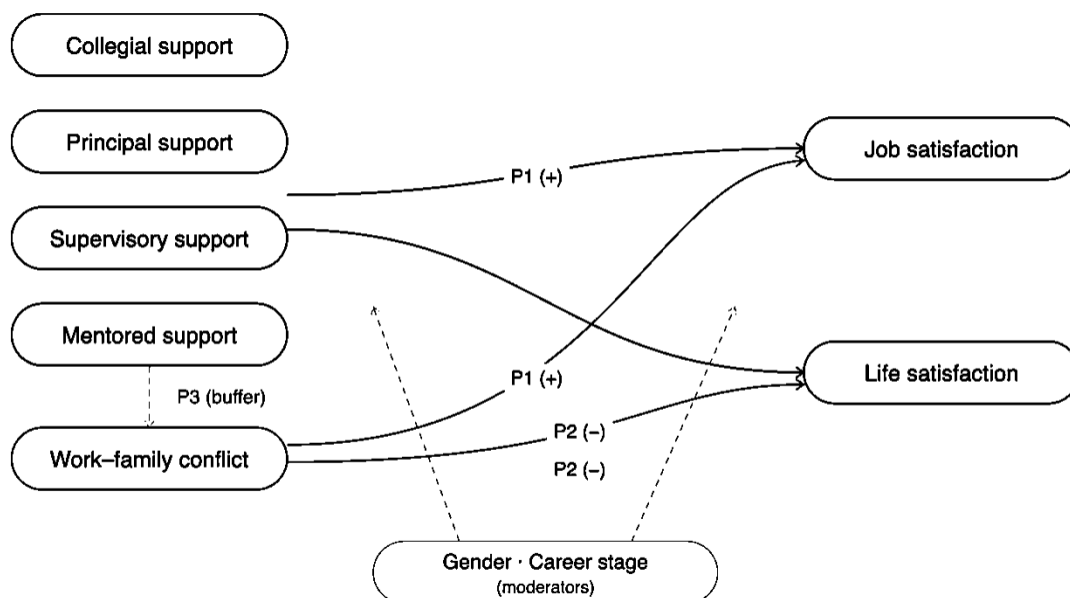
Gender differences in WFC have been a subject of ongoing theoretical debate. Traditional role theory predicts higher WFC among women due to disproportionate family responsibility assumptions; however, emerging evidence suggests that men in professional roles characterized by high time demands may experience comparable or greater WFC, particularly when societal norms construct breadwinner expectations as incompatible with active family engagement (Nohe et al., 2015). Career stage has also been theorized as a moderator of WFC, with early-career professionals disproportionately burdened by simultaneous demands of professional socialization and family formation (Hall, 2002).

Research Propositions

Building on the foregoing theoretical framework, the study was guided by three central propositions.

Figure 1

Conceptual Model of Workplace Social Support, Work–Family Conflict, and Teacher Well-being



Teal arrows (P1) represent the hypothesized positive effects of workplace social support dimensions on job and life satisfaction; coral arrows (P2) represent the hypothesized negative effects of work–family conflict on both outcomes; the dashed line (P3) indicates the proposed buffering interaction between social support and work–family conflict; and gray dashed lines indicate moderation by gender and career stage.

Methodology

Research Design

A cross-sectional survey design was employed to collect data from vocational school teachers across northeastern Thailand. This region was selected on the basis of its demographic representativeness within the national vocational education system and the practical accessibility of institutions through established research networks. The study received institutional ethical approval, and participation was entirely voluntary. All respondents provided informed consent prior to data collection.

Participants

The final analytic sample comprised 518 vocational school teachers ($N = 518$). Participants were employed across multiple vocational colleges and technical institutes within the northeastern region, spanning a range of subject specializations including engineering technology, business administration, hospitality, agriculture, and health sciences. The sample included both male and female instructors and represented a range of career stages from early-career (fewer than five years of experience) to experienced practitioners (five or more years).

Survey instruments were administered in Thai by trained research assistants during scheduled staff meetings, ensuring a high response rate and minimizing missing data. Completed surveys were checked for completeness before inclusion in the analytic dataset.

Measures

Workplace Social Support. Four dimensions of workplace social support were assessed using adapted scales drawing on the Survey of Perceived Organizational Support (Eisenberger et al., 1986) and the Workplace Support Questionnaire (Karasek et al., 1998). The four dimensions comprised: (a) collegial support (support from workplace peers), (b) principal support (support from school principals), (c) supervisory support (support from direct supervisors), and (d) mentored support (guidance from experienced mentor figures). Each subscale consisted of five items rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). All subscales demonstrated acceptable internal consistency (Cronbach's α ranging from .78 to .87).

Work–Family Conflict. WFC was measured using the five-item Work–Family Conflict Scale (Netemeyer et al., 1996), which assesses the extent to which work demands interfere with the fulfillment of family responsibilities. Items were rated on a five-point Likert scale. The scale demonstrated good internal consistency ($\alpha = .83$).

Job Satisfaction. Job satisfaction was assessed using a five-item scale adapted from the Minnesota Satisfaction Questionnaire short form (Weiss et al., 1967), measuring overall satisfaction with the teaching position. Internal consistency was acceptable ($\alpha = .81$).

Life Satisfaction. Life satisfaction was measured using the five-item Satisfaction with Life Scale (SWLS; Diener et al., 1985), a widely validated measure of subjective well-being. The scale demonstrated good reliability ($\alpha = .84$).

Demographic Variables. Gender (coded 0 = female, 1 = male), years of teaching experience (continuous), age, and educational qualification were included as demographic covariates in regression models.

Results

The regression analyses revealed several clear and meaningful patterns across both outcome measures (Tables 1 and 2).

The single most consistent finding was the role of colleague relationships. Across both job satisfaction ($\beta = .329, p < .001$) and life satisfaction ($\beta = .301, p < .001$), support from peers at work was the strongest positive predictor in the model. More than any formal leadership structure or mentoring arrangement, the quality of day-to-day relationships with fellow teachers shaped how satisfied vocational educators felt both at work and in their lives more broadly.

Work–family conflict told an equally consistent story, but in the opposite direction. It was a significant negative predictor of both job satisfaction ($\beta = -.241, p < .001$) and life satisfaction ($\beta = -.225, p < .001$), confirming that when work bleeds into family life, the damage is felt across both domains not just inside the classroom but at home as well.

Perhaps the most striking finding involved principal support, which produced a completely different effect depending on what was being measured. For job satisfaction, principal support was a significant negative predictor ($\beta = -.148, p = .005$) — meaning that closer principal involvement was associated with lower daily professional satisfaction, possibly reflecting experiences of micromanagement or added performance pressure. Yet for life satisfaction, the direction reversed entirely: principal support became a significant positive predictor ($\beta = .203, p < .001$). Teachers may draw broader meaning and stability from institutional leadership even when that same leadership creates friction in their day-to-day work.

Supervisory support showed a more straightforward pattern, contributing positively to both job satisfaction ($\beta = .123, p = .021$) and life satisfaction ($\beta = .154, p = .003$). Mentored support, by contrast, did not reach statistical significance in either model (job satisfaction: $\beta = .079, p = .099$; life satisfaction: $\beta = .065, p = .161$), suggesting that mentoring relationships, at least as measured here, did not independently predict well-being outcomes after accounting for other support sources. Finally, gender was non-significant in both models (job satisfaction: $\beta = .019, p = .635$; life satisfaction: $\beta = -.010, p = .787$), indicating that gender differences in work–family conflict operate through WFC itself rather than through a direct independent effect on satisfaction.

Table 1
Hierarchical Regression Analysis Predicting Job Satisfaction

Predictor	B	SE B	β	t	p
Sex	0.019	0.039	.019	0.476	.635
Principal Support	-0.083	0.030	-.148	-2.818	.005
Supervisory Support	0.088	0.038	.123	2.313	.021
Mentored Support	0.066	0.040	.079	1.652	.099
Colleague Relationship	0.279	0.036	.329	7.712	< .001
Work–Family Conflict	-0.115	0.019	-.241	-6.054	< .001

Note. N = 518. B = unstandardized coefficient; SE B = standard error; β = standardized coefficient; WFC = Work–Family Conflict. Mentored Support was non-significant ($p = .099$). Principal Support showed a negative association with job satisfaction.

Table 2
Hierarchical Regression Analysis Predicting Life Satisfaction (Happiness)

Predictor	B	SE B	β	t	p
Sex	-0.010	0.037	-.010	-0.270	.787
Principal Support	0.105	0.028	.203	3.750	< .001
Supervisory Support	0.102	0.034	.154	3.000	.003
Mentored Support	0.052	0.037	.065	1.405	.161
Colleague Relationship	0.241	0.033	.301	7.303	< .001
Work–Family Conflict	-0.101	0.018	-.225	-5.611	< .001

Note. N = 518. B = unstandardized coefficient; SE B = standard error; β = standardized coefficient; WFC = Work–Family Conflict. Mentored Support was non-significant ($p = .161$). Principal Support showed a positive association with life satisfaction, reversing its direction from Table 1.

Together, these results position peer networks and work–family strain as the two most critical factors for vocational teacher well-being, with the nature of principal leadership deserving closer attention. Future work would benefit from exploring the quality and reciprocity of peer relationships, the specific principal behaviors that support versus pressure teachers, and how work–family strain accumulates differently across career stages and school contexts.

Discussion

Colleagues Matter Most

Across both models, collegial support was the strongest predictor of well-being ($\beta = .329$) for job satisfaction and ($\beta = .301$) for life satisfaction. This is not surprising in isolation; research consistently shows that teachers in supportive peer environments report higher well-being and lower burnout (Collie et al., 2012; Skaalvik & Skaalvik, 2017). What is notable here is the margin. Teachers who perceive a collegial and supportive school environment report higher levels of wellbeing, resilience, and lower levels of stress and burnout and in this sample, that effect outweighed both formal leadership and mentoring combined. The reason likely lies in proximity: colleagues share the same workshop floor, understand the same technical pressures, and can offer help without the power dynamics that come with supervisory or principal relationships. Experienced teachers in particular draw their satisfaction primarily from

collegial collaboration, and this pattern appears to hold strongly in the vocational context as well.

The Principal Support Puzzle

Principal support produced the most unexpected finding: negative for job satisfaction ($\beta = -.148$) but positive for life satisfaction ($\beta = .203$). This split has a plausible explanation. Close principal involvement in day-to-day work may feel less like support and more like monitoring adding accountability pressure that chips away at professional autonomy. Teachers who perceive inadequate resources or a negative school climate report lower job satisfaction, which in turn contributes to higher attrition rates. At the same time, knowing that an institution is actively led may provide a sense of stability that benefits broader life satisfaction, even when it creates friction at work. The practical implication is direct: principals who want to support teacher well-being should step back from task management and focus instead on creating stable, resource-rich conditions being present without being intrusive.

Work–Family Conflict and Teacher Well-being: A Persistent Negative Effect

Work–family conflict was a significant negative predictor of both job satisfaction ($\beta = -.241$) and life satisfaction ($\beta = -.225$). This confirms what spillover theory has long proposed that strain in one life domain does not stay contained there (Staines, 1980). Importantly, social support did not buffer this effect. The two operate independently, meaning that even teachers with strong peer networks still suffer when work encroaches on family life. This is consistent with the main effect model of social support (Cohen & Wills, 1985) and has a clear practical implication: investing in peer networks and reducing work–family conflict are not interchangeable strategies—Sboth are necessary.

Male Teachers: An Overlooked Group

Male teachers reported significantly higher work–family conflict than their female counterparts a finding that cuts against the common assumption that women bear the heavier work–family burden. In Thailand's vocational context, male instructors are disproportionately concentrated in workshop-intensive fields with irregular hours and heavy equipment demands. Cultural expectations around breadwinning compound this, creating a double pressure that is rarely named or addressed in institutional policy. Exploring differential effects for men in particular provides insights into factors which may be of relevance for their retention a concern among practitioners and policymakers. Gender-inclusive WFC interventions are not just equitable—they are strategically necessary for retention.

Early-Career Teachers: A Double Penalty

New teachers faced the highest WFC and the lowest well-being simultaneously. This aligns with life course research identifying the career entry phase as uniquely stressful, when professional socialization, skill development, and family formation all compete at once (Hall, 2002). Support from school leaders plays a critical role in shaping the job satisfaction of novice teachers yet in this sample, mentored support did not independently predict well-being. This does not mean mentoring is irrelevant; it may simply mean that informal, variable mentoring is not enough. What early-career vocational teachers need most is structured access to the collegial networks that experienced teachers have already built because those networks, not formal mentoring, are what the data shows actually protects well-being.

Conclusions and Implications

Conclusions

This study has examined the relationships among workplace social support dimensions, work–family conflict, and well-being outcomes among 518 vocational school teachers in northeastern Thailand. The findings identify collegial peer relationships as the most powerful source of social support for both job and life satisfaction, confirm WFC as a significant and pervasive well-being drain, reveal a theoretically meaningful split effect for principal support across outcome domains, document counter-intuitive gender differences in WFC with male teachers disproportionately affected, and describe an early-career double penalty pattern of compounded vulnerability. These findings collectively advance understanding of the psychological ecology of vocational teacher well-being and have direct relevance to both research and practice.

Implications for Practice

Three sets of practice-oriented recommendations follow from the findings. First, institutional leaders should prioritize the deliberate engineering of collegial peer connections within vocational schools. This includes scheduling protected time for collaborative professional activities, creating shared workspaces that facilitate organic peer interaction, and recognizing peer support as a legitimate and valuable institutional resource rather than an informal byproduct of workplace culture. Structured peer-mentoring programs targeted specifically at early-career teachers may simultaneously connect new instructors to protective peer networks while addressing the double penalty of elevated WFC and diminished well-being that characterizes the career entry phase.

Second, principals and institutional managers should critically examine their leadership style in relation to the split effect identified here. Effective leadership for vocational teacher well-being likely involves a shift from task-focused monitoring toward a role that prioritizes systemic stability, resource provision, and advocacy for teacher workload management. In practical terms, this might involve principals actively lobbying for WFC-supportive policies rather than creating additional performance demands.

Third, and most urgently, institutional leaders should establish formal boundary intervention policies specifically designed to mitigate WFC. Such policies might include caps on after-hours communication expectations, flexible scheduling provisions for family emergencies, workload equity audits, and the destigmatization of work–family balance discussions, particularly for male educators who may lack cultural sanction for expressing WFC-related distress.

Limitations and Future Research

Several limitations of the present study warrant acknowledgment. The cross-sectional design precludes causal inference, and the regional sampling frame limits generalizability to the broader national vocational education population. Self-reported measures are subject to common method variance, although the diversity of predictor and outcome constructs reduces the risk of systematic bias. The non-significance of interaction terms may reflect insufficient statistical power for detecting moderation effects rather than the genuine absence of buffering, and future research with larger samples should revisit moderation hypotheses. Longitudinal designs tracking teachers across career stages would provide valuable evidence on

developmental trajectories of WFC and well-being. Qualitative investigations, particularly with male teachers, would illuminate the mechanisms by which work–family strain is experienced and managed in this underresearched subgroup.

Future research might also extend the present framework to examine organizational-level predictors of vocational teacher well-being, including school climate, workload policies, and leadership culture, as contextual factors that may condition the effects of individual-level social support and WFC. Cross-national comparative studies would further illuminate the extent to which findings from the Thai vocational education context generalize to vocational systems in other national and cultural contexts.

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

Claude (Anthropic), ChatGPT (OpenAI), Perplexity AI, and NotebookLM (Google) were used to assist with manuscript writing, editing, literature search, and diagram creation. These tools were not used in data collection, analysis, or interpretation of findings. All AI-assisted content was reviewed and approved by the authors, who take full responsibility for the work presented.

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Exploring Teachers' Perspectives of Developing Creativity in Students With Attention Deficit Hyperactivity Disorder: A Hermeneutic Phenomenology

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Abstract

The purpose of this hermeneutic phenomenological study was to interpret the lived experience of teachers developing the creativity of students with ADHD in the southern United States. At this stage in the research, high school students with ADHD were generally defined as students who have been formally diagnosed with attention-deficit hyperactivity disorder. The theory guiding this study was Karwowski's theory of creative growth mindset. The central research question for this study was: What are the lived experiences of teachers developing the creativity of high school students with ADHD? This study was a hermeneutic phenomenology that explored the experiences of 10–15 high school teachers whose students include those who are diagnosed with ADHD. Data were collected through individual interviews, journal prompts, and focus groups. The data were analyzed following van Manen's wholistic, selective, and detailed reading approaches. The data revealed five themes: (a) students with ADHD are most creative within structure, (b) students with diverse ADHD have diverse creative qualities, (c) students with ADHD process information differently than others, (d) students with ADHD need safety and trust, and (e) teachers can develop creativity in their students with ADHD. The findings were interpreted as: (a) students with ADHD need creativity in the classroom, (b) creativity in the classroom does not have to be elaborate, (c) creative strategies help build safety and trust in the classroom, (d) structure is necessary for developing creativity, and (e) teachers need training to be effective in developing creativity.

Keywords: attention deficit hyperactivity disorder, creative growth mindset, developing

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Introduction

The purpose of this hermeneutic phenomenological study was to understand the lived experience of teachers developing the creativity of students with ADHD at a charter school district in the southern United States. This article starts with a review of the scholarly research related to this topic, including Karwowski's (2014) theory of creative growth mindset (CGM) and how it relates to students with ADHD. The article includes the methodology of the study, as well as the results, discussion, and recommendations that came from the data.

Literature Review

The problem is that students with attention deficit hyperactivity disorder (ADHD) continue to achieve lower than their school peers (Cheesman et al., 2022; Lawrence et al., 2021; Visser et al., 2020). The purpose of this hermeneutic phenomenological study was to understand the lived experience of teachers developing the creativity of students with ADHD in the United States. Recent research confirms that students with ADHD exhibit many positive traits, including creativity, that could be included in the classroom to increase learning (Schippers et al., 2022; Steglich-Petersen & Varga, 2023). Using Karwowski's (2014) theory of creative growth mindset, this study explored how teachers' growth attitudes toward their students with ADHD can positively affect academic achievement. Gralewski and Karwowski (2019) defined creativity as a set of characteristics that allow individuals to solve problems and generate new and appropriate ideas within a certain context, and this definition will be used for this study.

Theoretical Framework

The theoretical framework for this study was the creative growth mindset (CGM) (Karwowski, 2014). CGM builds on Dweck's (1999) mindset theory. He defined the creative mindset as "beliefs about the stable versus malleable character and nature of creativity" (Karwowski, 2014, p. 62). Karwowski's (2014, 2018, 2022) research consistently revealed that beliefs about creativity can be encouraged and developed, making it malleable. Karwowski and Beghetto (2019) studied creative behaviors and found that they result from a person's intentional actions, which are influenced by the person's beliefs. If people believe their creativity can be developed, their attitudes and behavior towards creative tasks grow (Karwowski & Beghetto, 2019). CGM is the belief that creativity can grow as a person's beliefs about their own creativity are nurtured (Karwowski, 2014).

Stigmas Associated With ADHD

Students diagnosed with ADHD are stigmatized by their peers and teachers (Carr-Fanning, 2020; O'Connor et al., 2022). In many cases, the diagnosis, not the behaviors displayed, leads to a negative stigma (O'Connor et al., 2022). The stigmas associated with ADHD include low academic expectations, social rejection, expectations of bad behavior, assumptions of laziness, and overall negative repute (Metzger & Hamilton, 2021; Schoeman & Voges, 2022; Speerforck et al., 2019). Consequently, parents often avoid pursuing a diagnosis of ADHD for their children because of the fear of stigma (Schoeman & Voges, 2022; Speerforck et al., 2019).

Some teachers reported feelings of stress and irritation toward their students with ADHD (Mulholland et al., 2023). They found students diagnosed with ADHD to be difficult to teach and believe them to be willfully disobedient (Adamis et al., 2024; Mulholland et al., 2023; Wijerathna et al., 2023). In some cases, teachers attribute every negative behavior in the

classroom to ADHD (Adamis et al., 2024). Some teachers believe that students with ADHD use their symptoms as an excuse for non-compliance in the classroom (Mansfield & Soni, 2024). They also believe that an ADHD diagnosis is too easily obtained from a doctor or specialist, and those who do not want to comply seek out the diagnosis as a way to avoid school work (Lynch & Davison, 2024). Many teachers also believe that students with ADHD have a negative impact on the learning of other students (Mansfield & Soni, 2024). Students with ADHD report feeling overwhelmed when they realize their teacher has a negative perception of them (Mansfield & Soni, 2024). An ADHD diagnosis can cause teachers to expect disruptive behaviors and academic struggles (Metzger & Hamilton, 2021; Speerforck et al., 2019). Teachers with negative attitudes toward their students with ADHD are much less likely to be successful with classroom interventions that aim to help those students (Yang et al., 2024). Gaining insight into the creative attributes of students with ADHD could help reduce some of the negative issues those students face.

Teacher Positive Beliefs and Attitudes About ADHD

What teachers believe shapes their thinking and actions, affecting what the learning environment produces (Braude & Dwarika, 2020; Mulholland et al., 2023). Many teachers have positive attitudes toward students with ADHD, but their beliefs about ADHD can diminish their enthusiasm (McDougal et al., 2023; Mohr-Jensen et al., 2019; Mulholland et al., 2023; Wijerathna et al., 2023). Most teachers can articulate the significant symptoms of ADHD but have minimal extensive knowledge about ADHD (Adamis et al., 2024; Mohr-Jensen et al., 2019). Therefore, their beliefs about ADHD can be based on half-truths or opinions (Mohr-Jensen et al., 2019). Teachers who have the most consistently positive attitudes toward students diagnosed with ADHD are those who have training in and knowledge of ADHD and also tend to be under 45 years old (Adamis et al., 2024; Akdag, 2023; Mulholland et al., 2023; Ward et al., 2021). One explanation for the age factor is that increasing age can lead to lower tolerance; another is that younger teachers are part of the cultural shift toward more understanding of children with special needs (Adamis et al., 2024). Another key factor for having a positive attitude about students with ADHD is prior experience with those students (Akdag, 2023; Braude & Dwarika, 2020; Mulholland et al., 2023). Researchers consistently conclude that teachers' lack of training and knowledge regarding ADHD, so those who have taught students with ADHD feel more knowledgeable and, therefore, have more positive attitudes (Akdag, 2023; Braude & Dwarika, 2020; Mohr-Jensen et al., 2019; Mulholland et al., 2023; Ward et al., 2021).

Creativity and ADHD

One of the positive traits of ADHD is creativity (Gronneberg et al., 2024; Nordby et al., 2023; Schippers et al., 2022). ADHD is positively linked to increased creativity in students (Zaghi et al., 2023). Increased creativity in students with ADHD could be caused by a wider attention filter (Zaghi et al., 2023). More original ideas can form when more information is processed through the wider attention filter (Stearns, 2015; Zaghi et al., 2023). Increased creativity in students with ADHD could also be caused by a preference for information exploration when searching for solutions (Steglich-Petersen & Varga, 2023; Zaghi et al., 2023). Taking advantage of the increased creativity of students with ADHD can build their resilience, intrinsic motivation, and the ability to focus on school tasks (Hai & Climie, 2022; Moreno & Jurado, 2023). Instead of seeing students with ADHD as underachievers, teachers can engage and motivate those students by recognizing their natural creativity (Akpur, 2020; Zaghi et al., 2023). Through strategies like exploration, real-world problem-solving, and hands-on learning,

students with ADHD can use their natural curiosity positively (Steglich-Petersen & Varga, 2023; Zaghi et al., 2023).

Since one of the strengths of students with ADHD is creativity, it makes sense that promoting creativity in schools could provide positive experiences for them (Gronneberg et al., 2024; Nordby et al., 2023; Schippers et al., 2022). Many students with ADHD lack motivation and engagement in traditional classroom activities (Almulla, 2023; Cerezo et al., 2024). However, they exhibit high levels of engagement in tasks that require creativity (Cerezo et al., 2024). Students with ADHD view themselves as highly creative and believe they excel at generating new ideas (Girard-Joyal & Gauthier, 2022). In addition, they believe they excel at generating new ideas (Steele et al., 2021). When creativity is promoted in the classroom culture, students with ADHD feel emotional relief because they believe their needs are met (Kim & Chung, 2024).

Academic Achievement and Creativity

In recent years, creativity has been closely tied to academic achievement (Akpur, 2020; Almulla, 2023; Guo et al., 2021; Tzachrista et al., 2023). Creativity helps with critical thinking and problem-solving, which are 21st-century skills that aid academic success (Akpur, 2020). Students in learning environments that foster creativity and inquisitiveness can develop necessary critical thinking skills (Akpur, 2020). Creativity also enhances memory abilities, reduces stress, and improves communication, all of which can be linked to better academic outcomes (Tzachrista et al., 2023). Creative activities help students become independent learners who can problem-solve independently (Tzachrista et al., 2023). Independence in learning tasks, which is necessary for achievement, has been linked with creativity, and self-efficacy in creativity is a key factor in feeling confident to work independently (Du et al., 2020; Wang et al., 2021). Students need teamwork, creative tasks, and assignments that require critical thinking to improve their academic success (Almulla, 2023). The collaboration that comes with teamwork aids in increasing critical thinking, creativity, and communication skills (You, 2021). Students need to be able to work through the issues they face daily, and creative teaching practices help students build those skills while enhancing learning (Moreno & Jurado, 2023).

Classroom Strategies for Creativity

One aspect of hidden potential in students with ADHD is creativity (Beliard et al., 2019; Stearns, 2015). When that creativity is nurtured, students with ADHD thrive (Stearns, 2015). Educators who incorporate creativity into their teaching and assessment practices offer students with ADHD an outlet for their creative tendencies that match their neurodivergent brain (Zaghi et al., 2023). Creative activities in the classroom help students diagnosed with ADHD better engage with and retain more of the content (Zaghi et al., 2023). Since students with ADHD are naturally curious, creativity in the classroom setting gives them an outlet for their innate neurodiversity (Steglich-Petersen & Varga, 2023).

There are many ways that creativity can be used in the classroom. Teaching practices that promote creativity are typically less strict, less structured, and more experiential, with more elements of choice (Conradty et al., 2020). A less structured classroom environment may be difficult for some students with ADHD, so the teacher must remain the director of the classroom experience, ensuring the classroom culture remains positive, collaborative, and safe for all learners (Conradty et al., 2020). The teacher must also be the knowledge expert and the

role model, guiding learners as needed through mistakes and disruptive behaviors (Conradty et al., 2020). Conradty et al. (2020) found that less structured activities increase creativity and motivation in students through problem-solving. Experiential activities, like science labs, role-playing, field trips, and scavenger hunts, can take mundane content to a creative level once the students have enough background information to complete the tasks (Amorati & Hajek, 2021; Ferguson & Prain, 2020; Prasath et al., 2023). Creativity is fostered when students can imagine, explore, experiment, test, manipulate, and speculate in a science lab or on a field trip (Conradty et al., 2020). The teacher becomes the facilitator who directs and manages the students as needed and provides clear directions and limits for the activity (Amorati & Hajek, 2021). Amorati and Hajek (2021) found that experiential experiences increase student motivation, increase students' real-world understanding of the content, and provide an outlet for creativity. Reflective writing assignments allow students to describe their thoughts creatively on any topic and give their explanations or solutions (Daher, 2022; Prasath et al., 2023). Group work and project-based learning naturally strengthen creativity and provide positive challenges for students (Daher, 2022). Daher found that essential elements of successful group work include freedom, positive challenge, supervisory encouragement, group support, and sufficient resources. The teacher's role in facilitating each element is vital to the group's success. As students work together to sort out the problem and develop solutions, they learn how to think creatively (Daher, 2022; Eddles-Hirsch et al., 2020). Creative strategies can be as simple as offering choices, like taking a test or writing an essay to show mastery of content (Amorati & Hajek, 2021; Daher, 2022). Another simple creative strategy is asking students a what-if question in response to a history lesson or short story (Daher, 2022).

Teachers must encourage dialogue and discussion as solutions are worked out and ideas are rejected (Daher, 2022). Students need direction, boundaries, encouragement, and affirmation to reach their creative potential (Daher, 2022; Kalantari et al., 2023). However, boundaries that increase creativity must be instructive, guiding, and needed instead of restrictive, domineering, and unnecessary (Daher, 2022). Students also need trust and rapport with the teacher to be comfortable sharing their creative ideas (Kalantari et al., 2023).

Adults with ADHD, including many who are famous, reported encouraging news regarding the positive ways ADHD has impacted their lives (Nordby et al., 2023). By examining a creative growth mindset and how it can promote the natural creativity of students with ADHD, this study sought to understand teachers' perceptions of how creativity could impact their teaching strategies.

Methodology

Setting

The setting for this study was anywhere in the United States where teachers taught students with ADHD. Social media groups for teachers of students with ADHD were targeted for this study, as they provide valuable resources and support for teachers. Members of those groups indicated their interest in students with ADHD when they joined the group.

Participants

The participants in this study were 10 teachers from various regions of the United States. There were seven female and three male participants, exemplifying teachers from different grade levels and content areas.

Data Collection Plan

The first data collection method for this study was individual interviews. Interviewing the participants individually allowed me to understand the experiences of teaching students with ADHD from the teachers' perspective (Creswell & Poth, 2018). The second data collection method was a journal prompt. The purpose of a journal prompt was to complement the data gathered from the interviews (Yin, 2015). The final data collection method was focus groups. Focus groups allowed me to mediate as the group members answered the questions. (Yin, 2015). The participants were assigned to one of three focus groups, with varying numbers in each group based on when each participant was available. Multiple focus groups provided the richest data (Yin, 2015).

Table 1

Individual Interview Questions

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1. Please describe your educational background and career through your current position.
 2. Describe your experiences when working with students with ADHD in your classes.
 3. Describe successful practices you use when working with students in your classes.
 4. Define creativity as it relates to your process of teaching.
 5. What creative qualities do you see in students with ADHD?
 6. What experiences have you had that prepared you to work with students diagnosed with ADHD as a teacher?
 7. Describe an activity (or activities) that you did with the students with ADHD that required them to problem-solve.
 8. What were the results of the activity in #6?
 9. Describe an activity (or activities) that you did with your students with ADHD that required them to develop new ideas.
 10. What were the results of the activity in #8?
 11. What teaching practices have you used that tapped into the creative qualities you see in your students diagnosed with ADHD?
 12. What activities do you do with your students with ADHD that promote a creative growth mindset?
 13. How do your students with ADHD respond to activities requiring creativity in your classroom?
 14. What professional development would you like to have to better meet the needs of your students with ADHD?
 15. What else would you like to add to our discussion of your experiences with students diagnosed with ADHD that we haven't discussed?
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Table 2

Journal Prompt

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1. Using 200–300 words, describe in detail a day in your classroom that was a successful learning experience for your students diagnosed with ADHD. Include teaching strategies, behavior support, other interventions, and how you incorporated problem-solving skills and generated new ideas.
-

Table 3*Focus Group Questions*

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1. What is your understanding of the creative growth mindset?
 2. How does your understanding of the creative growth mindset reflect in your daily teaching practices?
 3. How can you encourage each other in teaching students with ADHD?
 4. What teaching strategies can we agree on to best meet the needs of students with ADHD?
 5. Describe the ways you see students diagnosed with ADHD being creative.
 6. What ideas or actions can you share to help design creative experiences for your students with ADHD?
 7. What else would you like to add to the discussion of ADHD and creative growth mindset?

Results

The data from this study revealed five overall themes. The first is that students with ADHD are most creative within structure. The second is that students with diverse ADHD have diverse creative qualities. The third theme is that students with ADHD process information differently than others. The last two themes are that students with ADHD need safety and trust, and teachers can develop creativity in their students with ADHD.

Students With ADHD Are Most Creative Within Structure

The participants all agreed that structure is necessary for students with ADHD. The need for structure was coded in vivo 124 times and was articulated in all three methods of data collection. Jane said, “They [students with ADHD] must know what to expect, and that is good for all students.” Heather said, “Structure is good. Even if you have loose moments, structure allows you to get back on track.” Austyn commented, “You have to provide scaffolding so your students with ADHD can do creative tasks well.”

Students With ADHD Have Diverse Creative Qualities

The next theme was that students with ADHD have diverse creative qualities. All 10 participants agreed that creativity is a trait they find in their students diagnosed with ADHD. Diverse creative qualities were coded in vivo 112 times and were discussed in all three data collection methods. Holly said very simply, “Actually, I find students with ADHD to be extraordinarily creative.” The participants described numerous ways in which creativity is evident in their students with ADHD. In her interview, Jane said, “When I get out of the way, anything my students with ADHD come up with will be ten times better than what I would have come up with.” Students with ADHD were diversely creative, as evident across all three sources of data, and were coded in vivo 90 times.

Students With ADHD Process Information Differently Than Others

All 10 participants articulated different ways their students with ADHD process information. The diverse ways students with ADHD process information were coded in vivo 102 times and were evident in all three data collection methods. John, who teaches math, said, “My students

with ADHD often surprise me with different ways of solving math problems. The process I teach does not always make sense to my students with ADHD, so they find a way that works for them.” Mary Jane agreed with John, saying, “The linear process I use to teach solving math problems does not work for all of my students with ADHD. I tell them that as long as they can explain their process for finding the answer, I am fine with it.” All of the participants recognized that students with ADHD have brains that work differently. They were intentional about finding strategies that work for the brains of individuals with ADHD.

Students With ADHD Need Safety and Trust

All 10 participants indicated that students with ADHD have needs that must be met in order to function creatively. The needs of students with ADHD were coded in vivo 131 times and were discussed in each of the three data collection methods. The need for safety and trust in the classroom was mentioned by all 10 of the participants. John said, “If I want my students with ADHD to succeed, the classroom must be a safe place to learn.” Heather quipped, “It all starts with everyone being respectful of each other.” Mary Jane expressed, “Students with ADHD have to believe that no one is judging them or critiquing them.”

Teachers Can Develop Creativity in Students With ADHD

All 10 of the participants agreed that teachers can develop creativity in students with ADHD. The ways the participants developed creativity were coded in vivo 125 times across all three data collection types. Growing creativity in students begins with building a creative culture. Elle said, “Whole brain teaching offers many opportunities for a creative classroom culture. They can create an attention-getter or rename aspects of the whole-brain teaching curriculum. It really gives them many ways to be creative.” Mary Jane fosters a creative culture in her classroom by encouraging students to make suggestions about topics or assignments. She said, “The students will say, ‘Why can’t we do it this way?’ and I will say, ‘Let’s try it!’ Sometimes their suggestion works, sometimes it doesn’t.”

Discussion

This section contains the interpretations from the findings of the study. The five interpretations from the study were (a) students with ADHD need creativity in the classroom, (b) creativity in the classroom does not have to be elaborate, (c) creative strategies help build safety and trust in the classroom, (d) structure is necessary for developing creativity, and (e) teachers need training to be effective in developing creativity. Empirical and theoretical sources helped confirm and provide context for the interpretations. The interpretations are based on the codes and themes that emerged from the data.

Students With ADHD Need Creativity in the Classroom

The data revealed that creativity in the classroom addresses many of the needs of students with ADHD. It was also clear from the data that students with ADHD have brains that work differently than other students. Previous literature indicated that when creativity is nurtured, students with ADHD tend to thrive (Stearns, 2015). In addition, when educators incorporate creativity into their teaching and assessment practices, they offer students with ADHD an outlet for their creative tendencies that match their neurodivergent brain (Zaghi et al., 2023). Teachers who understand the creative aspects of ADHD can create classroom environments that better suit their neurodivergent students (Hatak et al., 2021). The data showed that classroom

environments that work best for neurodivergent students are safe, full of trust, and allow for creativity.

Creativity in the Classroom Does Not Have to Be Elaborate

The data from this study highlighted different ways that creativity can be incorporated into the classroom setting. The data revealed that simple tasks that encourage creativity meet the creative needs of students with ADHD. Creativity in the classroom can be as simple as allowing students to solve problems using their own methods, as long as they get the correct answer. Other creative options from the data that are easy to implement include illustrating spelling words, using colored paper for handouts, or working with partners. The literature confirmed that creative activities in the classroom help students diagnosed with ADHD engage more effectively with and retain more of the content (Zaghi et al., 2023).

Creativity Strategies Help Build Safety and Trust in the Classroom

The data from this study revealed that students with ADHD need to feel safe in the classroom. The data further showed that creativity in the classroom adds the safety and trust that is necessary. The literature confirmed that students with ADHD need a supportive school environment (Hite et al., 2021; Krtkova et al., 2023). They want their teachers to value their input and listen to their ideas (Gibbs et al., 2023). According to the literature, teachers need to connect with students with ADHD (Saulsberry et al., 2020). Suggested ways to build connections with students included (a) understanding and accepting that they are different from their peers, (b) understanding that traditional teaching practices may not be effective for students with ADHD, (c) connecting through protection, which includes understanding the potential harm that could affect the student and how to avoid it, and (d) understanding the positive correlation between creativity and well-being (Acar et al., 2021; Li & Wu, 2024; Saulsberry et al., 2020).

Structure is Necessary for Developing Creativity

The data from this study indicated that students with ADHD require structure to complete creative tasks. This aligns with the literature, which states that the teacher becomes the facilitator, directing and managing students as needed and providing clear directions and limits for the activity (Amorati & Hajek, 2021). The literature showed that teaching practices that promote creativity are typically less strict, less structured, and more experiential, with a greater emphasis on elements of choice (Conradty et al., 2020). However, the literature also revealed that a less structured classroom environment may be difficult for some students with ADHD, so the teacher must remain the director of the classroom experience, ensuring the classroom culture remains positive, collaborative, and safe for all learners (Conradty et al., 2020).

Teachers Need Training to Be Effective in Developing Creativity

The data revealed that teachers recognize their need to stay informed and up-to-date about current teaching practices for students with ADHD. The data also showed that teachers need to be creative themselves to best manage creative activities. The literature supports the idea that for teachers to believe their experiences with students with ADHD can be positive, they need adequate training and exposure to ADHD (Mulholland et al., 2023; Ward et al., 2021). To increase creativity in teachers, the literature encouraged creativity training that typically

focuses on building creative self-efficacy, which enhances their feelings about their ability to be creative (Stolz et al., 2022).

Implications

The implications for policy are aimed at schools and school districts that have the ability to implement professional development and training for teachers. The first implication for policy is to provide creativity training for teachers. The literature suggested several components that should be incorporated in creativity training, which included focusing on building creative self-efficacy, obtaining a theoretical understanding of creativity, encouraging divergent thinking, and guiding the selection of the best solution (Fletcher et al., 2023; Liu et al., 2020; Sio & Lortie-Forgues, 2024; Sun et al., 2020). The second implication for policy is to offer training in creative strategies for teachers. The data from this study suggest that teachers want time to collaborate informally with their peers, as well as formal training to better serve students with ADHD. The third implication for policy is to allow teachers to offer creative options for summative assessments. This study's data showed that teachers recognize that students with ADHD flourish when allowed to use art, music, and other creative talents to express their understanding of what they have learned.

The implications for practice are aimed at teachers. The first implication for practice is to prioritize building relationships with all students. The data were clear that students with ADHD need trust and safety, and that it works for all students. The second implication for practice is to start with small, creative options. Both the data and the literature indicate that creative tasks in the classroom do not have to be complicated or expensive. The third implication for practice is to incorporate choice into your formative assessments. Teachers can allow students to demonstrate understanding of the content by writing a song or drawing a picture, rather than writing a summary for homework.

The empirical implications of this study are evident in their connections to previous literature. The first empirical implication was that previous literature indicated that teachers do not always have positive beliefs about students with ADHD (McDougal et al., 2023; Mohr-Jensen et al., 2019; Mulholland et al., 2023; Wijerathna et al., 2023). This study contributes to the literature by confirming the positive beliefs teachers hold about students with ADHD and their creativity. The second empirical implication is that previous literature found that students with ADHD need safety and trust in the classroom (Daher, 2022; Kalantari et al., 2023). This study confirmed that safety and trust are necessary for students with ADHD. This study also extends the literature by finding that safety and trust are enhanced by creative strategies. The third empirical implication of this study is that creative strategies do not have to be complicated. Previous literature found that teachers who incorporate creative strategies in their classrooms create an outlet for the neurodivergent brains of students with ADHD (Zaghi et al., 2023).

The theoretical implications for this study relate to the theoretical framework. The creative growth mindset (CGM) was the theoretical framework for this study. CGM is defined as beliefs about the stable versus malleable character and nature of creativity (Karwowski, 2014). Gralewski and Karwowski (2019) defined creativity as a set of characteristics that enable individuals to solve problems and generate new and relevant ideas within a specific context. The data from this study revealed that teachers believe they can develop creativity in their students with ADHD. That belief aligns with the malleable character and nature of creativity identified in CGM. Karwowski's (2014, 2018, 2022) research consistently revealed that beliefs about creativity can be encouraged and developed, making it malleable. Data also showed that

students with ADHD need structure to develop creativity. The need for structure aligns with the definition of creativity, which stipulates that creativity occurs within a specific context. This study further extends the theory of CGM by specifically examining the development of creativity in the school setting for students with ADHD. The data from this study showed that creativity is not just an option for students with ADHD. Creative strategies are necessary for students with ADHD.

Conclusion

Summary

The purpose of this hermeneutic phenomenological study was to interpret the lived experience of developing the creativity of students with ADHD for teachers in the United States. Creativity in students with ADHD was generally defined as the ability to generate products or ideas that are novel, useful, and appropriate at the same time (Gralewski & Karwowski, 2019). The theory guiding this study was Karwowski's (2014) creative growth mindset. Participants were recruited using convenience sampling and a screening survey to determine their eligibility. Data was collected using individual interviews, a journal prompt, and focus groups. Data was analyzed using van Manen's (2018) four steps for data analysis. The data revealed five themes of: (a) students with ADHD are most creative within structure, (b) students with diverse ADHD have diverse creative qualities, (c) students with ADHD process information differently than others, (d) students with ADHD need safety and trust, and (e) teachers can develop creativity in their students with ADHD. The interpretations of the data were: (a) students with ADHD need creativity in the classroom, (b) creativity in the classroom does not have to be elaborate, (c) creative strategies help build safety and trust in the classroom, (d) structure is necessary for developing creativity, and (e) teachers need training to be effective in developing creativity. Recommendations for future research include studying creativity in adults with ADHD and doing a longitudinal study of students with ADHD and creativity. This results of this study confirmed what students with ADHD already know about themselves; creativity is important to their well-being and academic success.

Recommendations

The first recommendation for future research is to conduct a similar qualitative study of adults with ADHD who are creative to understand how their creativity was developed. The second recommendation for future research is to consider a qualitative study of creativity from the perspective of school administrators. The third recommendation for future research is to conduct a longitudinal study examining the relationship between students with ADHD and creativity. Observing creativity in students over a long period of time could add significantly to the literature regarding ADHD and creativity. The final recommendation for future research is a quantitative study that measures effects of creativity on academic achievement.

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.

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Developing Problem-Solving Skills in Mathematics Teacher Education: Detecting Missing Ideas

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Abstract

The study sought to identify gaps in teachers' readiness to implement a problem-solving approach in mathematics. To achieve that, we analyzed the journals of in-service mathematics teachers enrolled in a graduate course at a Canadian university in 2022. The course focused on developing mathematical thinking through reading and practice. Participants wrote weekly journals describing their previous problem-solving experiences – both as students and teachers – and any ongoing changes resulting from the coursework. Nine teachers who perceived their past encounters with solving mathematical problems as positive were selected for the study. However, this favorable perception of problem-solving alone was insufficient for the confident and effective implementation of the approach in the classroom. We found that, prior to taking the course, the teachers were unaware of many ideas identified in research literature as fundamental and vital to the problem-solving process, let alone had the opportunity to test them in action. In this paper we discuss the six most common ideas cited by teachers in their journals and labeled as both new and useful. Our findings highlight a significant disconnect between research-based recommendations for mathematical problem-solving and the teachers' prior professional experiences. This deficiency in theoretical grounding may hinder pedagogical success.

Keywords: problem-solving, critical thinking, teacher education, mathematics

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Introduction

For the purpose of our discussion, we define problem-solving as an activity in which the learner is required to find a solution to a question for which they know neither the answer nor an approach ahead of time, and thus the activity calls for some creative insight (Schoenfeld, 1992). Mathematical problem-solving involves logical reasoning, analytical skills, structured thinking and pattern recognition. These skills are not only crucial in mathematics but are also transferable to other areas of life and work (Wang et al., 2025). While mathematical problem-solving can be challenging for some students, it presents opportunities for developing perseverance, building confidence through overcoming difficulties, and fostering a growth mindset (Dinapoli & Miller, 2022). Therefore, numerous national curricula advocate for problem-solving as a teaching methodology (Stacey, 2005). For instance, the National Council of Teachers of Mathematics (NCTM, 1980, 2000) identifies problem-solving as an integral part of mathematics learning and suggests that problem-solving must be the focus of school mathematics. Similarly, the Programme for International Student Assessment (PISA) aims at identifying and promoting the ability of an individual to understand and solve problem situations, including “the willingness to engage in such situations to achieve one's potential as a constructive and reflective citizen” (OECD, 2012, p. 7).

Young students may enjoy solving problems and puzzles related to mathematics due to children's natural curiosity and sense of accomplishment when solving simple problems. However, oftentimes this attitude changes as students grow and the volume, depth and abstractness of material significantly increase (Dowker et al., 2019). Thus, it is important to explore what can be done to address this phenomenon, in particular, from the perspective of teacher education and professional development. Specifically, the following question is of interest (Lester, 2013): What knowledge and experiences could be useful for teachers to have in order to help their students in learning mathematics through problem-solving activities?

To effectively guide students, teachers need mathematical content knowledge that include a strong understanding of mathematical concepts and procedures. Teachers should be familiar with various problem-solving strategies and heuristics, such as making diagrams, looking for patterns, and working backwards (Piñeiro et al., 2022). As well, teachers should demonstrate problem-solving processes such as representing, analyzing, interpreting and communicating (Foster et al., 2014). Chapman (2015) observed that mathematics problem-solving knowledge for teaching is a complex network of interdependent knowledge. In addition to the problem-solving content knowledge, teachers benefit from knowledge of students as problem solvers, instructional practices for problem-solving and the role of affective factors and beliefs on students' success with solving problems.

Despite many recent advances in research about problem-solving, there still a need for research about teaching through problem-solving (Weber & Leikin, 2016). In this paper we aim to detect some missing elements in problem-solving knowledge of practicing teachers. We considered a group of teachers who perceived themselves as capable problem solvers, had positive experiences with this way of learning mathematics and desired to implement problem-solving activities in their classes. At the same time, by enrolling in the course, these teachers sought to build confidence and enhance their effectiveness when implementing classroom problem-solving strategies. We were interested to find out to what extent these teachers were familiar with the most fundamental practices and ideas about problem-solving identified in the mathematics education research literature.

This paper is organised as follows: in section 2 we provide a brief summary of contemporary research on problem-solving. In section 3 we describe the context of data collection, methodology and the research question. In section 4 we present our findings. The last section contains our conclusions.

Literature Review on Problem-Solving

Research literature on problem-solving in mathematics reflects the epistemological, cognitive, metacognitive, affective, and pedagogical aspects of the problem-solving activity (Felmer et al., 2016; Liljedahl et al., 2016; Mason et al., 1982/2010; Schoenfeld, 1985, 1992; Silver 1985). In this section we briefly outline these aspects and main characteristics of this process.

A task that could be done by a familiar procedure (e.g. solving a quadratic equation using the formula for its roots) is an exercise (Schoenfeld, 1992). Solving many exercises in order to memorise certain procedures may be referred to as training. Indeed, extensive practice with given methods is useful for the learning about mathematical tools, but it is radically different from solving non-routine problems, because in the latter activity a method of solving needs to be found by the learner. More precisely, according to the heuristics proposed by Polya (1945/2004), the learner needs to understand the problem and develop a plan of their approach. Next, they implement the plan finding an answer, and finally, they check and elaborate on their solution. The experience of planning and consequently, of making one's own choices and inventions during the act of problem-solving helps students construct their own understandings out of many facts, methods, ideas, and other information available to them. This is consistent with the view on mathematics learning as a constructive rather than absorptive activity.

It has been noted that problem-solving at various levels relies upon mathematical creativity, the process which consists of four stages: initiation, incubation, illumination and verification (Hadamard, 1945). The initiation phase consists of deliberate and conscious work that includes understanding of and engagement with the problem along with recollection of past experience and study of related mathematical facts and tools. It creates the tension of unresolved effort when the solver is stuck and seemingly has no progress. The incubation stage signifies the continuation of work on the problem at the subconscious level. A rapid coming to mind of an idea how to proceed in order to attack the problem is referred to as the illumination stage or the AHA moment. If it happens, it usually results from the bridging of previous subconscious and conscious work on the problem. "These sudden inspirations never happen except after some days of voluntary effort which has appeared absolutely fruitless and whence nothing good seems to have come" (Poincaré, 1952, p. 56).

The correctness of the emerged idea is examined by the solver at the verification stage. This could include technical implementation of the idea as well as making judgement about the efficiency and possible modifications of the found approach. Problem solvers benefit from writing careful protocols of the work progress, especially at the initiation and verification stages.

The nature of mathematical knowledge is seen through scholars' participation in mathematical practices. This intertwines with growing understanding of mathematics as an empirical science that involves observation, experimentation and conjecturing besides calculations and deductions. In addition, mathematics is broadly viewed as a tool for searching for hidden patterns that helps to understand the world around us.

Cognitive approaches are concerned with mathematical content, specifically, with the roles of structural organization, mental representation, access to and processing of information in problem-solving. Metacognitive research highlights self-regulatory procedures, such as monitoring and decision making, and individual's abilities to control their cognitive processes. Students' beliefs about mathematics and self are also found to have an influence on the problem-solving outcomes. Problem-solving could be an emotional enterprise where students take risks and experience both disappointments and rewards. Developing affective and intellectual commitments to the solution helps students to stay on task and to display long term persistence in tackling problems.

It is proposed that students' mathematical dispositions, habits, viewpoints, and interpretation or meaning construction skills develop largely through the processes of socialization and enculturation rather than direct instruction (Resnick, 1988). Doing mathematics is increasingly seen as a social and collaborative act. This has pedagogical implications because the teaching of mathematics is viewed as giving students an opportunity to participate in a community of practice where they are not only familiarized with mathematical tools and trained with appropriate skills, but also form their mathematical dispositions and views. In any case, besides teachers' beliefs about mathematics and about capabilities of their students, the degree of their understanding of what constitutes the problem-solving process is an important factor in implementing this approach in schools. Below we will present some evidence of the formation of such understanding through teachers' participation in a graduate course on problem-solving.

Methodology

The data was collected in a graduate on-line course offered at Memorial University (Canada) for in-service K-12 teachers in spring of 2022. This 12-weeks course focused on mathematical thinking and problem-solving. During the course teachers participated in several types of activities consisting of individual problem-solving, discussion of problems in small groups, reading research-informed and practice-oriented articles about problem-solving, and writing a journal about their experiences and possible changes. More information about this course as well as examples of mathematical problems with teachers' collaborative inquiries could be found in Kondratieva (2020). All participants had at least 3 years of teaching experience. We selected only those teachers who reported having positive encounters with problem-solving in the past and later desired to implement this approach in their classes. Nine journals were analysed and reoccurring themes were identified. The research question was: What attitudes and ideas acquired by the teachers during the course were perceived by them as new and useful for conducting problem-solving activities in their classes?

Specifically, it was examined in which ways the teachers felt the influence of the ideas learned from the suggested reading on their ability to implement the problem-solving approach in their teaching practice.

Thematic analysis of students' journals employed in this research offers a method to identify common characteristics and attributes in the way people talk or write about a topic and thus allows the researcher to notice a shared experience of a group of people (Braun & Clarke, 2012). This approach allowed to obtain patterns in a set of data and to single out the topics and themes emerging in teachers' descriptions of new and useful ideas related to the problem-solving process as discussed in the literature that they read. The analysis and coding of the data was done by identifying words and phrases aligned with the ideas mentioned in the Literature Review section. The nine journals gave a good representation of teachers' answers as we found

no additional common themes when adding more journals into the consideration. Each of the six identified ideas was discussed in at least five of the nine teachers' journals. The results are summarized and discussed in the next section.

Results

We followed the journals of teachers (hereafter referred to as T1, T2, etc.) who claimed their strong preference for the problem-solving approach from the beginning of the course. We identified them using their personal statements, for example, "As a student I really enjoyed problem-solving in mathematics" (T1) or "As a teacher of mathematics, I try to incorporate problem-solving into my practice" (T2) or "As the course progressed my love for challenging problems grew stronger" (T3). The main reading references for the course were Mason et al (1982/2010) and Polya (1945/2004). In this section we abbreviate them as "MBS" and "Polya" respectively and present quotations from these sources used by the teachers in their journals.

The following ideas and quotations were the most frequently noted and elaborated.

Idea 1: It Is Useful to Record Experiences While Solving Problems.

Teachers noticed the following advice, which several of them quoted in their journals:

You should start recording your experiences so that they are not lost, but can be analysed and studied later. Recording your experiences will also help you to notice them and this contributes to developing your mathematical thinking. Aim to record three things: all the significant ideas that occur to you as you search for a resolution to a question; what you are trying to do; your feelings about it. (MBS, pp. 9–10)

Since one of the components of the course was actual problem-solving practice, the teachers had an opportunity to implement this idea right away. When recording their solution in progress, teachers started to use RUBRIC to pay attention to the following four moments: "The four key words that I suggest you begin using in your notes and in your thinking are STUCK!, AHA!, CHECK and REFLECT" (MBS, p. 16).

Most teachers explicitly stated that recording experiences "is an important step of the problem-solving process that I've never used before" (T4). In the following episode a teacher (T5) explains a typical situation when students record only computations:

[..] they did not record their thinking/reasoning and how they got where they were. Thus, at the next class when they revisited their work, many could not remember how they arrived at the place they were in the problem. At the time, it did not occur to me to have the students record their reasoning and thinking in writing. I will be implementing the RUBRIC writing process with my new class in September and encouraging my colleagues to do the same.

From this and similar episodes found in teachers' journals it is evident that the strategy of recording own experience while solving a problem was unknown for the teachers and at the same time, they see a potential in the employment of this strategy in their classes.

Idea 2: It Is Useful to Check, Reflect On and Justify One's Own Answer.

For most teachers the idea of checking a solution was not new, but it was reduced to a numerical verification. Teachers also stated that working out examples and finding patterns was their main focus while the following practice was not common in their classrooms:

Examples are, of course, not enough by themselves. They may convince your friend that your statements are plausible, but you must justify every step of your argument... You have to state the structural links which indicate why your conjecture is valid. (MBS, p. 87)

Admitting that “I’ve never really considered the why or how something works” (T4), several teachers quoted the following passage:

The important thing to remember is that a conjecture is an informed guess about a possible pattern or regularity which might explain WHAT is puzzling in a particular question. Once formulated, the conjecture is investigated to see whether it must be modified or whether it can be convincingly justified. This is done by seeking WHY. The nature of I WANT changes, from trying to articulate what is true, to trying to see why the conjecture might be justified, that is, from seeking WHAT to seeking WHY. The answer to WHY is a structure which links what you KNOW to what you have conjectured. Your argument will be an exposition of that link. (MBS, p. 82).

Teachers related to the idea that “reflection is probably the most important activity to carry out” (MBS, p. 105). T5 continued in their journal, “We do not do this enough with students. Providing students with time to reflection on their own thinking helps students deepen their understanding.”

We observe that refocusing on the WHY aspects of the solutions during the verification process, was identified by teachers as a novel and useful suggestion.

Idea 3: Getting Stuck Is Normal in Problem-Solving.

Many teachers’ journals revealed that they usually would be very frustrated if they could not solve a problem because they associated “stuck” with a failure. In words of T6,

this idea of failure can lead to a negative relationship with mathematics, where perhaps you don’t want to attempt ‘hard’ problems because you fear you will fail. In this respect, ‘intending or demanding to get the answer, and, worse, more elegantly and quicker than anyone else, is asking for failure eventually.’ (MBS, p. 131)

However, teachers noted the following advice regarding the attitude, emotional and cognitive behavior:

Being STUCK! is a healthy state, because you can learn from it [...] If you are STUCK!, [...] Specializing is your best friend, (Mason, p. 56) [...] then write down briefly what your idea is. If what you are going to try feels good, why not write AHA!? It makes you feel even better! (MBS, p. 57)

Teachers notice the importance of meta-cognitive skills allowing the solver to navigate their emotions during problem-solving. The recognition of being stuck and move forward trying new things signifies a shift from the attitude “I do not remember a formula” towards more adaptive reasoning and productive disposition. Teachers also noted the proposition “If still stuck, the best advice is to distil the question down to a form which can be held in the mind and mulled over” (MBS, p. 103), which is naturally connected to the next idea commonly identified in the journals.

Idea 4: Take Your Time to Think About a Challenging Problem.

Teachers started to appreciate the idea that solving a problem may take some longer time than usually is given in class for that activity. In words of T2, “I learned that it is okay to walk away from a problem and take a day (or many days!) to reflect on the problem.” Similarly, T1 wrote “The thing that resonated with me was that, ‘despite appearances, your thinking may still be going on, but below the level of awareness’” (MBS, p. 96).

Teacher T5 also suggested “we need to discuss, embrace, and teach that solving a challenging problem is usually ‘full of false steps, partial or mistaken insights, and groping toward articulating your sense of what is true’” (MBS, p. 87).

Of course, the literature on problem-solving does not give a universal rule of how to complete a solution of any problem, but it discusses how to deal with a stuck situation and make at least some progress. Taking more time to think about a problem and related questions was recognized as a new and beneficial approach in teachers’ journals.

Idea 5: Teacher Should Ask Guiding Questions in a Problem-Solving Class.

Several teachers reported that they learned the importance of not helping students too much with reference to the following rationale:

If the teacher helps too much, nothing is left to the student. The teacher should help, but not too much and not too little, so that the student shall have a reasonable share of the work [...] One way to do this is to ask the student WHAT they are trying to look for/solve, instead of telling them [...] (Polya, p. 1)

Teachers noted the importance of selecting and introducing a problem for their students:

It is sad to work for an end that you do not desire. Such foolish and sad things often happen, in and out of school, but the teacher should try to prevent them from happening in his class. [...] If the student is lacking in understanding or in interest, it is not always his fault; the problem should be well chosen, not too difficult and not too easy, natural and interesting, and some time should be allowed for natural and interesting presentation. (Polya, p. 6)

Teachers realised the power of guiding questions instead of providing direct hints. As T9 summarized,

MBS explain that being given hints in mathematics lend to blocking the opportunity for you to think. Rather than being given a hint, when stuck on a problem, or when you feel

you're stuck but are not, it would help if you had someone ask you a question; this gets you going again.

From teachers' journals we see that they began to reconceptualize their role in the classroom when implementing problem-solving approaches.

Idea 6: There Are Benefits for Learners When Problem-Solving Is Done in Groups.

Teachers knew about this pedagogical approach but they seem not knowing how the group problem-solving works best. They noted several suggestions in their reading, such as "Writing out what is known and explaining it to a friend often releases a blockage [when you are stuck]" (MBS, p. 103).

Also, working in a group is helpful when one is trying to test their ideas and convince others about a solution's correctness. As T1 wrote, "I want to encourage [my students] to challenge their own conjecture and those of other classmates in a respectful way."

Teachers also learned from their own experience of solving problems in groups. As T2 stated, "there were times when I did overlook options [in my solution], but there were times when I didn't know they existed until they were presented to me by someone else."

Building on the newly learned concepts – such as being stuck, conjecturing, verifying and reflecting – teachers saw the benefits of group work in a new light. They began viewing working in groups as an opportunity to articulate doubts, test ideas, and compare various solutions.

Conclusion

Research-based and practice-oriented literature on problem-solving offers many important findings for teachers and students of mathematics. In this paper we consider a group of teachers who initially identified themselves as persons who had positive encounters with solving mathematical problems and who attempted to implement problem-solving approaches in their classes. During a graduate course on problem-solving, these teachers were exposed to the ideas fundamental for the success of the problem-solving process and the development of mathematical thinking with this approach. Our study demonstrates that teachers discovered many new facts about problem-solving from reading research-based literature along with personal problem-solving practice. In particular, their journals clearly show that many of them were not aware of such ideas as (1) the usefulness of proper documentation of the problem-solving process; (2) the roles of review, explanation and reflection on one's own solution; (3) strategies for navigating "stuck" situation; (4) the importance of continuous thinking about a challenging question; (5) the effects of the amount and type of help provided to students; and (6) effective methods for discussing problems in groups.

Our results confirm that teachers oftentimes remain unaware of the practice-oriented literature, let alone research findings related to problem-solving in mathematics. Given that teachers play the pivotal role in educating their students, the identified unawareness may not only slow down the improvement of students' problem-solving skills but also undermine development of their mathematical proficiency, i.e., conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition (Kilpatrick et al., 2001). Therefore, dissemination of research recommendations remains an important missing part in teacher

education. The dissemination can occur by means of graduate programmes offered for in-service teachers. In addition, professional development should provide ongoing support and resources for teachers to improve their problem-solving instruction. Addressing the teachers' unawareness is necessary because even a positive personal history with solving problems, good intentions, and general teaching qualifications may not be sufficient for a teacher to confidently implement a problem-solving approach in the classrooms. By making the process of solving mathematical problems adequately present in the classroom instruction, teachers can help their students develop robust problem-solving skills and mathematical proficiency needed for success in school and beyond.

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.

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Structured Co-production in Crisis: Rethinking Centralization Through the UAE Volunteer Teaching Initiative

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Abstract

Global crises such as the COVID-19 pandemic expose the fragility of education systems and the need for new forms of collaborative governance. This study examines the United Arab Emirates' nationally coordinated volunteer-teaching initiative, in which more than 600 educators provided remote instruction to children of frontline workers. Operating within a centralized system supported by national digital infrastructure, the initiative demonstrates how structured co-production can transform volunteerism from an ad hoc response into an institutionalized model of public-service resilience. Using a qualitative case-study design with mixed-methods integration, and guided by Fraser's participatory justice, Freire's critical pedagogy, and Vygotsky's sociocultural theory, the study finds measurable academic gains, improved motivation, and enhanced psychosocial well-being. Findings indicate that digital equity, professional scaffolding, and civic trust enabled effective collaboration within hierarchy. The paper advances structured co-production as a hybrid governance model that reconciles central coordination with participatory inclusion, aligning with Sustainable Development Goals 4, 10, 16, and 17 to promote equity, inclusion, and institutional resilience.

Keywords: structured co-production, volunteer teaching, Sustainable Development Goals, crisis governance, educational resilience, equity

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Introduction

The COVID-19 pandemic created the largest education disruption in modern history, displacing over 1.6 billion learners across 190 countries (UNESCO, 2021). While governments scrambled to sustain continuity, many responses deepened inequities in access, quality, and digital readiness. Children from low-income households, displaced communities, and families lacking academic support bore the heaviest burden. The World Bank (2022) warns that pandemic-induced learning losses could reduce lifetime earnings for this generation by up to USD 17 trillion. Existing governance models—state-led reforms, privatization, or short-lived volunteer efforts—proved insufficient for equitable recovery. What remains underexplored is whether volunteer teaching, when institutionally embedded within public governance frameworks, can evolve from emergency aid into resilient civic infrastructure.

Across contexts, volunteer teaching emerged as a creative but fragmented response: radio-based instruction in Sub-Saharan Africa, mobile mentoring in South Asia, and online tutoring in Europe (Ferrari et al., 2022; UNICEF, 2021). These examples reveal the civic potential of educational volunteerism, yet most lacked continuity and systemic integration. Historical precedents, from post-Ebola outreach in West Africa to earthquake responses in Haiti, show that volunteerism rarely matures into a strategic governance mechanism for strengthening education systems (Morris et al., 2012).

The United Arab Emirates (UAE) offers a striking counterpoint. During COVID-19, the Ministry of Education launched a nationally coordinated volunteer-teaching program that mobilized more than 600 trained educators to deliver online instruction for children of frontline healthcare workers and other at-risk learners. Centralized governance, digital infrastructure, trauma-informed pedagogy, and cross-sector partnerships distinguished this initiative from ad hoc efforts elsewhere. By embedding volunteerism within state structures, the UAE created a model of structured co-production: a hybrid governance form in which centralized coordination enables, rather than constrains, participatory service delivery.

This paradox—co-production flourishing under centralization—forms the theoretical puzzle at the heart of this study. Co-production scholarship has long associated effective collaboration with decentralized, bottom-up governance (Bovaird & Loeffler, 2023; Osborne, 2018). Yet the UAE experience suggests that hierarchy and participation need not be opposed. The paper therefore asks: Can co-production thrive within a centralized system, and through what mechanisms of structure, trust, and design?

This paper argues that *structured co-production is the key mechanism through which centralized systems can enable participatory, equitable education during crisis*. This central claim is supported by an integrated theoretical lens, empirical evidence from the UAE case, and explicit alignment with Sustainable Development Goals (SDGs) 4, 10, 16, and 17.

Research Objectives and Questions

The study pursues three objectives: (a) to analyze the organizational structure and delivery mechanisms of the UAE volunteer-teaching program; (b) to evaluate its academic, psychosocial, and civic outcomes; and (c) to assess the program's potential for institutionalization within education policy. These objectives are addressed through three research questions: How can structured volunteer teaching sustain learning continuity, equity, and social cohesion during crises? What academic, emotional, and civic outcomes emerge for

students and educators? In what ways can volunteer teaching be institutionalized within education policy to strengthen resilience and progress toward global development goals?

Literature Review

Volunteer teaching has emerged as a vital mechanism for sustaining education during crises such as pandemics, conflict, displacement, and natural disasters. UNESCO (2021) estimates that school closures disrupted the education of more than 1.6 billion learners, while the OECD (2022) highlights how civic initiatives bridged institutional capacity gaps. From a governance perspective, volunteer teaching operates as auxiliary public-service capacity, reinforcing state resilience and legitimacy when formal systems are overstretched.

Despite extensive documentation of volunteer teaching during crises, *existing studies treat it as temporary and fragmented, failing to conceptualize it as an institutional governance mechanism*. This descriptive bias has obscured the conditions under which volunteer participation can be embedded as durable public capacity. The present review redresses that gap by reframing volunteer teaching as a transformative form of structured co-production aligned with SDGs 4, 10, 16, and 17.

Co-production and Volunteer Governance

Co-production—citizens and public agencies jointly delivering services—has become central to public administration scholarship. Bovaird and Loeffler (2023) define it as shared responsibility for outcomes; Osborne (2018) and Alford (2014) position it as the core logic of contemporary public service. Brandsen and Honingh (2016) distinguish among co-design, co-delivery, and co-assessment, clarifying where citizen engagement enters institutional processes. Within this taxonomy, volunteer teaching constitutes both co-delivery and co-assessment, since volunteers provide instruction and generate feedback that informs system learning.

The dominant assumption in this literature is that effective participation requires decentralized, community-based governance. The UAE case challenges that assumption directly. *This study contests the prevailing premise in co-production scholarship that participation requires decentralization, demonstrating instead that hierarchical systems can enable participation through structured design*. This reconceptualization positions hierarchy as a facilitative—rather than restrictive—condition of collaboration, and empirically validates Voorberg et al. (2023), who argued that co-production can succeed in hierarchical settings when supported by trust, training, and mutual accountability.

Volunteerism in Crises: Comparative Governance Models

Education systems are inherently vulnerable to disruption. COVID-19 alone halted in-person learning for over 90% of students worldwide (World Bank, 2022), exposing digital divides and institutional fragility. Volunteer teaching emerged globally as a flexible mechanism to sustain learning and psychosocial support, with precedents including post-earthquake Haiti and the West African Ebola response (Morris et al., 2012; Williamson & Eynon, 2020). During COVID-19, models expanded through Italy's national tutoring networks, Finland's resource-sharing hubs, South Africa's rural centers, and Brazil's radio-learning initiatives (Ferrari et al., 2022; Lindfors et al., 2021; Maringe & Sing, 2021).

A pivotal comparison lies in centralized versus decentralized configurations. Centralized programs achieve scale and consistency through national coordination, standardized training, and unified digital platforms. Decentralized models foster adaptability with less uniformity. Crisis-governance research (Kapucu, 2009; Moynihan, 2012) indicates that hybrid configurations—blending central coordination with local agency—yield the most resilient outcomes, an insight aligned with SDG 16's emphasis on inclusive and effective institutions. Table 1 summarizes the contrasting features of centralized and decentralized models as discussed in the literature.

Table 1

Comparative Characteristics of Centralized and Decentralized Volunteer-Teaching Models

Dimension	Centralized Models (e.g., UAE)	Decentralized Models (e.g., Finland, Brazil)
Governance Structure	National coordination and unified oversight	Local autonomy and community governance
Quality Assurance	Standardized training, evaluation, digital monitoring	Variable standards; local adaptation
Flexibility	Rapid mobilization; limited local tailoring	Context-specific customization; slower scale-up
Resource Equity	Strong state redistribution of technology and funding	Dependent on community resources
SDG Alignment	SDGs 4, 10, 16: scale and equity through institutions	SDGs 4, 17: local innovation and partnerships

Note. Adapted from Ferrari et al. (2022); Kapucu (2009); OECD (2022); UNESCO (2021); World Bank (2022).

Embedding Volunteerism in Policy: Strategic Pillars

Recent research reframes volunteer teaching as a lever for systemic resilience rather than a stopgap (Lepp et al., 2021). Beyond pedagogy, volunteer programs enhance ministerial crisis capacity, foster public–private collaboration, and expand human resources (Gudmundsdottir & Hathaway, 2020; Leung, 2016). Institutionalizing such programs, however, requires alignment with governance principles of transparency, inclusion, and accountability. Evidence from UNESCO (2021), OECD (2022), and World Bank (2022) identifies five policy pillars: alignment with national strategies; training and recognition through micro-credentials; inclusive digital infrastructure; cross-sector partnerships; and adaptive monitoring and evaluation. These pillars (Table 2) reinforce the governance mechanisms required to embed volunteerism into sustainable education systems.

Table 2*Policy Pillars for Institutionalizing Volunteer Teaching*

Pillar	Core Focus	SDG Link
Alignment with National Strategies	Integrate volunteer roles into education plans	SDGs 4, 16
Training and Recognition	Certification and professional identity	SDGs 4, 10
Inclusive Digital Infrastructure	Access for all learners	SDGs 9, 10
Cross-Sector Partnerships	Multi-stakeholder coordination	SDG 17
Monitoring and Evaluation	Data-driven learning loops	SDG 16

Theoretical Framework: The Justice–Dialogue–Learning (JDL) Model

This study synthesizes three theoretical traditions—Fraser's participatory justice, Freire's critical pedagogy, and Vygotsky's sociocultural learning theory—into an integrated analytical model termed the Justice–Dialogue–Learning (JDL) framework. Together, they provide a multidimensional lens for examining how structured co-production advances educational equity, resilience, and inclusive institutional design during crises.

Fraser (2008) defines justice as the interaction of redistribution, recognition, and representation. Applied to volunteer teaching, these principles translate into the redistribution of educational access, recognition of volunteers as legitimate agents of learning, and representation of community voices within institutional structures. The UAE program demonstrates how participatory parity can emerge within a hierarchical framework: through structured recruitment, equitable digital access, and transparent feedback mechanisms, the state secured parity procedurally, redefining justice as equity embedded within structured coordination (SDGs 10, 16).

Freire (1970) centers critical pedagogy on dialogue, reflection, and empowerment. The UAE initiative shows that dialogic pedagogy can be institutionalized within structure rather than existing outside it. Volunteer teachers used digital platforms and small-group mentorship to cultivate mutual learning and emotional support, generating what Freire termed *conscientização* within a system designed for coordination and oversight. The paradox of dialogue within hierarchy becomes productive: structured participation enabled inclusive communication and empathy-driven pedagogy (SDGs 4, 17).

Vygotsky (1978) adds a cognitive dimension. His concepts of the Zone of Proximal Development and the More Knowledgeable Other illuminate how learning occurs through social interaction and guidance. In the UAE program, volunteers served as More Knowledgeable Others for students, while the Ministry served the same role for volunteers, providing resources, training, and infrastructure. This nested scaffolding—state → volunteer → student—transformed pedagogy into governance, reinforcing resilience and adaptability (SDGs 4, 16).

Together, these traditions form the JDL triangle (Table 3). Justice ensures equity, Dialogue enables empowerment, and Learning institutionalizes adaptability—the operational core of

structured co-production. The UAE case thus exemplifies governed participation, where structure becomes the architecture of inclusion rather than its antithesis.

Table 3

The Justice–Dialogue–Learning (JDL) Framework

Dimension	Core Principle	UAE Application	SDG Link
Justice (Fraser)	Redistribution, recognition, representation	Equitable digital access; inclusion of volunteer educators	SDGs 10, 16
Dialogue (Freire)	Communication and reflection as empowerment	Peer mentorship; feedback loops; emotional support	SDGs 4, 17
Learning (Vygotsky)	Scaffolding and social interaction	Multi-level learning: ministry → volunteer → student	SDGs 4, 16

Research Design and Methodology

This study employs a qualitative case-study design with mixed-methods integration to examine the organizational structure, impacts, and policy relevance of the UAE national volunteer-teaching initiative during the COVID-19 pandemic. A case-study design enables rich contextual analysis while integrating quantitative and qualitative evidence to enhance validity and transferability (Creswell & Plano Clark, 2018; Yin, 2018). The design aligns with public-affairs research traditions emphasizing multi-perspective inquiry into governance, civic participation, and institutional learning (Bryson et al., 2014).

Case Selection and Sampling

The UAE was selected as a critical case (Yin, 2018) to test whether co-production can operate effectively within centralized authority. The volunteer-teaching initiative—mobilizing more than 600 trained educators—combined strong digital infrastructure, rapid policy coordination, and broad civic participation. The case is analytically generalizable rather than statistically representative, offering a transferable framework for hybrid governance systems pursuing SDGs 4, 10, 16, and 17. A purposive, stratified sampling approach ensured diversity across socioeconomic status, gender, academic performance, and school type. Three participant groups were included—volunteer teachers, students, and parents (healthcare workers)—identified through Ministry of Education records. Attrition (12 students, 6 parents) was documented and excluded to maintain analytic integrity.

Data Collection and Analysis

Four data sources were triangulated. Structured surveys included 5-point Likert and open-ended items addressing learning continuity, motivation, well-being, and program impact; instruments were piloted, back-translated, and achieved Cronbach's $\alpha = .86$. Semi-structured interviews ($n = 30$) explored adaptation, engagement, and psychosocial experiences. Academic metrics included pre- and post-intervention grade averages, weekly engagement logs, and self-reported confidence scores. Comparative document analysis of policy and practice documents from Brazil, Finland, South Africa, and India contextualized the UAE model within global patterns (OECD, 2022; UNESCO, 2021).

Quantitative data were analyzed in IBM SPSS Statistics 29. Paired-sample t-tests assessed pre- and post-intervention changes in academic performance and self-reported motivation; Wilcoxon signed-rank tests were applied where normality assumptions were not met. Qualitative data were analyzed using Braun and Clarke's (2006) six-phase thematic analysis in NVivo, combining deductive codes reflecting the JDL dimensions with inductive codes from participant narratives. Inter-coder reliability reached Cohen's $\kappa = .84$.

Reflexivity, Ethics, and Limitations

The lead researcher maintained analytic memos to track positionality and interpretive decisions. Positioned as a semi-insider, familiar with regional education systems but independent of program administration, the researcher critically examined potential bias. Ethical approval was granted by the Abu Dhabi Department of Education and Knowledge (Approval No. 2023-04-017). All procedures adhered to the Declaration of Helsinki, COPE, and ICMJE standards. Data were pseudonymized and stored on encrypted servers in compliance with UAE federal privacy regulations and the GDPR. Informed consent was obtained from all participants, with parental consent and child assent for minors. The study is bounded by the UAE's centralized governance model, which may not generalize fully to decentralized or low-resource systems. Reliance on self-reported psychosocial data introduces potential bias, mitigated through triangulation with academic and qualitative evidence. The cross-sectional design limits temporal insight, indicating the need for longitudinal studies.

Findings

This section presents integrated results addressing the study's three objectives, linking empirical evidence with the JDL framework. Quantitative and qualitative findings are triangulated to show how the UAE initiative operated as a co-produced public-education service during crisis, advancing SDGs 4, 10, 16, and 17.

Mobilization, Scope, and Civic Engagement

Within two weeks of launch, 619 qualified educators were recruited through Ministry channels to serve children of frontline healthcare workers and other vulnerable learners. This rapid, non-monetary participation reflects the latent civic infrastructure of the teaching profession (Putnam, 2000), activated under institutional stress. Among the 619 educators, 68% were women and 32% men, collectively serving 219 students aged 6–15 across 12 subjects. Instruction was delivered mainly in small groups of one to four students, balancing personalization and scalability (Table 4). Compared with fragmented volunteer efforts in prior crises, the UAE's centralized-but-participatory system illustrates structured co-production in operation: state coordination enabled civic participation rather than suppressing it, simultaneously redistributing learning opportunities (Justice), enabling sustained family contact (Dialogue), and providing scaffolded small-group instruction (Learning).

Table 4
Volunteer Teacher and Student Participation Metrics

Metric	Value
Total volunteer teachers	619
Student beneficiaries	219
Subjects covered	12+
Average class size	1–4 students
Female teachers	68%
Male teachers	32%
Grade levels served	1–9

Note. From author's field data (2024).

Impact on Student Academic Performance

The study evaluated pre- and post-program academic data in Mathematics, English, and Science using paired-sample t-tests and Wilcoxon analyses. A statistically significant improvement was observed in Mathematics ($p < .05$). Improvements in English and Science, though substantial in magnitude (+13 percentage points each), did not reach significance ($p = .06$). While statistical significance was not reached for English and Science, the magnitude of improvement suggests practical significance, likely constrained by sample size. Together, the results indicate a consistent, positive academic trend across all core subjects (Table 5). Younger learners (Grades 1–4) showed the largest gains, benefiting from individualized pacing and dialogic feedback. These data are interpreted cautiously given the small-N scope and short duration; nonetheless, they support the hypothesis that centrally coordinated volunteer teaching mitigates crisis-induced learning loss when grounded in structured co-production.

Table 5
Student Academic Performance Before and After Volunteer Teaching

Subject	Pre-Program Mean (%)	Post-Program Mean (%)	Improvement (%)
Mathematics	67	81	+14
English	72	85	+13
Science	69	82	+13

Note. From Student learning portfolios and teacher evaluations (2024).

Psychosocial and Emotional Well-being

Beyond academic outcomes, the initiative played a protective role during a period of social isolation and parental absence. Survey data ($n = 172$) revealed significant emotional benefits: 76% of students reported increased motivation, 71% reported reduced stress, and 68% reported a stronger sense of social connection (Table 6). Qualitative evidence reinforced these patterns. A nine-year-old student observed that her teacher asked how she was feeling before each lesson—something no one had done before. Volunteer educators described reciprocal growth, with one stating that helping the children helped him cope. This reciprocity embodies mutual

resilience: teaching becomes a two-way civic act rather than a one-directional service, aligning with co-production's core principle that public value is created reciprocally between providers and users. Disparities remained, however. Adolescents preparing for national exams expressed anxiety about curriculum alignment, indicating the need for differentiated volunteer frameworks that integrate psychosocial care with advanced academic scaffolding.

Table 6

Emotional and Psychosocial Impacts on Students

Psychosocial Dimension	Students Reporting Positive Impact (%)
Increased motivation	76
Reduced stress and anxiety	71
Greater sense of connection	68

Note. From Student and parent surveys (2024).

Stakeholder Perspectives and Cross-Sector Impact

Interviews with 42 volunteer teachers highlighted vocational rejuvenation and pedagogical creativity. Freed from bureaucratic constraints, volunteers adopted adaptive, relational methods, reporting growth in digital fluency, trauma-informed communication, and differentiated scaffolding. One mid-career teacher described the experience as rebuilding trust in learning. Fifty-one frontline parents (ICU nurses, emergency physicians) described the program as both academic relief and emotional assurance—knowing that someone was supporting their children's homework while they worked extended shifts produced measurable reductions in household stress. This cross-sector outcome reinforces social-capital spillover: educational support sustained healthcare capacity, an intersectoral benefit rarely quantified in crisis governance. The program bridged education and healthcare, producing both bonding and bridging capital (Putnam, 2000), and validated the JDL claim that justice, dialogue, and learning operate as mutually reinforcing dimensions of structured co-production.

Comparative Analysis: Centralized and Decentralized Models

To enhance generalizability, the UAE model is compared with decentralized volunteer education in Finland and Brazil (Table 7). The comparison draws on UNESCO (2021), OECD (2022), World Bank (2022), and study data. The UAE model extends co-production theory by demonstrating that centralization and participation are not mutually exclusive. When supported by digital equity, transparent standards, and civic trust, hierarchical systems can facilitate inclusive co-creation. The optimal architecture is hybrid: a centrally managed digital platform and quality-assurance framework ensure Justice and scalability, while local schools, NGOs, and community organizations adapt content and delivery, fostering Dialogue and contextual Learning.

Table 7*Centralized vs. Decentralized Co-production in Crisis Education*

Country / Model	Governance	Quality Assurance	Civic Partnership	Primary SDGs
UAE (Structured Co-Production)	Centralized; unified digital platforms	High; uniform training and monitoring	State–NGO partnerships; cross-sector MOUs	4, 10, 16, 17
Finland (Local Co-Design)	Decentralized; municipal autonomy	Moderate; teacher autonomy	School–community networks	4, 17
Brazil (Grassroots Networks)	Polycentric; NGO-led	Variable; local capacity	Civil-society and faith-based mobilization	4, 10, 17

Note. From Ferrari et al. (2022); OECD (2022); UNESCO (2021); study data (2024).

Discussion

The UAE's volunteer-teaching initiative functioned both as an emergency response and as a governance innovation, demonstrating that civic capacity can be institutionalized within centralized systems without sacrificing inclusivity or adaptability. The discussion is organized around three analytical dimensions: extending co-production theory, rethinking participation, and governance lessons for resilient systems.

Extending Co-production Theory

The UAE case extends classical co-production theory (Bovaird & Loeffler, 2023; Brandsen & Honingh, 2016; Osborne, 2018) by providing empirical evidence that hierarchical coordination can enable—rather than inhibit—participatory service delivery. Conventional theory has treated co-production as the natural domain of decentralized governance. The evidence indicates that centralized systems can institutionalize participation when built on civic trust, digital inclusion, and ethical design. Through Fraser's participatory justice, the initiative redistributed access and ensured parity; through Freire's dialogic pedagogy, teacher–student relationships became sites of empowerment; through Vygotsky's sociocultural theory, scaffolded small-group structures advanced both academic and psychosocial development. Together these findings advance structured co-production as a governance model in which centralized authority provides the structure, while civic actors provide the dialogue and adaptability.

Rethinking Participation: From Charity to Civic Partnership

In many crisis contexts, volunteer teaching is treated as charity—temporary, informal, and unaccountable. In the UAE, it was reframed as civic partnership embedded in formal governance mechanisms. Volunteers were not helpers filling a state gap but co-producers of public value, legitimized through formal training, safeguarding, and coordination protocols. This finding supports Voorberg et al.'s (2023) argument that co-production is an interactive, iterative process of value creation rather than a transfer of responsibility. The UAE model demonstrates that such reciprocity—teachers supporting families, families validating teachers' roles—creates a two-way civic act, reinforcing social cohesion and institutional trust. The

process generates public value beyond educational outcomes: it builds the social capital and civic trust that are the bedrock of resilient societies (SDG 16).

Governance Lessons and Synthesis

These findings suggest that the long-standing dichotomy between centralized control and participatory governance is empirically flawed. Rather than opposing forces, structure and participation operate as complementary mechanisms when mediated through institutional trust and design. This repositions co-production not as a governance alternative, but as a governance evolution.

The UAE program achieved scale because it was embedded within the formal apparatus of the Ministry of Education, supported by digital infrastructure, and guided by cross-sector collaboration across education, health, and social services. Centralized governance ensured coherence and equity (Justice), while community engagement enabled flexibility and responsiveness (Dialogue and Learning). The optimal model is therefore a hybrid architecture: a centrally managed digital platform and quality-assurance framework set baseline standards, while municipal districts and NGOs adapt delivery for local contexts. Such hybrid systems align directly with SDGs 4, 10, 16, and 17.

Policy Implications

Four policy directions follow. First, institutionalize flexibility (SDGs 4, 16) by embedding volunteer teaching in national emergency-education frameworks with clear protocols for activation, coordination, and quality assurance. Second, structure for inclusion (SDGs 4, 10) through inclusive digital infrastructure, micro-credentialing, and recognition systems that sustain motivation and professional legitimacy. Third, design for adaptive learning (SDGs 16, 17) through feedback loops between volunteers, schools, and ministries, allowing continuous learning and iterative policy adjustment. Fourth, build cross-sector partnerships (SDG 17) by institutionalizing collaboration across education, health, and social-protection sectors, with shared data protocols and joint crisis-response councils that sustain coordination beyond emergencies.

Conclusion

Can co-production thrive under centralization? The evidence indicates that it can. As education systems confront overlapping crises—from pandemics to displacement and climate disruption—the UAE volunteer-teaching initiative shows how civic capacity can be mobilized within strong state systems to sustain essential public services. Structure and solidarity need not be opposites: centralized coordination can enable participatory, inclusive, and equitable forms of co-production when grounded in justice, dialogue, and learning.

Three contributions emerge. First, the initiative produced measurable academic gains and psychosocial benefits for vulnerable learners, affirming the dual role of pedagogy as both cognitive and affective practice. Second, it offered reciprocal value to educators and healthcare families, reinforcing mutual resilience and civic trust. Third, the model illustrates how state coordination, inter-agency collaboration, and digital infrastructure can transform individual goodwill into organized, durable public capacity.

Comparative insights confirm that no governance model is universally optimal. Centralized approaches deliver consistency and scale; decentralized systems nurture contextual innovation. The most promising future lies in hybrid architectures that combine central standards and safeguarding (Justice) with localized flexibility (Dialogue and Learning). Policy transferability depends on adapting the UAE's core principles—strategic coordination, accredited training, equitable technology access, and integrated psychosocial care—to diverse governance and resource contexts. Future research should track long-term effects on learning, civic identity, and professional development through comparative and longitudinal designs, and should test the structured-co-production model in low-resource and decentralized settings. Treating volunteer teaching as governance innovation rather than charitable gesture reframes it as a civic partnership that enriches both education and democracy.

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