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Message from the Editor-in-Chief

Dear Colleagues,

The October 2025 issue of The Turkish Online Journal of Educational Technology (TOJET) brings together the scholarly contributions that reflect the journal's continuing mission to connect technology, pedagogy, and research across diverse educational landscapes. The studies featured in this issue come from Turkey, Taiwan, Thailand, Uganda, the United Arab Emirates, Brazil, China, and Northern Cyprus, presenting a truly global dialogue on the transformative power of educational technology.

Each article provides unique insights into how artificial intelligence, augmented reality, digital infrastructures, and pedagogical innovations are reshaping learning environments, teacher education, and educational policy in the 21st century.

Artificial Intelligence and Teacher Education

The integration of artificial intelligence into teaching and learning has become one of the most defining developments in education today. In “Integrating Generative AI in Teacher Education: A Qualitative Exploration of TPACK Growth and Critical Reflection,” Min Jou, Tzu-Hsuan Kuo, Yu-Chun Chiang, and Yungwei Hao from Taiwan explore how pre-service teachers experience AI as both a creative tool and a pedagogical partner. Their qualitative analysis shows a transformative shift from uncertainty to reflective confidence and ethical awareness, emphasizing AI's potential to enhance critical thinking and instructional creativity.

Complementing this work, Hüseyin Gökal and Cem Ufuk Baytar present “The Impact of Task–Technology Fit on the Intention to Use Artificial Intelligence in the Education of Information Technology Students.” Their study demonstrates that perceived usefulness, technological compatibility, and self-efficacy strongly influence students' willingness to integrate AI into their academic activities, underscoring the importance of task–technology alignment in educational design.

Development of an Online Lesson on Ideological and Political Theory Courses for Undergraduate Students of a University in Western China.

This study aimed to develop high-quality online lessons for ideological and political theory courses at a university in Western China and to examine their effects on students' learning achievement and satisfaction. Using a one-group pretest–posttest experimental design with 20 undergraduate participants, the research employed the Superstar Learn Platform as the instructional tool. Expert evaluations showed that the media quality was rated as good (mean = 4.43) and the content quality as excellent (mean = 4.90). The students' average scores increased significantly from 62.33 (pretest) to 76.97 (posttest), and their overall satisfaction with the online lessons was at the highest level (mean = 4.71). The findings indicate that the online ideological and political theory lessons effectively enhanced academic performance, engagement, and learner satisfaction, while promoting flexibility, self-directed learning, and innovative teaching practices in higher education.

E-Learning on Career Development and Career Planning for Fourth-Year Undergraduate Students from Yunnan, China

This research investigated the effectiveness of an e-learning system for career development and career planning among 30 fourth-year undergraduate students in Yunnan, China. The study assessed instructional efficiency, learning achievement, and student satisfaction using quantitative methods. Results demonstrated that the e-learning program achieved an efficiency level of $E1/E2 = 82.40/81.33$, exceeding the standard criterion of 80/80. Expert evaluations rated both the content (mean = 4.78) and media design (mean = 4.50) as excellent. Students' mean scores significantly improved from 8.80 (pretest) to 16.27 (posttest), and their satisfaction with the course was high (mean = 4.51). The study concluded that e-learning effectively enhances academic performance, self-regulated learning, and career readiness, providing a flexible and engaging approach to professional skill development for university students.

Augmented Reality and Immersive Learning Environments

This issue features two innovative studies that highlight the pedagogical value of Augmented Reality (AR) in fostering engagement and applied learning. In “The Effects of Augmented Reality Technology on Learning Achievement of First-Year University Students in China,” Ken Chen, Saiphin Siharuk, and Withawat Penphu reveal that AR-based safety education significantly improves students' learning outcomes by creating immersive, realistic simulations of emergency scenarios.

Similarly, Ana Regina Mizrahy Cuperschmid contributes “Augmented Reality Assisting the Assembly of Do-It-Yourself Furniture,” which demonstrates how WebXR-based AR systems enhance learners’ spatial understanding and procedural skills. The study illustrates how AR can bridge theory and practice, particularly in engineering and design education, offering learners an authentic, hands-on experience within digital learning environments.

Digital Pedagogy and Language Learning Innovation

Two studies in this issue address the growing need to integrate technology meaningfully into language education. Lina Daouk and Ahmad Tabbara from the United Arab Emirates, in their study “Flipped Classroom Methodology in Higher Education: A Quasi-Experimental Study,” show that flipped classroom approaches enhance student motivation, engagement, and critical thinking by transforming learners into active participants rather than passive recipients.

Nurainee Waealee and Zainee Waemusa from Thailand explore “The Integration of Corpus-Based Approach in Vocabulary Instruction in Thai EFL School Context.” Their quantitative research identifies gaps in teachers’ corpus literacy and underscores the need for professional development to enable effective use of digital corpora in vocabulary instruction. Both studies reaffirm that technology integration must be pedagogically purposeful, combining interactivity with reflective learning design.

Equity, Access, and Educational Infrastructure

Addressing issues of digital inclusion, Andrew Ojulong from Uganda examines “The Role of RENU and NITA-U in Providing Infrastructure and Online Access in Ugandan Higher Education.” His policy-focused analysis highlights how national technology agencies have improved connectivity across universities but also exposes ongoing inequalities between public and private institutions. The study offers actionable recommendations for achieving equitable access to digital resources and closing the digital divide in African higher education systems.

Culture, Heritage, and Educational Technology

Cultural sustainability through digital innovation is another recurring theme in this issue. In “Ethnomusicological Preservation and Educational Application of Jaw Harp Music of the Yi Region in Liangshan, China,” Maolan Zhang, Arsenio Nicolas, and Awirut Thotham merge ethnomusicology and pedagogy to document and preserve the Yi jaw harp tradition as an intangible cultural heritage. The study proposes digital archiving, multimedia teaching, and instrument classification systems as educational strategies that connect cultural preservation with modern pedagogy—demonstrating how technology can serve as a bridge between tradition and transformation.

Educational Reform and Policy Development in Northern Cyprus

Three studies from Northern Cyprus offer critical insights into educational policy, management, and teacher motivation. In “Evaluation of the Current Education System in Northern Cyprus from the Perspectives of School Administrators,” Şaziye Öztinen, Sonay Dericioğlu, and Nazım Serkan Burgul analyze the strengths and weaknesses of the secondary education system. Their findings point to outdated curricula, limited infrastructure, and low motivation as major obstacles to modernization, calling for comprehensive reform aligned with 21st-century learning outcomes.

Building upon this, Rüya Uyguner, Sonay Dericioğlu, and Nazım Serkan Burgul assess “The Applicability of Full-Day Education in Northern Cyprus.” Their qualitative analysis highlights that inadequate physical and technological infrastructure, increased teacher workload, and student fatigue reduce the effectiveness of full-day schooling. The authors recommend a gradual, well-supported implementation model, emphasizing pilot testing, infrastructure development, and constructivist curriculum revision to ensure success. Finally, Gümrah Amcaoğlu Yorucu, Sonay Dericioğlu, and Nazım Serkan Burgul contribute a complementary study on sports-oriented high schools, focusing on teacher motivation and institutional efficiency. Their research underscores that professional recognition, fair workload distribution, and school resources are key factors for sustaining teacher engagement and overall school performance in specialized educational environments.

A Shared Vision for the Future

Collectively, these eleven papers highlight TOJET’s dedication to advancing research that bridges innovation, reflection, and inclusion. From artificial intelligence and augmented reality to cultural preservation and educational reform, the studies in this issue reaffirm that the true value of educational technology lies not only in digital tools but in their ability to transform human understanding, democratize access, and nurture creativity.

This study examines the impact of school administrators' influencing behaviors on school mindfulness and teachers' organizational commitment. Based on data from secondary school teachers in Turkey and Northern Cyprus analyzed through SEM, the findings indicate that administrators' tactics enhance teachers' organizational commitment but diminish school mindfulness. While authority-driven and mutual benefit approaches decrease mindfulness, expertise- and relationship-oriented strategies promote it. Overall, positive and supportive influence behaviors foster teachers' intrinsic motivation and strengthen their organizational commitment.

This qualitative study investigates collocational awareness among instructors of Turkish as a Foreign/Second Language (TFSL). Drawing on interviews and reflective journals from three instructors, the findings reveal that regular collocation-focused activities enhance students' vocabulary, fluency, and motivation, while fostering greater pedagogical awareness among teachers. The study underscores the need for a structured framework to support systematic collocation instruction in TFSL contexts.

I extend my heartfelt appreciation to all authors, reviewers, and members of the editorial board for their contributions and commitment to excellence. Their collective efforts ensure that The Turkish Online Journal of Educational Technology continues to be a leading international platform for research and dialogue in the evolving field of educational technology.

Call for Papers:

TOJET welcomes academic studies in the field of educational technology. Submitted articles may address topics such as the use of technology in classrooms, the impact of technology on learning, and the perspectives of students, teachers, administrators, and the community on educational technology. Such studies will enhance the quality of theoretical and practical approaches in educational technology.

Article Submission Criteria:

- Submitted articles must be original, unpublished, and not under consideration by another publication.
- Articles may cover a wide range of topics, including assessment, attitudes and beliefs, curriculum design, equity, applied research, learning theories, sociocultural issues, and educational practices for special populations.

Warm regards,
Editor-in-Chief

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October 2025

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An Examination of the Opinions of Educational Administrators and Teachers on the Establishment of Sports Middle and High School in Turkey

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ABSTRACT

This study aims to gather the opinions of inspectors, school administrators, and physical education teachers regarding the incorporation of the Sports Secondary School and High School into the formal education system in Northern Cyprus. A qualitative research approach was utilized, employing a case study design. The study group included 40 participants, comprising inspectors, school administrators, and physical education teachers working at the secondary education level under the Ministry of National Education (MoNE) in the Turkish Republic of Northern Cyprus (TRNC). To collect data, a semi-structured interview form was developed by the researchers and used for data collection. This form consisted of a preliminary information section and eight open-ended questions. For data analysis, descriptive and content analysis techniques, recognized methods of qualitative data analysis, were employed in the study. The study group consisted of 40 participants, including inspectors, school administrators, and physical education teachers working at the secondary education level under the Ministry of National Education (MoNE) in the Turkish Republic of Northern Cyprus (TRNC). A semi-structured interview form, one of the qualitative data collection tools, was utilized. The interview form, developed by the researchers, consisted of a preliminary information section and eight open-ended interview questions. For data analysis, descriptive analysis and content analysis techniques, which are among qualitative data analysis methods, were employed.

The study's findings revealed that sports-oriented schools support students' physical, mental, social, and academic development. Participants highlighted that sports high schools are expected to cultivate positive outcomes, including discipline, responsibility, career planning, international achievements, and a healthy lifestyle. Nevertheless, several significant challenges were identified, such as inadequate infrastructure, limited financial resources, and difficulties balancing academic and athletic commitments. The study also indicated that adapting sports school models from the European Union and Turkey to the Turkish Republic of Northern Cyprus (TRNC) could enhance international sports recognition, strengthen competitiveness, and boost sports tourism. Additionally, the social and diplomatic power of sports is regarded as a significant strategic asset, especially for countries experiencing political isolation or international boycotts.

The study evaluates the integration of a sports-oriented secondary school and high school model into the education system of the Turkish Republic of Northern Cyprus (TRNC) as a multifaceted initiative. This integration not only supports individual development but also offers social, economic, and cultural benefits. The findings emphasize the importance of strategic planning, the establishment of a robust sports policy, the development of high-quality sports infrastructure, and the cultivation of qualified human resources to ensure the successful implementation of this model.

Keywords: Northern Cyprus, Sports Secondary School and High School, Educational Administrators, Teachers.

INTRODUCTION

In the current century, an analysis of countries that have successfully excelled in sports reveals that athletes typically begin training at a young age. They tend to specialize in specific sports and consistently engage in practice and competitions throughout their development. It is crucial for governments to establish clear objectives

for promoting sports and nurturing athletes. These objectives significantly contribute to the widespread adoption and advancement of sports (Yaşar, 2014).

In the literature, various definitions of education can be found. Broadly defined, education is a process aimed at bringing about desired and lasting changes in individuals' attitudes (Kuşkonmaz, 2011). The concept of sport encompasses activities performed individually or as part of a team, which may involve systematic and disciplined repetition of movements, require physical development, and provide enjoyment. In both individual and team sports, social interaction and support are often essential; thus, the presence of a community plays a significant role in both types of sports (Balyer & Özcan, 2014). Sports-oriented secondary schools and high schools are educational institutions where students with athletic talent receive both academic and athletic training simultaneously (Uğur, 2018). Regular monitoring of student performance in sports schools is crucial for evaluating their development. The growing establishment of sports-oriented educational institutions has the potential to bring about a multidimensional transformation within the national education system. This approach integrates academic processes with athletic development, representing a significant advancement in education.

In Turkey, a decision published in 2020 established four sports high schools as part of a project school framework. Unlike traditional sports high schools, these project-based schools select their administrators and teachers according to specific regulations designed for project schools. The goal of this regulation is to appoint administrators with a background in sports and qualified subject-specific teachers to fulfill staffing needs. This strategy aims to significantly improve the quality of education and training in these institutions. This study will provide information on the currently active general and thematic sports high schools. To meet the growing demand for qualified professionals in the field of sports and to advance Turkish athletics, it is essential to increase the number of sports high schools and to boost their appeal among students (Nakip, 2024).

Research focused on the importance of establishing sports-oriented secondary schools and high schools in the Turkish Republic of Northern Cyprus (TRNC) is limited. A review of the schools affiliated with the Ministry of National Education in TRNC shows that while there are various secondary and high schools, there is a notable lack of institutions explicitly dedicated to sports-focused education. This gap underscores the need for schools specializing in sports education. Evaluations regarding the establishment of Ahmed Sami Topcan Sports High School have been conducted, highlighting the importance of sports high schools in guiding young people toward athletics at an early age and developing their talents. Such institutions are considered essential for enabling students to specialize in sports and achieve success on international platforms (Nurçin, 2019).

The purpose of this study is to evaluate the opinions of inspectors, school administrators, and physical education teachers working in secondary education institutions affiliated with the Ministry of National Education of the Turkish Republic of Northern Cyprus (TRNC) regarding the integration of a sports-oriented secondary school and high school model into the education system. This evaluation aims to reveal stakeholders' perceptions of both the positive and negative aspects of the sports-focused school model, as well as to identify the opportunities and challenges encountered during this process.

In this context, the primary research question of the study is: "What are the opinions of inspectors, school administrators, and teachers regarding the integration of the Sports-Oriented Secondary School and High School model into the formal education system in the Turkish Republic of Northern Cyprus (TRNC)?" Based on this main research question, the sub-objectives of the study are as follows:

What are the opinions of inspectors, school administrators, and physical education teachers working under the Ministry of National Education of the Turkish Republic of Northern Cyprus (TRNC) regarding the integration of the Sports-Oriented Secondary School and High School model into the formal education system for the 2024–2025 academic year?

1. How do stakeholders evaluate the advantages of the sports-oriented school model in terms of students' physical, social, and academic development?
2. What institutional, financial, and pedagogical challenges might arise during the integration of sports-oriented secondary schools and high schools into the education system?
3. What are stakeholders' perspectives on the applicability of sports-oriented school models from the European Union and Turkey in the context of the TRNC?
4. How are the impacts of sports-oriented schools on students' career development and professionalization processes in sports assessed?
5. What are stakeholders' views on the potential benefits of establishing sports schools in the TRNC in overcoming international sports-related embargoes?

6. What are stakeholders' expectations regarding the contribution of sports-oriented secondary schools and high schools to the training rate of professional athletes abroad?

METHODOLOGY

Research Design

This study used a qualitative research approach, which is appropriate for exploring the lived experiences and context-specific perspectives of primary stakeholders in an educational setting (Creswell & Poth, 2016). Among the various qualitative research designs, a case study design was chosen. In the literature, the case study is sometimes referred to as an "example study" or "vignette analysis." This method is employed to examine a specific situation, event, or group dynamic in detail (Subaşı & Okumuş, 2017).

Study Group and Sampling

In qualitative research methods, a key characteristic of participants in a study group is their careful selection, which aligns with the study's purpose and research questions. The individuals included in the study group are those whom the researcher observes and interviews to collect data (Yıldırım & Şimşek, 2021). For this research, the study group consists of inspectors, school administrators, and teachers working in state-affiliated secondary education institutions under the Ministry of National Education (MoNE) of the Turkish Republic of Northern Cyprus (TRNC) during the spring semester of the 2024–2025 academic year. Participants were chosen from secondary schools located in the regions of Nicosia, Famagusta, Kyrenia, Güzelyurt, and İskele. In this study, criterion sampling — a method of purposive sampling — was employed. Criterion sampling requires that participants represent the essence of the topic being studied and support the overall aim of the research. By applying these criteria, the researcher can gain a deeper understanding of the research focus and acquire significant insights (Yıldırım & Şimşek, 2021).

Data Collection Tool

In this study, a semi-structured interview technique served as the qualitative data collection tool. The researcher developed the interview form based on a thorough literature review and expert opinions, consisting of a total of seven questions. It was designed to gain an in-depth understanding of the perspectives of inspectors, school administrators, and teachers regarding the establishment of sports-oriented secondary and high schools in Northern Cyprus. The questions in the form were open-ended, allowing participants to express their experiences and opinions freely.

Semi-structured interviews combine the standardized format of structured interviews with the flexibility of open-ended discussions, making this method effective for gathering detailed information from participants (Punch & Oancea, 2014). The semi-structured interview form used in this study was created with input from field experts and was tested through a pilot study. Feedback obtained during the pilot implementation led to revisions of the form, enhancing the effectiveness and reliability of the data collection process (Yıldırım & Şimşek, 2021).

Data Collection Process

The necessary permissions were obtained from the Department of Primary Education of the Ministry of National Education in the Turkish Republic of Northern Cyprus (TRNC-MoNE) (see Appendix 1). Following this, an application was submitted to the Ethics Committee of the Institute of Social Sciences at Akdeniz Karpaz University, and all required documents were presented in full. The study group consisted of school principals, vice principals, and teachers working in primary education institutions affiliated with the TRNC Ministry of National Education. These institutions were located in the regions of Nicosia, Famagusta, Güzelyurt, Kyrenia, and İskele. The schools included in the study were visited, and the interview process was initiated accordingly. A semi-structured interview form, prepared by the researcher for school administrators and primary school teachers, was used during the interviews. The research process commenced following the approval of the Ethics Committee at the Institute of Social Sciences of Akdeniz Karpaz University. Interviews were conducted in March during the spring semester of the 2024–2025 academic year, after obtaining official permission from the Ministry of National Education. The interviews took place at locations and times that were convenient for the participants.

Data Analysis

In this study, two qualitative data analysis techniques were used: descriptive analysis and content analysis. Descriptive analysis provides a systematic way to present data collected according to predetermined categories, such as participants' demographic information. This method summarizes the data within specific themes and subthemes, supported by direct quotations from participants. For example, variables such as participants' professional roles (e.g., teacher, vice principal, inspector), educational background (e.g., bachelor's or master's

degree), and years of professional experience— which can be quantified—were analyzed using descriptive analysis (Karahana et al., 2022). On the other hand, content analysis is a technique employed to organize and interpret qualitative data. The primary goal of this method is to identify meaningful units within participants' statements and group them into themes and subthemes. During content analysis, the data were processed in detail, coded around emerging themes, and similar opinions were categorized together, with frequently recurring concepts highlighted. In this study, an inductive approach was applied throughout the content analysis process (İlgar & İlgar, 2014).

Validity and Reliability

In this study, various strategies were implemented to ensure the validity and reliability of the qualitative data collection and analysis processes. To enhance validity, the semi-structured interview questions were developed based on expert opinions and tested through a pilot study. The interview form was revised based on the feedback received during this pilot implementation. Additionally, during the interviews, participants' responses were explored in greater detail, and whenever necessary, member checking was conducted by revisiting participants to confirm the accuracy of their statements. These procedures strengthened the internal validity of the research (Yıldırım & Şimşek, 2021). To ensure reliability, a systematic approach was adopted at every stage of the study. During data analysis, coding was performed independently and validated by experts to minimize bias. All collected data were meticulously documented, and transparency was maintained throughout the entire analysis process. These practices reduced the researcher's subjective interpretations and facilitated a more reliable understanding of the findings (Patton, 2018; Merriam, 2013). Finally, adherence to ethical research standards was considered a critical factor in enhancing the overall validity and reliability of the study.

Findings

Table 1: Demographic Characteristics of the Participants

Position		
Teacher	21	52.5
Inspector	1	2.5
Principal	4	10.0
Vice Principal	14	35.0
Field of Expertise		
Physical Education	35	87.5
Other	5	12.5
Years of Service		
0–4 years	8	20.0
5–9 years	2	5.0
10–14 years	5	12.5
15–19 years	10	25.0
20–24 years	5	12.5
Years of Teaching Experience		
0–4 years	4	10.0
5–9 years	5	12.5
10–14 years	5	12.5
15–19 years	13	32.5

20–24 years	3	7.5
25 years and above	10	25.0
Years of Administrative/Inspector Experience		
0–4 years	11	27.5
5–9 years	4	10.0
10 years and above	5	12.5

According to the demographic information presented in Table 1, 57.5% of the participants are female, while 42.5% are male. The majority of the participants (52.5%) are teachers, followed by vice principals at 35%. A significant proportion of the participants (87.5%) work in the field of physical education. Regarding years of service, the highest proportions are found among participants with 15 to 19 years of experience (25%) and those with over 25 years of experience. In terms of total teaching experience, the largest group consists of participants with 15 to 19 years in the profession (32.5%). For administrative and inspector roles, the most prominent group (27.5%) has served for 0 to 4 years.

Table 2: Evaluation of the Integration of Sports-Oriented Secondary Schools and High Schools into the Formal Education System

Developmental areas targeted by physical education	28	70.0
Athlete licensing and talent identification	22	55.0
Students' acquisition of discipline and responsibility	17	42.5
Orientation toward sports and career planning	14	35.0
The impact of sports on preventing harmful habits	9	22.5

As indicated in Table 2, 70% of the participants believe that physical education and sports support students' physical, mental, and social development. Additionally, 55% of participants think that sports-oriented schools contribute to athlete licensing processes and talent identification. Furthermore, 42.5% indicated that these institutions help students develop a sense of discipline and responsibility, while 35% emphasized their significant role in career planning and development. On the other hand, 22.5% of participants noted that these schools can play a crucial role in preventing students from engaging in harmful behaviors. Overall, the majority of participants agreed that sports-focused schools not only promote physical development but also create a structure that supports social and psychological growth. These findings highlight the multifaceted impact of sports on individuals and strengthen the case for integrating sports-oriented schools into the formal education system.

Moreover, participants anticipate that such institutions will make a positive contribution to fostering discipline, responsibility, and career development among students.

Table 3: Evaluation of the Advantages Provided by Sports-Oriented Secondary Schools and High Schools for Young Athletes

Contribution to training professional athletes	34	85.0
Developing a disciplined and healthy lifestyle	30	75.0
Increased motivation and inclination toward sports	27	67.5
The possibility of achieving success at the Olympic level	18	45.0
Expansion of sports culture	20	50.0
Increase in the number of national athletes	16	40.0
Clarification of career goals	12	30.0
Tendency toward coaching and teaching careers	9	22.5

Table 3 outlines the thematic distributions related to the potential benefits of Sports-Oriented Secondary Schools and High Schools for young athletes. A substantial majority of participants (85%) believe that these institutions would aid in the development of professional athletes. Additionally, 75% indicated that such schools would

encourage students to adopt a disciplined and healthy lifestyle, while 67.5% emphasized their potential to enhance students' motivation and interest in sports.

Furthermore, 45% of participants suggested that achieving Olympic-level success would be more feasible through these schools. Other notable benefits include fostering a sports culture (50%), increasing the number of national athletes (40%), clarifying students' career goals (30%), and promoting careers in coaching and teaching (22.5%).

Table 4: Evaluation of the Potential Challenges in Integrating Sports-Oriented Secondary Schools and High Schools into the Education System

Lack of physical infrastructure and facilities	27	67.5
Insufficient financial resources	24	60.0
Difficulty in balancing academic and athletic demands	21	52.5
Shortage of qualified personnel	19	47.5
Institutional adaptation and regularity deficiencies	18	4.0

Table 4 shows that 67.5% of participants identified a lack of physical infrastructure and facilities as the most significant challenge in implementing sports-oriented secondary schools and high schools. Additionally, 60% of participants identified insufficient financial resources as their primary concern, while 52.5% mentioned the difficulty of balancing academic and athletic demands. Furthermore, 47.5% of participants pointed to a shortage of qualified personnel, and 45% recognized regulatory or institutional inconsistencies as key obstacles. These findings indicate that while sports-oriented schools have the potential to impact students' development positively, it is crucial to address issues related to infrastructure, funding, staffing, and policy alignment for successful integration into the formal education system.

Table 5: Evaluation of the Potential Positive Impacts of Implementing the Sports School Model in the Turkish Republic of Northern Cyprus (TRNC).

Increased recognition of the country in sports	26	65.0
Enhanced international competitiveness	24	60.0
Contribution to sports tourism and the economy	22	55.0
Training of qualified athletes and coaches	20	50.0
Widespread adoption of sports culture in society	19	47.5

As illustrated in Table 5, 65% of the participants believe that adapting the sports school model used in the European Union and Turkey to Northern Cyprus would enhance the country's recognition in the field of sports. Additionally, 60% indicated that this implementation could boost international competitiveness, while 55% noted its potential to contribute to sports tourism and the national economy. Furthermore, 50% of the participants stated that this model would support the training of qualified athletes and coaches, and 47.5% emphasized its role in promoting a sports culture within society. These findings suggest that implementing a sports school model in Northern Cyprus could yield significant social, cultural, and economic benefits while improving the country's global visibility in sports.

Table 6: Evaluation of the Impact of Sports-Oriented Secondary Schools and High Schools on Youth Career Development

Career awareness and guidance in the field of sports	29	72.5
Academic-athletic balance and Personal development	25	62.5
Orientation toward sports-related professions (e.g., coaching, physiotherapy)	23	57.5
Development of disciplined and organized lifestyle habits	21	52.5
Achievement-based scholarships and educational opportunities	18	45.0

According to Table 6, 72.5% of participants believe that sports-oriented schools can enhance career awareness and guide young individuals toward appropriate career paths. Additionally, 62.5% stated that balancing academic and athletic activities has a positive impact on personal development. Furthermore, 57.5% of participants indicated

that these schools would increase students' interest in sports-related professions, such as coaching and physiotherapy. Similarly, 52.5% highlighted the critical role that sports-oriented schools play in fostering disciplined and organized lifestyle habits. Lastly, 45% of participants mentioned that achievement-based scholarships and advanced educational opportunities offered by these institutions would motivate young individuals to strive for higher levels of success.

Table 7: Evaluation of Sports-Related Sanctions in the Event of Establishing Sports-Oriented Secondary Schools and High Schools in the Turkish Republic of Northern Cyprus (TRNC)

Mitigation of sports- related sanctions through success and recognition	25	62.5
Enhanced representation and promotion at the international level	23	57.5
Professional athletes serving as role models	20	50.0
Potential of sports to transcend political boundaries	16	40.0
Opinion that overcoming sports-related sanctions	11	27.5

As shown in Table 7, 62.5% of the participants indicated that sports-related sanctions could potentially be weakened through athletic success and increased international recognition. Additionally, 57.5% believed that the participation of TRNC athletes in international competitions would enhance the country's promotional power and visibility on the global stage. Furthermore, 50% of the participants noted that professional athletes could positively influence the country's image, while 40% highlighted the potential for sports to transcend political boundaries. However, 27.5% of the participants expressed the opinion that overcoming sports-related sanctions would remain challenging due to structural and political barriers.

Table 8: Evaluation of the Impact of Establishing Sports-Oriented Secondary Schools and High Schools on the Number of Professional Athletes Abroad

Increase in the number of professional athletes	30	75.0
International success and enhanced competitiveness	26	65.0
Role model influence and inspiration for future generations	23	57.5
Sports performance supported by education	21	52.5
Systematic and scientific management of sports	18	45.0

According to Table 8, 75% of participants believe that establishing sports-oriented schools would increase the number of professional athletes competing internationally. Additionally, 65% of participants think that this would lead to higher levels of international success, while 57.5% feel that such achievements would inspire younger generations by providing strong role models. Furthermore, 52.5% indicated that sports performance would improve when complemented by academic education, and 45% pointed out that sports activities would be conducted more systematically and scientifically. These findings suggest that integrating sports-oriented schools into the education system could significantly enhance international representation and contribute to the development of globally competitive athletes.

Discussion

This study offers a comprehensive examination of how Sports-Oriented Secondary Schools and High Schools are integrated into the education system of the Turkish Republic of Northern Cyprus (TRNC). The findings suggest that sports-oriented schools play a significant role in fostering students' physical, mental, social, and academic development. Most participants emphasized that sports should be viewed not only as a physical activity but also as a means to cultivate discipline, develop a sense of responsibility, facilitate career planning, and encourage the adoption of a healthy lifestyle.

The research findings indicate that sports-oriented schools hold significant promise for training professional athletes, promoting youth participation in sports, and achieving success at the Olympic level. While both sport and exercise are crucial for physical and mental well-being, they are fundamentally distinct concepts. Exercise refers to regular, planned, and repetitive physical activities, whereas sport involves these activities carried out under a set of rules and often in a competitive environment (Zorba & Saygin, 2013). Incorporating sports-oriented schools into the education system helps instill exercise habits from an early age, contributing to the development of physically active individuals throughout their lives. In this context, sports high schools not only have the

potential to nurture elite athletes but also to cultivate individuals with a greater awareness of healthy living, thereby benefiting society as a whole.

Research frequently highlights the positive effects of exercise on mental health, stress management, and academic achievement (Biddle et al., 2019). In Turkey, thematic sports high schools are established to allow students to specialize in specific sports such as football, volleyball, wrestling, or swimming. These schools provide students with intensive, professional training in their chosen disciplines. For example, the Turkish Football Federation Meral-Celal Aras Sports High School in Istanbul offers a specialized educational opportunity focused on football (Nakip, 2024). Incorporating structured content that emphasizes exercise awareness and healthy habits into the curricula of sports-oriented secondary and high schools can enhance both their athletic and educational functions. The findings of this study suggest that adapting the sports school models from the European Union and Turkey to the Turkish Republic of Northern Cyprus (TRNC) could improve the region's recognition in the sports arena, enhance its international competitiveness, and contribute to sports tourism. Participants noted that sports can serve as a powerful tool for social, economic, and diplomatic purposes. Additionally, in Southern Cyprus, Efstathios (2013) reports on the "Elite Athletes' Programme," which has been approved by the Cyprus Ministry of Education, Sports, and Youth. This program allows students to develop their athletic skills while maintaining their academic performance. Students can prepare for three A-Level subjects and obtain the Apolytirion (high school diploma). The program provides a balanced structure, combining morning training sessions with academic lessons throughout the day.

In countries like the Turkish Republic of Northern Cyprus (TRNC), where sports-related sanctions are in place, sports can serve as a strategic tool for foreign policy. This study's findings suggest that sports-oriented schools have the potential to deliver significant benefits not just at the individual level but also at societal, economic, and cultural levels. However, to fully realize this potential, a comprehensive and systematic strategy is necessary. Qualified human resources, adequate infrastructure, and strong political commitment should support this strategy. Without these structural and policy-based supports, integrating sports-oriented secondary and high schools into the TRNC education system may encounter substantial challenges, and their anticipated contribution to national and international sporting success could be limited.

FINDINGS OF THE STUDY

The study's findings indicate that the majority of participants consider the integration of sports-oriented secondary schools and high schools into the formal education system to be both necessary and beneficial. Participants emphasized that the implementation of such institutions would strengthen the country's sports culture and contribute significantly to the development of a more active and engaged society.

Furthermore, the study concludes that sports-oriented educational institutions have the potential to support both academic and athletic success simultaneously, foster discipline among students, and provide significant advantages in terms of career guidance and professional development.

Participants emphasized the need for centralized planning and institutional support to address critical issues, including infrastructure deficiencies, facility shortages, nutritional support, and the provision of sports equipment. The findings suggest that sports can effectively help overcome sports-related sanctions and enhance international representation. In this context, the study concludes that implementing a structured sports education model could increase the number of professional athletes

achieving international success. Such advancements would not only enhance the global visibility of the TRNC but also contribute to the development of a competitive sports culture within the country.

In conclusion, the integration of sports-oriented secondary schools and high schools into the education system of the Turkish Republic of Northern Cyprus (TRNC) represents a multifaceted approach. This model not only emphasizes the training of professional athletes but also significantly enhances the physical, mental, and social development of young individuals.

Recommendations

Recommendations for Researchers

- It is recommended that the Ministry of National Education (MoNE) organize in-service training programs for physical education teachers to ensure a balanced integration between academic learning and sports activities.
- The legal framework of the sports-oriented education model should be clearly defined, and it is suggested that a separate directorate/department be established within MoNE to oversee its implementation.

- Collaboration between sports-oriented schools and universities is recommended to ensure academic support, curriculum alignment, and the development of coordinated training programs.
- To overcome the challenges posed by sports-related sanctions, sports diplomacy should be promoted, and collaboration with international media outlets is suggested to enhance the visibility of professional achievements.
- It is recommended that future studies investigate students' perspectives on the integration of sports-oriented schools into the formal education system in Northern Cyprus to ensure a more comprehensive understanding of stakeholder needs.

Recommendations for Future Research

- It is recommended that future studies on related research topics utilize quantitative and mixed-method research designs with larger and more diverse sample sizes. This approach will enable researchers to compare results and findings from different methodologies with those identified in the current study, thereby enhancing the generalizability of the outcomes.
- Additionally, future research could focus on conducting a more comprehensive study under the same research title by examining the perspectives and attitudes of both students and parents regarding the integration of sports-oriented secondary schools and high schools into the formal education system. Such studies would provide a broader and more inclusive understanding of stakeholder expectations and potential challenges.

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Augmented Reality Assisting the Assembly of Do-It-Yourself Furniture

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ABSTRACT

Furniture assembly is often perceived as a confusing and demotivating task, especially when relying on traditional manuals and/or online videos, which can be mis. Do It Yourself (DIY) furniture manufacturing can be even more challenging, as it requires not only assembly steps but also material fabrication stages, often demanding access to advanced technologies. This research introduces a set of DIY furniture designs and evaluates the use of WebXR to assist the assembly process. This study aims to assess the potential of AR in supporting the assembly of DIY furniture, identifying its benefits and challenges. The chosen research method was a proof-of-concept exploratory trial, which in turn was divided into three stages: (i) design of DIY furniture, (ii) development of AR tutorials to support furniture assembly, and (iii) user evaluation. These stages were integrated into undergraduate and graduate courses within teaching, research, and community outreach activities, thus fostering interdisciplinary collaboration, with undergraduates contributing to furniture design and assembly, while graduates focused on AR tutorial development. The data analysis was based on the participants' responses to the questionnaires following the furniture assembly. None of the participants had prior experience with AR tutorials. Nevertheless, all participants successfully assembled the proposed furniture: a table, a stool, and a chair. The assembly process, however, was hindered by the instability of the webXR system in keeping virtual objects fixed in space, the excessive grouping of tasks within each step, and the difficulty participants faced in identifying the furniture components. It was observed that the average assembly time was directly related to the level of complexity previously assigned to each piece of furniture. These findings highlight the need for improvements in the proposed experience. By leveraging AR technology, this project has the potential to improve accessibility to DIY furniture by providing autonomy in assembly tasks.

Keywords: Extended Reality, Tutorial, Mounting, User experience.

1 Introduction

Furniture assembly frequently presents significant challenges for users, mostly due to conventional assembly guides, frequently criticized for their confusing structure, poor-quality visuals, and lack of clarity in step-by-step instructions (Dixon; Terton; Greenaway, 2018; Huang et al., 2018). To make the process easier, many companies provide printed instruction manuals, usually including illustrations and step-by-step guidance (Donkor, 2010). However, such manuals may lack essential information for the proper development of the assembly process, which can compromise the user experience, making it frustrating and challenging, even for individuals with prior experience (ReclameAqui, 2025c, 2025b, 2025a).

The Do-It-Yourself (DIY) movement represents a growing tendency, especially in the furniture business, due to several factors such as the search for more economic options (Vyas, 2020), the customization of the housing environment (Wolf; McQuitty, 2013) and the pleasure of doing something handmade (Birau, 2025). DIY is a philosophy of life that encourages the design of objects needed in everyday life, allowing a reduction in consumption and generating greater savings in the development of these products (Wolf; McQuitty, 2011). Nowadays, there are several options for self-assembly furniture, from simple bookcases (Kirchmer, 2023) to complex structures (Usukhbayar; Jiang; Tanaka, 2023).

DIY activities are characterized by self-driven efforts in which individuals undertake tasks, such as assembling furniture using provided instructions and tools, without professional assistance (Spinillo; Fujita, 2012; Watson, 2012). People are motivated to engage in DIY activities, including furniture assembly, due to economic benefits and the lack of product availability (Wolf; McQuitty, 2011). This approach democratizes the access to furnishings, making it more financially viable and adaptable to individual needs (Mettler et al., 2023).

DIY furniture projects can range from simple repairs and modifications to entirely custom-built pieces, often reflecting individual style, sustainability values, and cost-effectiveness (Buechley et al., 2009; Fox, 2014). Customary characteristics of DIY furniture include creativity and customization (Buechley et al., 2009; Fox, 2014), use of modular designs of (Altehenger, 2022), and sustainability (Ankarberg; Terzioğlu; Sundin, 2023).

The pandemic years had great collaboration in the development of this movement, because of the general isolation and lockdown all over the world, which encouraged people to handcraft abilities and to become independent of outsourced services (Mantz, 2021). Moreover, technology and social media helped spread the mindset of the DIY movement, encouraging people through Youtube tutorials, TikTok “how to...” videos and Facebook groups (Pişl, 2023).

The assembly process typically involves using tools and following step-by-step pictorial instructions to guide the construction (Spinillo; Fujita, 2012). In order to assist these assembly tasks, Augmented Reality (AR) systems allow people to view virtual instructions and technical information overlaid on the physical world, in real time (Dargan et al., 2023). This is particularly useful in this context, where visualization of assembly steps and interaction with three-dimensional models can facilitate the understanding and execution of complex tasks (Chytas et al., 2020). Studies show that AR not only improves knowledge retention but also reduces the time needed to reach proficiency (Raj et al., 2024).

The immersive technologies have great potential as support to assembly tasks (Di Pasquale et al., 2024), especially with the possibility of developing applications in Web Extended Reality (WebXR) Application Programming Interface (API). This API enables the creation and deployment of XR applications (such as Virtual Reality and AR) directly from the browser of different mobile devices, regardless of platform and independent of installed apps (Yang et al., 2021). It is noteworthy that one of the lead researchers in the current study has applied the AR experience in assembly of wood frame panels (Cuperschmid; Grachet; Fabrício, 2016), verifying the expansion potential to DIY furniture, this having even more execution ease in comparison to wood frame panels that have the weight and dimension difficulties.

Hence, the main objective of this research is to introduce a set of DIY furniture designs and presents a prototypical study that evaluates the use of webXR to assist the assembly process. This study aims to assess an initial overview of the potential of AR in supporting the assembly of DIY furniture, identifying its benefits and challenges. In order to attain this purpose, this study shall collect data related to: I) assembly process, II) user experience with AR, and III) participant well-being during experiments. This endeavour seeks to democratize access to self-assembly furniture, facilitating the process by overcoming the limitations of traditional manuals and enhancing the user experience. The results of this research have the potential to contribute to the continuous improvement of AR-based assembly support systems.

2 Theoretical Background

2.1 DIY movement

The DIY movement emerged in the 1910's in the United States, gaining strength with post-war scenario of home improvement, and its essence lies in encouraging people to manufacture and repair products such as furniture objects in an artisanal way, with easily available tools and raw materials, normally found at home, without the help of professionals, “doing it yourself” (Atkinson, 2006).

The production processes of materials and consumer goods have undergone significant changes over time. In the 1960s, a gap was observed between the quality parameters of manufactured products and the high expectations of customers. Efforts to improve product quality to meet these expectations led to increased final costs, which affected the cost-benefit balance of products (Matuszek & Seneta, 2020). This phenomenon spurred a pursuit of efficiency in production processes, involving the elimination of unnecessary components and the reduction of manufacturing time, which led to the development of the “Design for Assembly” (DFA) method (Moultrie; Maier, 2014). Once tested and adopted by large corporations, DFA proved highly valuable, making production processes considerably more economical (Boothroyd; Dewhurst; Knight, 2002).

Design for Assembly (DFA) is a design and evaluation approach focused on simplifying product assembly, reducing costs, and improving efficiency and quality. DFA seeks to minimize components and steps in the assembly process, delivering quantifiable benefits such as enhanced efficiency and cost savings (Boothroyd; Dewhurst; Knight, 2002). DFA principles can be applied across various industries, including furniture manufacturing and construction. These principles include design simplification, standardization, modularity, accessibility, minimization of fasteners, symmetrical design, reduction of adjustments, and fewer assembly steps. The correlation between assembly efficiency and the Assembly Efficiency Index (AEI) is crucial for validating DFA's effectiveness in specific projects (Zhai et al., 2023).

In addition to advancements in production processes, cultural changes in consumer preferences have influenced product design (Mohammed Yousif; Ramirez, 2024). The demand for environmentally friendly products, longer lifespans, and socially responsible corporate policies are just some of the challenges the industry has faced in recent years to meet market demands. Among these cultural shifts, the DIY movement stands out, gaining widespread adoption, particularly in developed countries like Germany, the UK, and the USA, where labor costs are high (Spinillo; Fujita, 2012). For DIY-oriented products, assembly is performed by end-users rather than specialized labor. This unique aspect impacts both the design process and the way assembly instructions are communicated to users.

Replicability is essential in DIY, depending on the replicator's personal skills and the availability of specific tools to define the complexity and difficulty of the task. In their research, revealed that around 8% of YouTube tutorials do not work and that a potential replicator would waste time and resources if they replicated it.

According to (Richardson, 2004a), some perceptions also alter the user's notion of difficulty, such as the number of components in the set and the step in question in a visual way. An alternative would be to separate the parts into packages according to the assembly phase. Avoiding repeating instructions for the same steps in different phases also helps to reduce the perception of difficulty, given the reduction in the volume of instructions. In parts with three-dimensional orientations, spatial confusion is very common, so ensuring that the fixing points are distinct in order to avoid positioning inaccuracy minimizes the possibility of error and the perception of difficulty, as well as the use of symmetrical components in order to reduce the mental load in the correct positioning of the fittings.

It is relevant to mention some guidelines to support the creation of DIY tutorials (Lahaye et al., 2023a), among them the use of a concise, clear and explanatory title; a thumbnail image (presentation) with a complete and well-lit view of the final object; a complete list of necessary materials and estimated completion time; photos of the tools in order to simplify their identification; describe the uniqueness and purpose of the project; pay attention to risks to the health of the user and the assembler; guide the necessary precautions and good practices; provide an index and the structure of the tutorial chronologically; detail the steps; list all the tools to be used in the step at the beginning of the explanation of the phase in question; inform about common errors and viable alternatives; merge videos and texts; provide references; link to other tutorials when necessary, considering that many external links can intellectually overload the user and provide supplementary files whenever necessary.

When comparing the instructional article and the instructional video, it was observed that videos and instructional articles practically do not differ in content, but rather in the presentation of information. According to (Behnke et al., 2019), the main characteristic of good instruction should be perceptive simplicity regardless of the level of personal skill. Visualizing the process, more than just writing it down, helps the person being instructed to imagine and compare their results, but the trend of videos on the web is towards short guides rather than complete tutorials. In their research, (Grom; Bytsan, 2022) revealed that around 8% of YouTube tutorials do not work and that a potential replicator would waste time and resources if they replicated it. As a growing concept, the DIY movement and its developments, like tutorials and furniture, can benefit from immersive experiences, bringing novelty and improvement to this field.

2.2 AR for furniture assembly

Extended Reality (XR) encompasses immersive technologies such as Virtual Reality (VR), AR and Mixed Reality (MR) (Khan, 2022). XR technologies have grown exponentially, offering versatile applications across industries like healthcare, entertainment, and manufacturing (Delaney, 2023; Stacchio et al., 2023; Choi; Lee, 2024). Interaction with XR is enabled through devices like head-mounted displays (HMDs), locators, and hand controllers (Li et al., 2020).

AR builds on VR by blending virtual objects into the real world, allowing real-time interaction (Liu; Zhang, 2013). This is adequate in this research with the object furniture that are being assembly in the real world. WebXR

combines the use of XR with the flexibility of a web browser, enabling the rapid and creative development of immersive experiences (SIGGRAPH, 2021). This means that there is accessibility to use XR technologies directly from web pages, without the need to install additional applications or plugins. With this, users can access XR content through devices such as smartphones, tablets, computers and VR/AR headsets, using browsers such as Google Chrome or Mozilla Firefox. This makes these experiences more accessible and democratizes access to immersive technology (Li et al., 2020).

AR has been applied to assembly tasks to enhance visualization and instructional processes. For instance, the AR-oriented Information Planning System (ARIPS) and the AR-based Assembly Instruction System (ARAIS) are notable examples, where ARIPS helps process engineers generate assembly files, and ARAIS provides shop floor workers with augmented visualization for precise execution of assembly operations (Li et al., 2018). Similarly, the Allview framework explores the integration of XR, including AR, in Vocational Education and Training (VET) for the Woodworking and Furniture (W&F) sector. This research focuses on developing immersive training environments, combining tools like VR, MR, and 360° videos, to enhance digital and sustainable assembly practices (Leal-Enríquez; Gutiérrez-Antúnez, 2024). These applications demonstrate AR's potential to optimize assembly instructions and foster transformative training methodologies.

The interactivity and visualization can enrich the process in furniture assembly with the potential of reducing cognitive workload by offering intuitive visual cues and step-by-step instructions, making the assembly process more manageable for first-time users (Deshpande; Kim, 2018a). Techniques that parse assembly instructions and reconstruct 3D models of furniture components can animate the assembly process and helps users visualize each step and understand the sequence of actions required, thereby reducing errors and assembly time (Shao et al., 2016b).

The use of AR provides engineering simulations with a smaller margin of error, increasing the accuracy and efficiency of planning and execution processes (Zhao et al., 2023). Furthermore, AR can be used to train workers and construction teams, providing a better understanding of construction processes and procedures, thereby contributing to shorter construction time and less waste (Xu; Moreu, 2021). It has also been explored in the context of furniture, enhancing user experience. IKEA's mobile application allows customers to seamlessly integrate virtual furniture into their physical environments, highlighting the significant impact of interactivity and novelty in the shopping process (Ozturkcan, 2021).

Similarly, AR-based assembly instruction systems, such as the interactive application proposed by (Chikaraddi et al., 2022), provide scalable and sustainable solutions for guiding furniture assembly, leveraging evolving technologies for diverse deployment scenarios. Moreover, AR technology has been employed to replicate furniture arrangements, enabling users to customize interiors and explore layouts interactively without physical objects, thus addressing time-intensive processes associated with traditional furniture purchases (Mohan et al., 2022).

Closer to the aim of this work, particularly for Ready-to-Assemble (RTA) furniture, an experimental study using an AR application demonstrated its benefits for first-time users, especially when assembling more complex furniture highlighting the need for well-designed visual features and interaction modes in AR applications and providing insights to guide the development of performance-driven tools for spatially demanding assembly tasks (Deshpande; Kim, 2018a). These advancements demonstrate AR's potential role in furniture-related applications, from design visualization to assembly guidance.

3 Materials and Methods

This study was designed as a proof-of-concept exploratory trial, involving three main stages: i) design of the furniture pieces (table, stool and chair) during an undergraduate course; ii) creation of an AR system for assembly and; iii) user evaluation.

3.1 Furniture design

To develop the furniture, a community outreach course was offered in the second semester of 2023 for undergraduate students of Civil Engineering and Architecture. In this discipline, reference research was carried out and furniture designs were developed for indoor common areas. The use of accessible furniture assembly materials and equipment, such as pine boards, and cutting services commonly offered by home centers similar to circular and jig saws in order to disseminate furniture assembly in all economic and geographic layers of Brazil. The initial resulting design proposals from the course were prototyped on a reduced scale using additive FDM 3D printing techniques and subsequently evaluated for their stability, ease of assembly and overall design. It was observed that many of the resulting designs included complex cuts and fittings, in addition to large dimensions.

This would be discouraging for carrying out assembly tasks considering the execution time and amount of material required, as well as requiring extensive previous experience of the user, contrary to the observed DIY principles observed in the literature (Collier; Wayment, 2018).

Hence, a set of tables, chairs and stools were chosen among the furniture designs developed in the course (Figure 1). The selected designs presented an interesting set for evaluation purposes for the current research, as they had progressive levels of assembly complexity, the stool being the simplest, followed by the table and chair (Figure 2). This is due to the parts' weight, difficulty of assembly, number of assembly steps, dimensions of the resulting furniture design, as well as the dimensions of its parts and its quantity. Those characteristics were observed to be desirable in DIY (Podskarbi et al., 2017).



Figure 1: Set of furniture designed by undergraduate students.

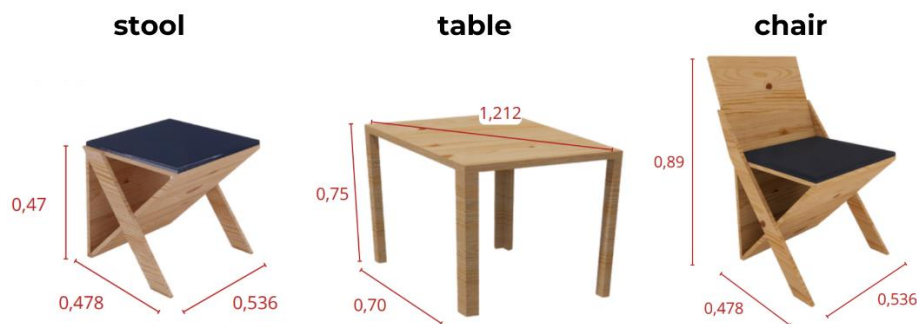


Figure 2: Pieces of furniture with their dimensions.

3.2 Creation of the AR application

The development of the aforementioned AR application came to pass in a course “AR in Architecture” offered to postgraduate students of the UNICAMP’s “Arquitecture, Tecnology and City” program in the first semester of 2024, in a course that discussed the implications of AR within the realm of architecture. Therefore, masters’ and doctoral students enrolled in the course discussed and reflected upon the theme, ultimately coming up with possible manners of elaborating AR applications for furniture design assembly (Figure 3).

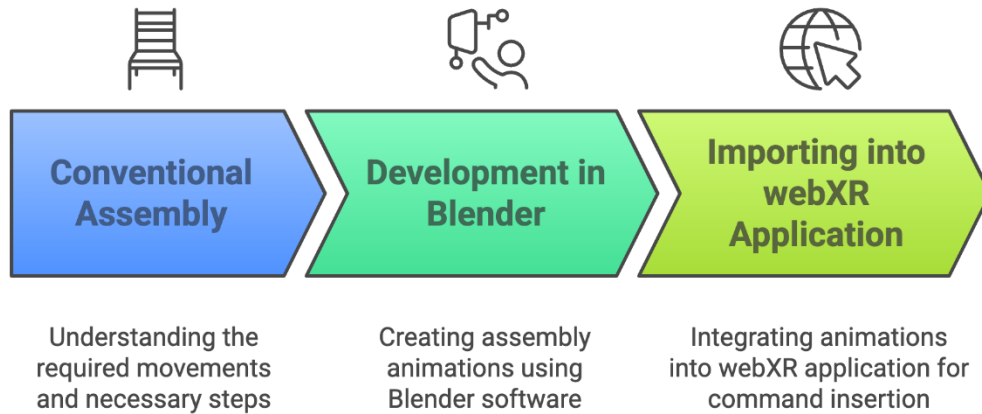


Figure 3: Creation of AR application workflow.

There, the applications and user evaluation protocol were developed as an initiative involving the creation of animations and applications in WebXR. The development of the AR tutorial was structured as an iterative process, prioritizing application performance based on the planned assembly steps. The initial phase involved analyzing the physical assembly of the furniture to understand the required movements and steps, such as the correct placement of screws and fittings. This analysis was crucial to ensure that the instructions conveyed in the AR tutorial were accurate and aligned with real-world assembly processes.

The animations for the tutorial were created using Blender, an open-source 3D software selected for its advanced animation capabilities and compatibility with AR platforms. Furthermore, its support for the .glb file format, a widely recognized standard for AR applications, ensured seamless integration with WebXR no code applications. The furniture models, initially designed in SketchUp during the Atelier course, were imported into Blender for the animation development.

The animation creation process within Blender involved several key steps. First, the 3D models were imported and organized into layers, with components grouped logically to facilitate efficient animation workflows. Each assembly step was animated using keyframes to ensure smooth transitions, including actions like aligning parts, inserting screws, and fitting joints. Camera angles and lighting within Blender were adjusted to highlight critical actions, enhancing the instructional clarity of the animations. Once completed, the animations were exported in the .glb format, maintaining compatibility with the AR platforms used for tutorial deployment (Figure 4).

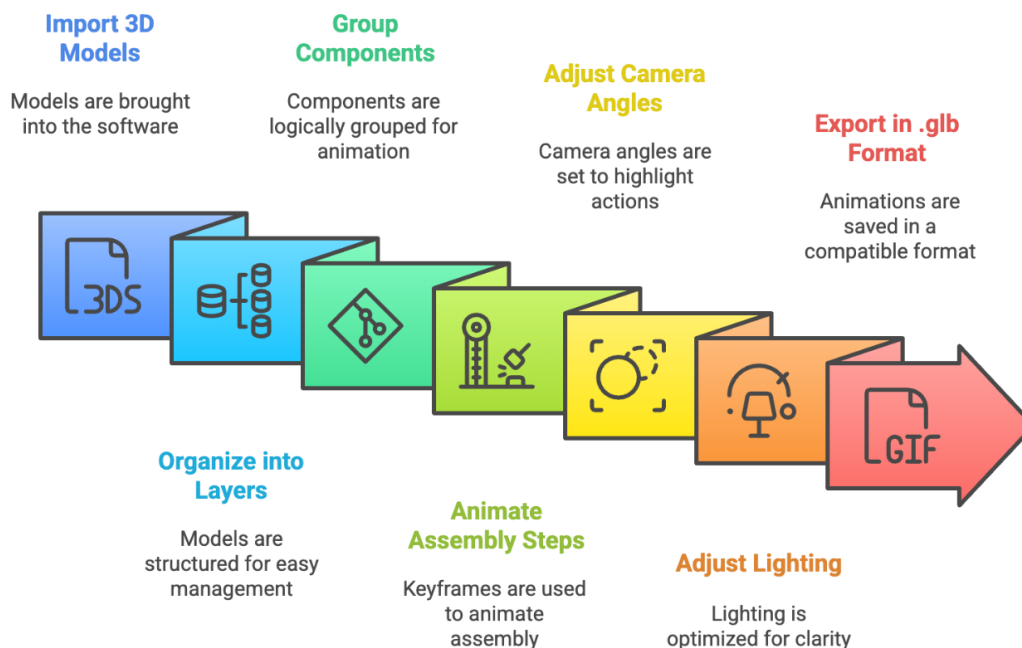


Figure 4: Animation creation workflow.

To choose an application, a survey of no-code applications for smartphones (Table 1) was carried out. Based on this data, tests were carried out on apps that offered a free version with no time limit. Among them, XR+ was chosen (XR+, 2024), which offered different types of tracking, the possibility of a mobile simulator and the availability of all the features in the free version. However, it is worth noting that there was a limit of 5 scenes per project.

Table 1: Survey of webXR applications

APP	3D format	File size limits	Trial version	Pricing	Tracking
8th Wall ¹	.glb	100 MB	Basic plan free	Pro: US\$ 99/month	Image Face Hand Real-world location
Awe ²	.OBJ; .FBX; .GLB	20 MB	Basic plan free	Plus: US\$ 12/month Lite branded: US\$ 89/month Custom branded: US\$ 149/month	Image Face AR Real-world location
Easy AR ³	.MB; .MA; .MAX; .JAS; .C4D; .BLEND; .LXO; .FBX; .DAE; .XSI; .SKP; .3DS; .OBJ; .DXF	--	Personal Edition free	Professional: \$39,00/month Classic: \$1399/month	Image 3D object Surface Sparse Spatial map
Hololink ⁴	.GLB; GLTF; .USDZ	10MB	30 days	Personal: US\$ 9 /month Basic: US\$ 29 /month Pro: US\$ 99 /month Business: US\$ 159 /month	Image Simple Surface
MyWeb AR ⁵	.GLB	15MB	14 days	Pro: US\$ 25/month Ultimate: US\$ 399/month Ultimate Plus: US\$ 990/month Phygital Marketing: US\$ 1200/month	Image QR Code Curved Image Real-world location
Onirix ⁶	.FBX; .OBJ; .GLB	Polygons: 200.000; Vertex: 500.000; Nodes: 100; Texture Size: 1.000	15 days	Starter: EU\$ 45/month Professional: EU\$ 299/month Get Scale: EU\$ 1499/month	Image Rotation Real-world location Spatial
Web AR Studio ⁷	.GLB; .GLTF	25MB	Non-commercial version free	Standard: US\$ 8/month Business: US\$ 24/month Unlimited: US\$ 110/month	Photo QR Code Surface Real-world location
XR+ ⁸	.OBJ; .FBX; .GLB	20MB (free version); 50MB (paid version)	Non-commercial version free	Advanced: US\$ 109,00/month Super: US\$ 439,00/month	SLAM Image Face Body (paid version)

- ¹ Available at <<https://www.8thwall.com>> . Accessed on 17 april 2024.
² Available at <<https://awe.media/>> . Accessed on 17 april 2024.
³ Available at <<https://www.easyar.com/>> . Accessed on 17 april 2024.
⁴ Available at <<https://www.hololink.io/>> . Accessed on 17 april 2024.
⁵ Available at <<https://mywebar.com/>> . Accessed on 17 april 2024.
⁶ Available at <<https://www.onirix.com/>> . Accessed on 17 april 2024.
⁷ Available at <<https://web-ar.studio/pt/>> . Accessed on 17 april 2024.
⁸ Available at <<https://xr.plus/>> . Accessed on 17 april 2024.

The animations were then imported into the chosen WebXR application. The XR+ provided the environment for integrating the animations with additional instructional elements, such as written and audio commands, to enhance user understanding and interaction. The tutorials contained 5 scenes in the case of the stool (Figure 5) and 4 scenes in the case of the table (Figure 6) and the chair (Figure 7).

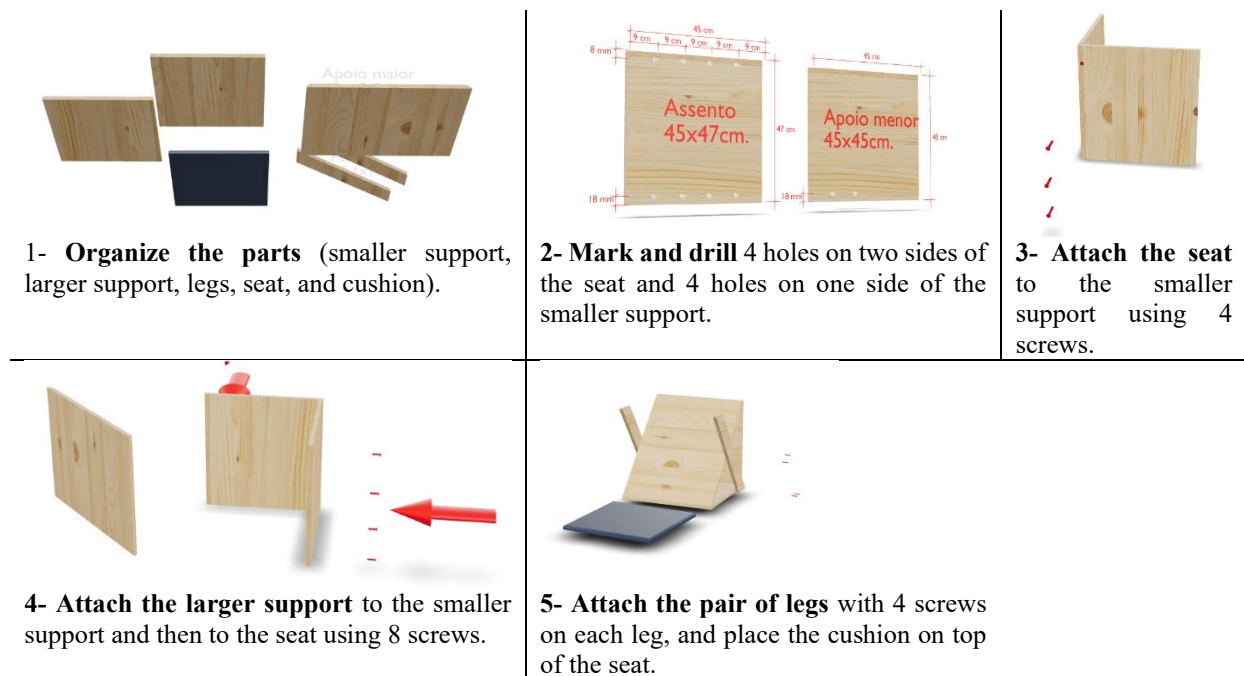


Figure 5: Stool Assembly.

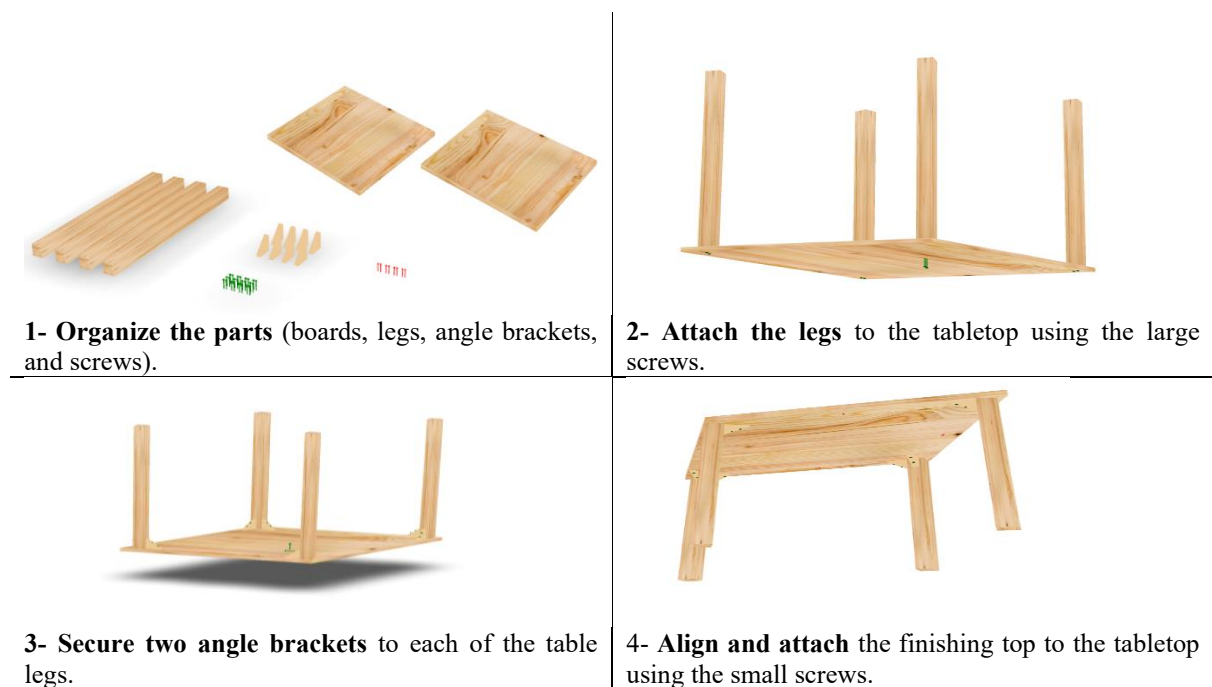


Figure 6. Table Assembly.

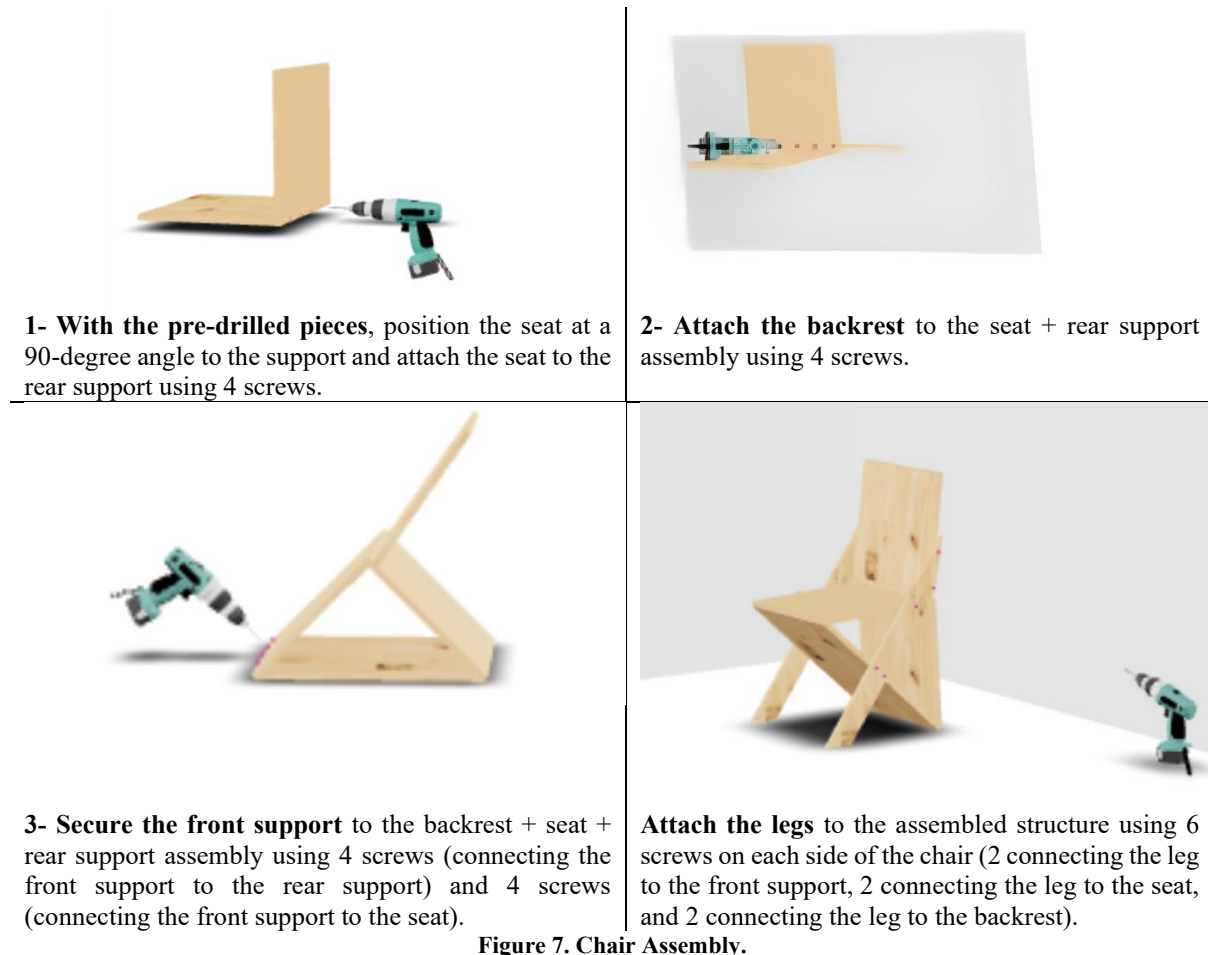


Figure 7. Chair Assembly.

3.3 User Evaluation

The target group selected for this experiment consisted of undergraduate students in Civil Engineering and Architecture, enrolled in elective university extension course at Unicamp, a public Brazilian university, during the second semester of 2024. According to enrollment records, their average age ranged from 19 to 23 years. These students have academic backgrounds aligned with the topics addressed in the study—such as assembly, design, and spatial reasoning—although most had limited prior experience with DIY furniture assembly. This lack of experience enabled a clearer evaluation of the impact of using an AR-based tutorial. Furthermore, the group is representative of the broader Brazilian population, with many students coming from less privileged socioeconomic backgrounds, which highlights both the democratizing potential of the DIY movement and the social relevance of this research.

The thirty-four enrolled students were first- and second-year students from the Civil Engineering and Architecture and Urbanism programs of UNICAMP. None of them had significant prior experience with DIY furniture assembly; only a small portion of the students had assembled simple furniture sold in retail stores with the aid of paper and/or pdf manuals. Thus, a woodworking activity was conducted involving the use of a drill, belt sander and jigsaw, customary DIY furniture assembly tools.

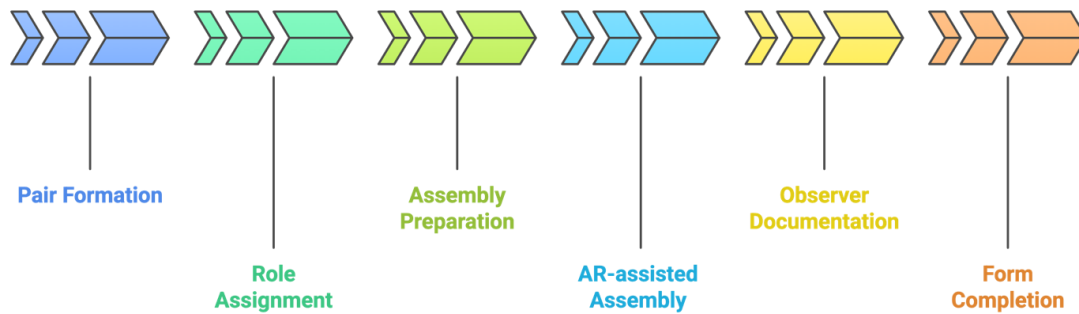


Figure 7: User Experience Process.

To this end, the user evaluation process was submitted to Plataforma Brasil and the UNICAMP Research Ethics Committee and authorization for human research was obtained in July 2024 (Certificate of Presentation of Ethical Appreciation, CAAE: 80547924.0 .0000.8142; CEP: 6.958.238), thus obtaining the necessary ethical approval parameters for analogous researches as according to Brazilian law. The consent forms were signed by the students who voluntarily wanted to participate.

Followingly, the individual furniture assembly itself began on the physical model laboratory within the university campus, supervised by a lab technician and monitored by researchers. Previously cut wooden pieces, screws, glue, a tape measure, and a screwdriver were placed on a table for each participant. A total of thirty (30) people participated in the experiment, with fifteen (15) assembling stools, seven (7) assembling chairs, and eight (8) assembling tables.

It is worth mentioning that none of the students had any previous experience with AR tutorials or similar geared towards furniture design. The beginning and finishing times of the assembly process were marked and observed throughout the assembly. Difficulties, errors, spontaneous comments, repetitive gestures, and challenges encountered during the assembly or in using the AR application were documented as well as suggestions and participant feedback. Additionally, photographs were taken of the results and specific moments during the assembly for later evaluation. Each student assembled only one piece of furniture (no one repeated the assembly process with different items).

4 Results

After completing the furniture assembly using the AR-assisted process, users were asked to fill out an evaluation form. The form used a Likert scale ranging from 0 to 5 divided into three sections: I) Assembly process (10 questions), II) User experience with AR (6 questions), and III) User well-being during experiments (4 questions). The emphasis on user-centered design aimed to provide vital insights into the system's practical and ergonomic impact.

4.1 Assembly process

Based on the forms' answers it was observed varying levels of satisfaction and ease across the three types of furniture. The initial explanations (Q1) were perceived positively, especially for the table (85.7% strongly agreed or agreed) and stool (71.4%), while the chair had more neutral or disagree responses, suggesting some users had difficulty understanding the tutorial's dynamics for this item. Identifying assembly parts (Q2) was easy for users, particularly for the table, with 85.7% strongly agreeing or agreeing, while the chair showed a lower percentage of ease in identifying parts, reflecting some difficulty in this task. Users generally felt confident in following the tutorial steps (Q3) and performing the assembly (Q4), with most agreeing that the steps were clear and manageable, particularly for the table and stool. The chair, however, had more mixed results, with a higher proportion of users finding the assembly steps and process less intuitive (Table 2).

User satisfaction and confidence were generally high across the furniture types. Most participants felt satisfied with their performance (Q5) in the assembly process, particularly with the stool, where 92.9% of users strongly agreed or agreed with their satisfaction. The safety of the assembled furniture (Q8) was also a strong point, with the majority of users feeling confident in the stability of their furniture, particularly for the stool and table. As for future use of AR tutorials (Q9 and Q10), there was a notable increase in confidence and comfort, particularly for the stool and table, with most users agreeing they would be able to assemble similar items without the tutorial.

However, the chair still saw lower comfort levels, indicating that while the AR system was effective, users felt less confident about replicating the task without further assistance (Figure 8).

Table 2: Collected data from users about assembly process statements.

Stool	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Strongly agree (5)	6,25%	18,75%	0,00%	6,25%	43,75%	25,00%	43,75%	50,00%	43,75%	12,50 %
Agree (4)	31,25%	18,75%	37,50%	37,50%	43,75%	25,00%	25,00%	43,75%	37,50%	25,00 %
Neutral (3)	50,00%	25,00%	37,50%	31,25%	6,25%	6,25%	18,75%	6,25%	0,00%	31,25 %
Disagree (2)	12,50%	25,00%	18,75%	25,00%	0,00%	37,50%	12,50%	0,00%	12,50%	18,75 %
Strongly disagree (1)	0,00%	12,50%	6,25%	0,00%	6,25%	6,25%	0,00%	0,00%	6,25%	12,50 %
Table	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Strongly agree (5)	57,14%	85,71%	71,43%	14,29%	28,57%	42,86%	14,29%	42,86%	71,43%	57,14 %
Agree (4)	28,57%	0,00%	14,29%	57,14%	42,86%	14,29%	57,14%	28,57%	14,29%	14,29 %
Neutral (3)	14,29%	14,29%	0,00%	28,57%	14,29%	28,57%	28,57%	0,00%	0,00%	0,00%
Disagree (2)	0,00%	0,00%	14,29%	0,00%	14,29%	14,29%	0,00%	28,57%	0,00%	14,29 %
Strongly disagree (1)	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	14,29%	14,29 %
Chair	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Strongly agree (5)	0,00%	0,00%	12,50%	0,00%	12,50%	0,00%	0,00%	37,50%	12,50%	12,50 %
Agree (4)	25,00%	0,00%	62,50%	0,00%	12,50%	12,50%	25,00%	37,50%	0,00%	12,50 %
Neutral (3)	25,00%	25,00%	25,00%	50,00%	25,00%	50,00%	25,00%	12,50%	62,50%	12,50 %
Disagree (2)	50,00%	25,00%	0,00%	37,50%	37,50%	37,50%	37,50%	12,50%	12,50%	37,50 %
Strongly disagree (1)	0,00%	50,00%	0,00%	12,50%	12,50%	0,00%	12,50%	0,00%	12,50%	25,00 %

Q1: The initial explanations were sufficient to understand the dynamics of the AR tutorial

Q2: I found it easy to identify the parts for assembly

Q3: The tutorial showed exactly the steps I should take

Q4: I found it easy to carry out all the assembly steps

Q5: I felt satisfied with how well I performed and completed the task using AR

Q6: I did not have any physical difficulties during the assembly process (parts that were too heavy, handling the tools)

Q7: I feel that I assembled the furniture quickly

Q8: Would you feel safe using the furniture you assembled?

Q9: After assembly with the AR tutorial, would it be possible to assemble the same piece of furniture again without the tutorial?

Q10: I feel comfortable assembling another piece of furniture using an AR tutorial?

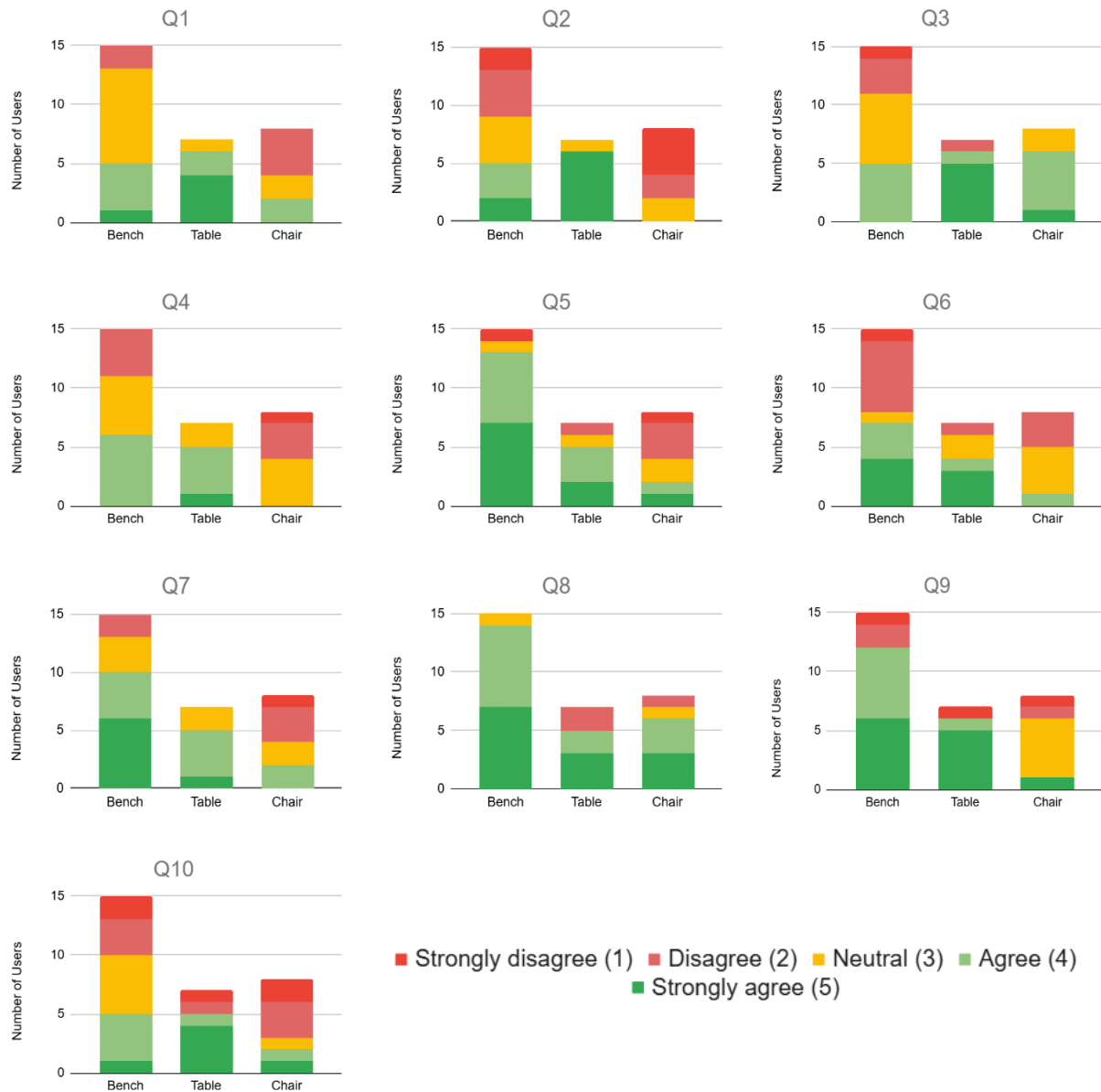


Figure 8: Visual scale of the furniture pieces for the assembly process statements.

4.2 User experience with AR

Approaching the AR application itself, the collected data reveals distinct user experiences across the stool, table, and chair assembly processes using AR. The table consistently outperformed the other furniture items in terms of usability and effectiveness. For instance, navigation between assembly steps (Q11) was easiest for the table, which achieved relatively better feedback regarding the naturalness of digital object overlays (Q12) and technical reliability (Q15), with fewer users reporting significant issues like crashes or slowdowns. However, even for the table, there were notable challenges, as evidenced by mixed responses about immersion (Q14) and novelty (Q16), where only a small portion of users found the experience extraordinary (Table 3).

In contrast, the stool and chair assemblies encountered more pronounced issues with the majority of negative feedback. For the stool, responses highlighted difficulties navigating steps (Q11) and a lack of smooth digital overlays (Q12), with six participants strongly disagreeing about the naturalness of AR integration. The chair faced similar struggles, particularly with immersion (Q14) and technical reliability (Q15), where the majority of users disagreed or strongly disagreed about the seamlessness of the experience.

Across all items, the perceived novelty and engagement of the AR system (Q16) were modest, indicating a need for enhanced features to better captivate users. These findings suggest the AR system is more effective for simpler

assemblies (like the table) but requires significant refinement to improve its intuitiveness, immersion, and overall user satisfaction for more complex tasks (Figure 9).

Table 3: Collected data from users about experience with AR statements.

Stool	Q11	Q12	Q13	Q14	Q15	Q16
Strongly agree (5)	6,25%	0,00%	6,25%	0,00%	12,50%	0,00%
Agree (4)	18,75%	6,25%	12,50%	0,00%	0,00%	31,25%
Neutral (3)	18,75%	12,50%	37,50%	31,25%	0,00%	37,50%
Disagree (2)	31,25%	43,75%	31,25%	31,25%	25,00%	25,00%
Strongly disagree (1)	25,00%	37,50%	12,50%	37,50%	62,50%	6,25%
Table	Q11	Q12	Q13	Q14	Q15	Q16
Strongly agree (5)	28,57%	14,29%	28,57%	14,29%	28,57%	14,29%
Agree (4)	28,57%	14,29%	28,57%	14,29%	0,00%	14,29%
Neutral (3)	14,29%	28,57%	28,57%	28,57%	14,29%	28,57%
Disagree (2)	14,29%	14,29%	14,29%	0,00%	14,29%	42,86%
Strongly disagree (1)	14,29%	28,57%	0,00%	42,86%	42,86%	0,00%
Chair	Q11	Q12	Q13	Q14	Q15	Q16
Strongly agree (5)	12,50%	0,00%	0,00%	0,00%	0,00%	0,00%
Agree (4)	0,00%	12,50%	25,00%	0,00%	12,50%	12,50%
Neutral (3)	25,00%	12,50%	50,00%	12,50%	25,00%	25,00%
Disagree (2)	37,50%	25,00%	25,00%	37,50%	25,00%	37,50%
Strongly disagree (1)	25,00%	50,00%	0,00%	50,00%	37,50%	25,00%

Q11: Was it possible to easily navigate between the different stages of assembly using the tutorial?

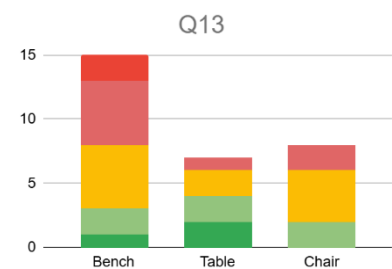
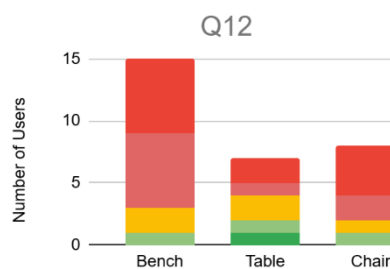
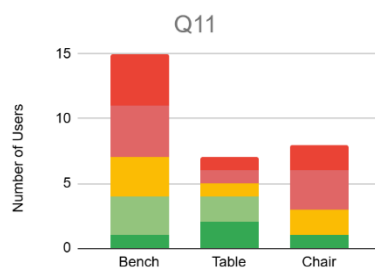
Q12: The superposition of digital elements in the real environment was natural and intuitive?

Q13: The colors and texts made it easier to understand the tutorial?

Q14: I felt completely immersed in the digital environment created by AR during the assembly process?

Q15: There were no technical problems, such as slowness, crashes or loss of tracking of digital objects?

Q16: When using this AR system, I felt involved in something extraordinary, was it a novelty?



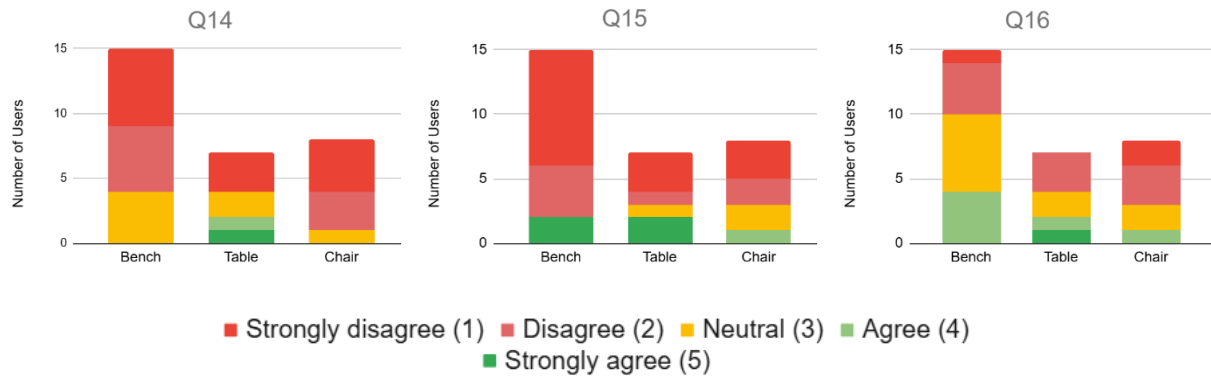


Figure 9: Questionary about the experience with AR.

4.3 User well-being

The users' responses about their well being during the experience with AR suggests that user well-being during furniture assembly varied depending on the furniture type. Most users did not find the assembly process tiring (Q18), particularly for the stool and table, where 78.6% and 85.7% of respondents, respectively, either strongly agreed or agreed. However, this percentage does not coincide in the case of the chair, where only 50% felt the same, confirming the initial knowledge that the chair assembly process required more effort. Similarly, when evaluating the comfort of using a smartphone during assembly (Q17), opinions were mixed. While some users agreed about its comfort (21.4% for the stool, 14.3% for the table, and 21.4% for the chair), a substantial proportion found it neutral or disagreed, with the stool and chair receiving the most negative responses, highlighting potential ergonomic issues or the strain of prolonged smartphone use (Table 4).

Regarding motivation and task performance, the AR system received moderate ratings. Users generally felt encouraged and motivated to complete the task (Q19), especially for the table and stool, where 50% and 42.9% agreed or strongly agreed. In contrast, the chair had a higher percentage of neutral responses (35.7%), indicating that users felt less motivated while assembling it. The AR system was effective in ensuring error-free assembly on the first attempt (Q20) for most tasks, particularly for the table, where 71.4% of users agreed or strongly agreed. The stool and chair also showed satisfactory results, with 50% and 35.7% of users agreeing, respectively. Overall, while AR positively impacts users' well-being for simpler tasks like the stool and table, improvements in ergonomics, user motivation, and fatigue management are necessary, especially for more complex tasks like the chair assembly (Figure 10).

Table 4: Collected data from users about well-being statements.

Stool	Q17	Q18	Q19	Q20
Strongly agree (5)	6,25%	50,00%	6,25%	25,00%
Agree (4)	12,50%	25,00%	37,50%	25,00%
Neutral (3)	31,25%	0,00%	25,00%	18,75%
Disagree (2)	37,50%	18,75%	25,00%	18,75%
Strongly disagree (1)	12,50%	6,25%	6,25%	12,50%
Table	Q17	Q18	Q19	Q20
Strongly agree (5)	14,29%	57,14%	14,29%	28,57%
Agree (4)	14,29%	28,57%	42,86%	42,86%
Neutral (3)	57,14%	0,00%	14,29%	14,29%
Disagree (2)	0,00%	14,29%	28,57%	14,29%
Strongly disagree (1)	14,29%	0,00%	0,00%	0,00%
Chair	Q17	Q18	Q19	Q20
Strongly agree (5)	12,50%	25,00%	12,50%	12,50%
Agree (4)	25,00%	37,50%	12,50%	50,00%
Neutral (3)	25,00%	25,00%	62,50%	0,00%

Disagree (2)	25,00%	12,50%	0,00%	12,50%
Strongly disagree (1)	12,50%	0,00%	12,50%	25,00%

Q17: Using the smartphone for AR during assembly was comfortable?

Q18: I did not feel tired during assembly?

Q19: When I was using the AR system, I felt encouraged and motivated to complete the task?

Q20: Using the AR system I was able to complete the task without errors, on the first attempt

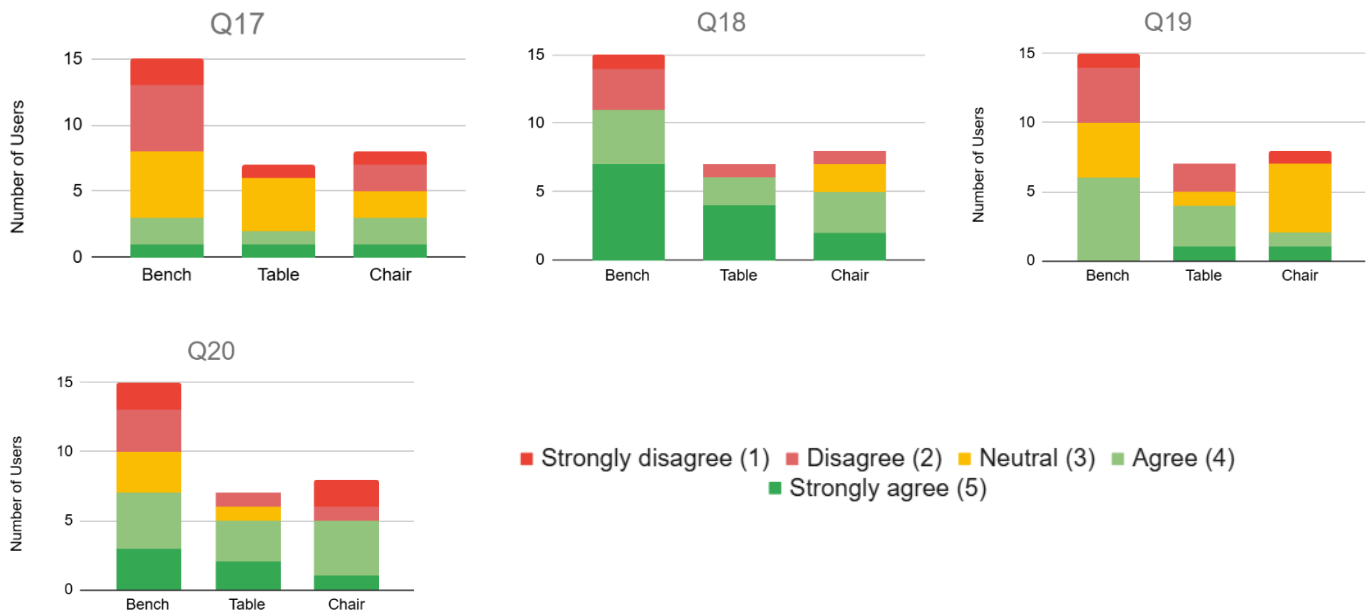


Figure 10: Results obtained from the questionnaire on user well-being.

4.4 Observations

During the assembly process observations were made about the general assembly, especially regarding the problems observed in the experience highlighting several recurring issues that impacted the assembly experience and were not approached in the Likert scale objective questions. A significant number of observations (Figure 11) approached challenges related to furniture and parts handling indicating that the physical interaction with the components was a considerable concern. This was closely followed by issues with parts identification, confirmed by the assemblers' comments, suggesting that users may have struggled to visually or contextually match the components during the assembly (Figure 12). It was also noted the existence of problems with the holes previously made, since they were misaligned with other parts of the furniture, resulting in errors during the assembly and, consequently, instability of the furniture itself (Figure 13).

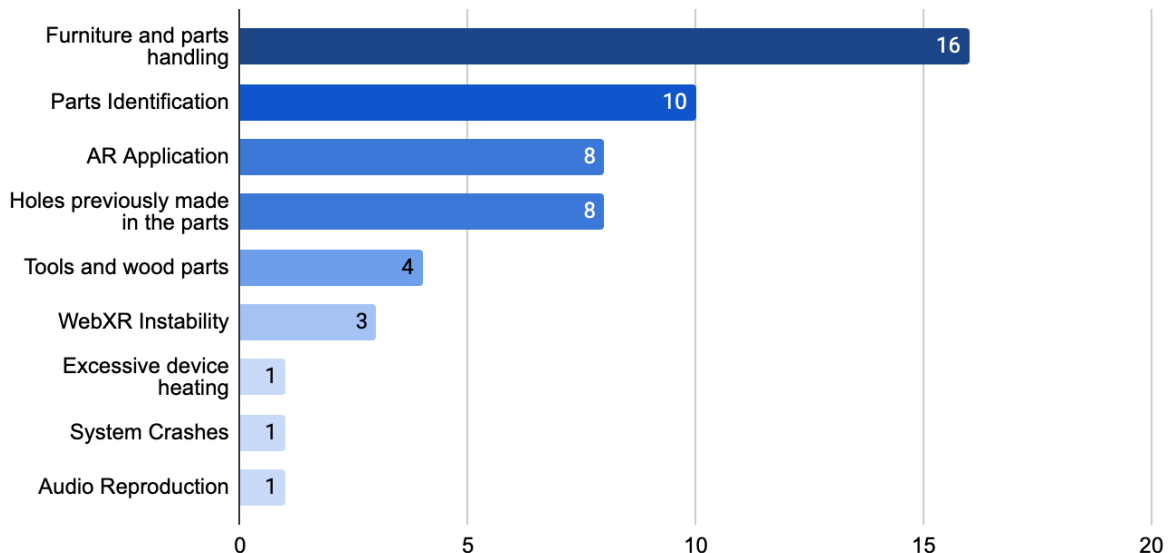


Figure 11: Observations about the assembly process.



Figure 12: Difficulties in handling the furniture during the screwing process.



Figure 13: Wood piece with misaligned holes and unstable furniture.

Additionally, WebXR instability and AR application issues were identified as potential barriers, pointing to technical limitations in the AR system, which could have caused confusion or disrupted the assembly flow. Excessive device heating and system crashes also appeared as isolated problems, indicating potential device performance limitations, which might affect the user experience.

From the assemblers' perspective, the most frequently reported issue was parts identification, which may indicate a need for clearer visual cues or better labeling within the AR interface (Figure 14). WebXR instability was also a major concern, as 6 assemblers pointed out this issue, further underscoring the need for a more stable connection and interaction between the AR system and the user's environment. AR application-related issues were similarly mentioned, which could involve difficulties in navigation or understanding the AR overlays, highlighting room for improvement in user interface design. Moreover, audio reproduction was a point of contention, suggesting that audio instructions or cues may not have been clear enough or appropriately timed for all users.

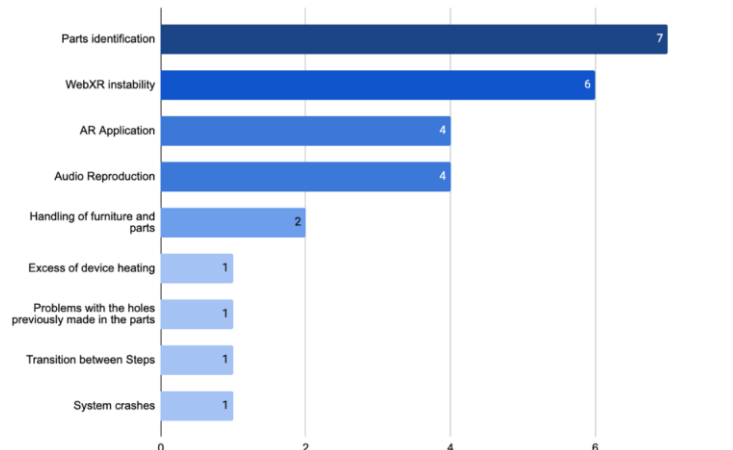


Figure 14: Observations from the assemblers about the experience.

The start and finish times were recorded in order to obtain the average assembly time for each piece of furniture (Figure 15). The average assembly time indicate that the table took the least time at 45.9 minutes, followed closely by the stool at 47.1 minutes, while the chair required significantly more time at 62.5 minutes. These variations may be attributed to differences in the complexity of the designs, the number of components, or the level of difficulty in following the assembly instructions. The observed times suggest that the chair assembly might present more challenges, potentially highlighting areas for improvement in either the furniture design or the assembly guidance provided through the AR system.

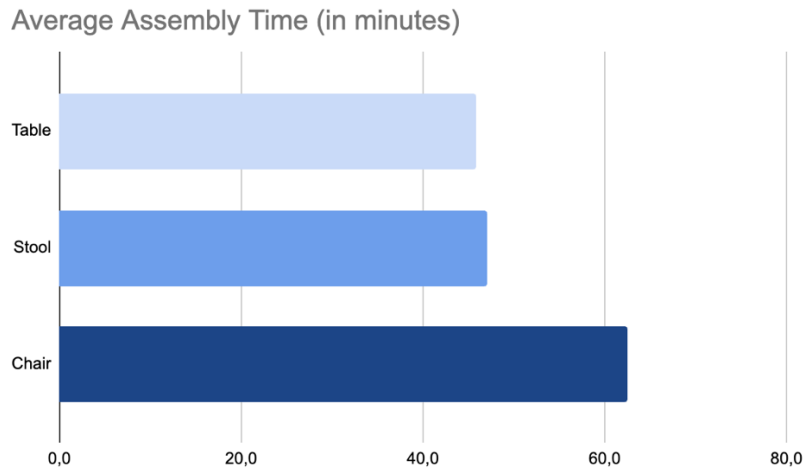


Figure 15: Average Assembly time.

5 Discussion and Conclusions

This proof-of-concept exploratory study aimed to introduce a set of DIY furniture designs and evaluate the potential of AR as a supportive tool in the assembly process. It sought to identify initial challenges and opportunities that could guide the development of a more robust and scalable AR-based workflow for DIY furniture assembly. The findings offer preliminary evidence that AR can help bridge the gap between traditional assembly practices and innovative digital solutions enabled by technologies such as WebXR.

The results obtained in the user evaluation revealed that all participants, despite having no prior experience with AR, successfully assembled the proposed furniture (table, stool and chair) (Figure 16). This demonstrates the general effectiveness of AR in simplifying complex tasks, consistent with other studies (Shao et al., 2016b; Deshpande; Kim, 2018b). However, technical challenges such as instability in the WebXR platform, difficulty in fixing virtual objects, and issues in identifying physical components were identified, echoing the concerns raised by (Zhao et al., 2023) about the importance of precision and stability in AR applications.



Figure 16: Furniture assembled by the students in the user evaluation.

The assembly times varied according to the complexity of the furniture, with the chair requiring the most time and a large quantity of negative feedback, compared to the table and stool. This aligns with the principles of Design for Assembly, which emphasize the importance of design simplification to improve assembly efficiency. User feedback also highlighted varying satisfaction levels, with simpler furniture like the table and stool being more intuitive and easier to assemble. These findings support on the need for perceptive simplicity in instructional design.

Despite its potential, the research faced limitations. The use of the free version of the chosen WebXR application, XR+, was limited to a maximum of 5 scenes. This meant that tasks had to be grouped together, overloading the mental workload required to carry out the steps. There were also challenges with tracker stability, along with device performance issues such as overheating and crashes, as well as difficulties in parts identification, all of which highlighted areas for improvement. It is worth noting that AR tutorials for DIY have not yet been extensively explored, and for this reason, the guidelines proposed by (Richardson, 2004b; Wakkary et al., 2015; Lahaye et al., 2023b) had to be adapted to this new medium. This work is still evolving and requires further studies to refine the proposal so that new AR tutorials can achieve greater efficiency.

The volatility of WebXR platforms was also noted, as the XR+ application used in this study is no longer available, alongside with Awe (identified in section 3.2), emphasizing that this is an emerging area that has not yet been consolidated. Results will help develop, in the future, a more robust process involving the development of AR for the assembly of DIY furniture.

By demonstrating the feasibility of AR for assembly tasks, this work lays the groundwork for further applications in education, professional training, and other DIY sectors. For instance, AR could enhance technical courses by providing immersive, step-by-step instructions, or serve as an alternative to traditional manuals in the furniture industry.

Future research should focus on optimizing WebXR technologies for stability and usability, exploring ergonomic interfaces to enhance user comfort, and expanding the study to include diverse demographics and furniture types. Addressing the mentioned challenges could involve integrating AI to automate component identification, refining user interfaces, and optimizing the platform for broader device compatibility, ensuring AR's role as a robust solution for complex assembly tasks.

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Development of an Online Lesson on Ideological and Political Theory Courses for Undergraduate Students of a University in Western China

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ABSTRACT

The research objectives were to: 1) develop online lessons on ideological and political theory courses to quality, 2) compare the pre-test and post-test scores of students after learning an online lesson on ideological and political theory courses, and 3) study the satisfaction of students who learned an online lesson on ideological and political theory courses. The sample of this study was 20 students at a University in Western China. The instruments research consisted of Superstar Learn Platform, an evaluation form regarding the quality of media and contents, the pre-test and post-test assessment form, and an evaluation form regarding student's satisfaction towards Online Lesson on Ideological and Political Theory Courses. Statistics used for data analysis were mean, standard deviation, and t-test for dependent samples. The results showed that: 1) the online lessons on ideological and political theory courses in media at an good level with the average score of 4.43 and quality of contents at an excellent level with the average score 4.90, 2) the students who learned via online lessons on ideological and political theory courses had an average the pre-test score of 62.33 points and post-test scores 76.97 points, respectively, when comparing the pre-test and post-test scores, so that the post-test scores were higher than pre-test scores with statistical significance at the level, and 3) the students were satisfied with online lessons on ideological and political theory courses overall the students' satisfaction was found to be at a highest level with the average score of 4.71.

Keywords: Online Lesson, Ideological and Political Theory Courses, Undergraduate Students of a University in Western China

INTRODUCTION

Background and Statement of the Problem

The ideological and political education work in colleges and universities is related to the quality of college personnel training, the overall development of higher education, and the realization of the fundamental task of moral cultivation (Hu Jingpu, 2024). As an important part of college education, ideological and political education plays an irreplaceable role in shaping students' world outlook, outlook on life, and values (Niu Hu, 2024). All this looks very nice, but in the actual teaching process, it is like many other subjects, there are many problems: First, course content is out of touch with reality: Some course contents are too theoretical. Second, the teaching methods are not rich enough. In recent years, the profound changes in internal and external environments and the rapid development of digital intelligence technology are affecting the growth environment of college students in the new era in an unprecedented way (Xue Bing, 2024). General Secretary Xi Jinping stressed that it is necessary to use new media and new technologies to revitalize work (Meng Wenyu, 2024). It will not only change the traditional mode and concept of ideological and political education but also form a more ideal form and category of education (Liu Jiexi, 2024). Under the background of continuous curriculum reform, these problems in the course teaching of ideological and political theory in universities should arouse the wide attention of educators.

Research of Objectives

To develop online lessons on ideological and political theory courses to have quality. To compare the pre-test and post-test scores of students after learning an online lesson on ideological and political theory courses. To study the satisfaction of students who learned an online lesson on ideological and political theory courses.

Research Questions and Hypothesis

Students who learn with online lessons on ideological and political theory courses can increase their academic achievement. Students learning through an online lesson on ideological and political theory courses can improve their learning satisfaction.

Conceptual Framework

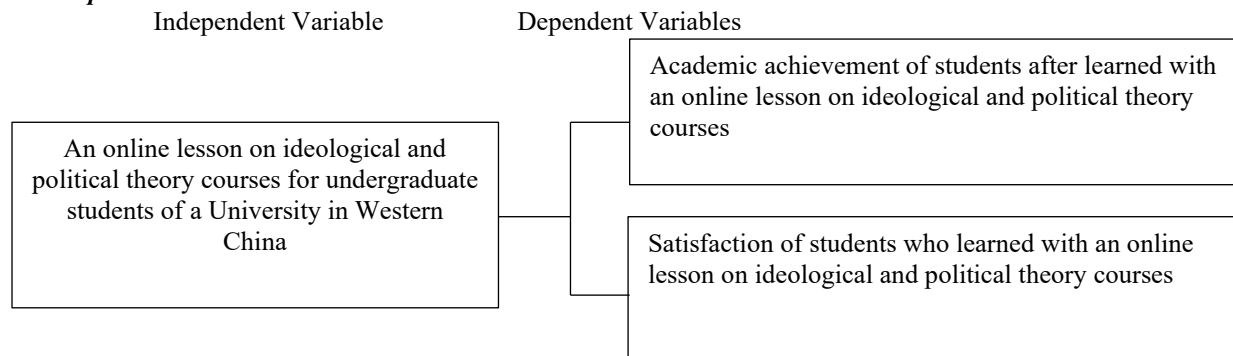


Figure 1.1 Conceptual Framework

LITERATURE REVIEW

ADDIE Model

Smith PL, Ragan TJ (2020) considers the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation phases, provides a systematic blueprint for creating effective learning experiences. According to Van Tiem D, Moseley JL, Dessinger JC (2012), it is renowned for its flexibility and adaptability, allowing instructional designers to tailor each phase to suit the specific needs of learners and the learning context. However, Siemens G, Gasevic D considers (2014) with the rapid evolution of technology, these phases necessitate a harmonious infusion of digital tools and methodologies. This integration of technology within the ADDIE framework leads to the creation of technology-enhanced learning experiences that cater to diverse learning styles and preferences.

The ADDIE model is a systematic instructional design framework consisting of five phases: Analysis, Design, Development, Implementation, and Evaluation. In online education, it is widely applied to improve course structure and effectiveness. The process begins with the Analysis phase, where learner needs, objectives, and technological tools are identified. Next, in the Design phase, course structure, learning objectives, teaching strategies (such as videos, interactive exercises, and live sessions), and assessment methods are planned. The Development phase follows, involving the creation of multimedia learning materials, learning activities, and testing course content on online platforms. Once developed, the course enters the Implementation phase, where it is launched, learning activities are facilitated, and learner engagement is monitored. Finally, the Evaluation phase ensures continuous improvement by gathering feedback, analyzing learning outcomes, and refining instructional strategies. Research shows that the ADDIE model enhances online course design, with technological support and learner interaction playing crucial roles in successful implementation. Moreover, ongoing evaluation and feedback help optimize instructional content and improve student learning experiences.

All in all, the synergy of the integration of the ADDIE model and technology is at the forefront of instructional design innovation. In this era of rapid technological development, it is of vital importance for educators, instructional designers and policymakers to understand its complex processes, gain advantages and look forward to future development directions. This comprehensive research provides guidance for those who wish to make full use of technology to transform education and training.

Academic Achievement

Tophat.com (2022) considers academic achievement to be the achievement of a student or institution concerning short or long-term educational goals. Academic achievement is usually measured by a student's grade point average (GPA), and for institutions, it can be measured by graduation rates.

Study.com (2022) considers academic achievement as the degree to which a student has learned knowledge and skills over a specific period. This achievement is often measured by a variety of assessments, including standardized tests (such as the SAT, ACT) and classroom test scores. These tests are designed to assess students' knowledge and understanding of specific subject areas. Grade Point Average (GPA) provides an overall profile of academic performance. The projects, papers, and assignments completed by students during the course are also

an important measure of academic achievement. These tasks often require students to apply what they have learned and demonstrate their understanding and analytical skills. Students' engagement in class discussions, teamwork, and extracurricular activities also reflects their academic success. These activities can show students' initiative, cooperation ability and practical application ability. Teacher evaluations of students, including their performance, participation, and progress in the classroom, are also important components of academic achievement.

Ward, Stoker, and Murray-Ward (1996) considers academic achievement refers to the outcome of the educational process that is, whether students, teachers, or institutions achieve their educational goals. The core of academic achievement lies in whether the pre-set educational goals have been achieved. These goals can be the mastery of academic knowledge, the development of skills, the formation of learning habits. The assessment of academic achievement should take into account the individual differences of students, including their learning styles, interests and abilities. Therefore, assessment methods should be flexible and varied to better reflect the actual performance of each student. Academic achievement is not just a static result, but should also include continuous improvement and progress in the learning process of the student. This means that education should be constantly adjusted and optimized to help students achieve their best academic performance.

According to Stumm, Hell, and Tomas (2011), the impact of individual differences on academic performance involves several factors, including intelligence, personality traits, and interest in learning. Their research points out that intelligence is one of the strongest predictors of academic performance, and intelligence is a core predictor of academic performance, especially fluid intelligence and crystallized intelligence. But personality traits, such as diligence and interest in learning, also have a significant impact on academic performance. Diligent students generally perform better academically, while students with an interest in learning are more inclined to take the initiative to learn and explore new knowledge. Interest in learning is the third pillar of academic performance, which can stimulate students' learning motivation and initiative.

According to the research of Bossaert, Doumen, Buyse, and Verschueren (2011), the impact of individual differences on academic performance involves multiple factors, including students' personality traits, family environment, learning motivation, and learning strategies. Their research highlights the important role of these factors in academic performance and explores how students' academic achievement can be enhanced through effective teaching methods and support systems.

Satisfaction

There are several findings of definitions regarding the concept or term “satisfaction” In the services and marketing literature. According to Oliver (1997), he stated that satisfaction is a pleasurable fulfillment that in general consumers are familiar with that consumption completes some goal or desire, and consequently, this completion creates a pleasurable feeling. As for Halstead et al. (1994), satisfaction refers to an alternate response that is centered on matching the result of the product with some standard set prior to the purchase and measured during or after consumption.

On the contrary, Fornell (1992) describes satisfaction as a common evaluation based on the result of the product perceived after the purchase and compared with prospects prior to the purchase. Additionally, the term satisfaction has been researched thoroughly in many empirical studies through massive personal interviews and meetings with consumer groups. Satisfaction according to Giese and Cote (2000) comprises of three crucial elements which are first, a general affective response that varies in its intensity, secondly a focus on the choice of product, purchase or consumption and lastly, the moment of determination that varies according to different situations and duration in time. The term satisfaction itself creates a vast diversity within industry and societal perspectives and varies with regard to the object focus and level of specificity. According to Yi (1991), satisfaction consists of levels of satisfaction with a product or service, purchase decision experience, performance attribute, consumption use experience, department or store of the business organization, lastly with a pre purchasing experience.

According to Spreng and Olshavsky's (1989) research, student satisfaction can be defined as the short-term attitudes generated by students' evaluations of educational experiences, services, and facilities. Their research highlights the process by which satisfaction is formed, arguing that satisfaction is the result of a comparison between student expectations and experience. On the other hand, Harvey, Plimmer, Moon, and Geall (1997) also indicate that student satisfaction is a quality enhancement tool that is designed to improve the quality of student experience. In addition, Bailey, Bauman, and Lata (1998) study shows that student satisfaction can be viewed in a way associating various multiple factors such as campus community, advertising services, and faculty in the educational environment accounted for the variance in students' satisfaction.

METHODOLOGY

The population of this study is 70 students from Class 1 of 2024 at a University in Western China.

The sample of this study was 20 students at a University in Western China who enrolled in ideological and political theory courses. They were selected by using purposive sampling selected from the School of Politics and Public Administration.

Research Design

The researcher used a quantitative approach in experimental design for conducting this study. The data was collected in a quantitative or numerical form derived from the test, and the researcher used a one-group pretest-posttest design. This design included a pretest measure followed by a treatment and a posttest for a single group. An illustration of the design is as follows:

Group: O1 x O2

O1 = Measurement of the pretest score

X = Digital Technology in the online ideological and political theory courses

O2 = Measurement of the achievement of the post-test score

Research of Methodology

Step 1: The assessments in this study have been developed to accommodate the research hypothesis. Therefore, it has been developed based on two theories used in this study. Research has shown that using ideological and political theory online courses to improve students' academic performance, the purpose of the student questionnaire has two main parts.

Part 1: The first part aims to measure expert opinions by developing an online course on ideological and political theory to improve the academic performance of students. This section is a closed questionnaire based on a five (5) point Likert-type scale. Participants were asked to rate how much they agreed with each statement on a scale of numbers 1-5, with each number interpreted as follows:

5 = Excellent

4 = Good

3 = Moderate

2 = Sufficient

1 = Improvement

Table 1 Range of mean and verbal interpretation for assessment of quality

Range Value	Verbal Interpretation
4.50-5.00	Excellent
3.50-4.49	Good
2.50-3.49	Moderate
1.50-2.49	Sufficient
1.00-1.49	Improvement

Part 2: This part is an open-ended questionnaire. Participants were asked to express their opinions and suggestions by ideological and political theory online courses to improve the performance of students with learning abilities.

Step 2: Before attempting an assessment, ask three measurement and evaluation experts working in the field of measurement and evaluation or education to check that the language used in the questionnaire is appropriate. The data obtained were used to calculate the project objective Consistency Index (IOC). The measurement and evaluation expert's evaluation of the project's Objective Conformity Index (IOC) content quality found that the project's objective Conformity Index (IOC) value was 1.00, which was then submitted to the content expert for further evaluation, and the measurement and evaluation expert used the project's objective Conformity Index (IOC) media quality to evaluate the results. The objective Consistency Index (IOC) of the project is given a value of 1.00, which is then evaluated and submitted to media experts for further evaluation. Evaluation criteria are used to check consistency between objectives and test items, as follows:

Table 2 Value of item objective congruence index and verbal interpretation

+1	item is considered congruent with the objectives.
0	item is considered neutral in terms of whether it was congruent with the objectives.
-1	item is considered not congruent with the objectives.

For acceptable data, the overall average score of the project Objective Consistency (IOC) index should be higher than 0.5.

Step 3: The assessment will be used by experts. An assessment content specialist assesses ideological and political theory online courses to improve student learning outcomes and a media specialist assesses the quality of media in online course development based on ideological and political theory to improve student learning.

The Achievement Assessment (Pre-test and Post-test)

The pre-test and post-test shared the same project with 15 questions related to the definition, determination, and property theory of the "materiality of the world and the law of development" part of ideological and political theory courses that they learned in class: Students were assigned to make predictions before learning about "materiality of the world," and to take a post-test after learning this knowledge. The researchers completed the following steps:

Step 1: The researchers selected the type of test to select multiple-choice, fill-in-the-blank, and short-answer tests to use in the study.

Step 2: The second part of the questionnaire is developed based on the online course to measure student academic achievement to enhance the parallel part of the higher vocal student.

Step 3: Ask three measurement and evaluation experts working in the field of measurement and evaluation or education to check for consistency between objects and items in the test. The data obtained were used to calculate the project Objective Consistency Index (IOC)

Evaluation criteria are used to check consistency between test objectives and projects, as follows:

Table 3 Value of item objective congruence index (IOC) and verbal interpretation of achievement assessment

+1	item is considered congruent with the objectives.
0	item is considered neutral in terms of whether it was congruent with the objectives.
-1	item is considered not congruent with the objectives.

For acceptable data, the overall average score of the project Objective Consistency (IOC) index should be higher than 0.5.

Step 4: Both pre-test and post-test were tested on 50 students in a University in Western China, but were not samples of this study. After the test is tested, it is used to find the difficulty index, discrimination index, and reliability index of the achievement test. Using Kuder-Richardson's K-R#20 formula, it is found that the 36 difficulty index should be between 0.2 and 0.8, the discrimination index should be 0.2 or higher, and the reliability should be 0.8 or higher.

Step 5: The pretest and posttest are used with the participants to explore their ideological and political theory knowledge before and after learning the materiality of the world through the online courses based on SuperStarLearn to enhance the materiality of the world of undergraduate students.

The questionnaire on students' satisfaction

Through questionnaires, students are asked about their learning using SuperStarLearning-based online courses to enhance the materiality of the world. The researchers did the following steps:

Step 1: The questionnaire in this study was developed to conform to the research hypothesis. Therefore, it has been developed based on two theories used in this study. Research shows that the use of online courses based on SuperStarLearn can enhance the materiality of the world. The purpose of the questionnaire has two main parts,

Part 1: Part 1 aims to measure student satisfaction with online courses based on SuperStarLearn to enhance the materiality of the world. This part is a closed questionnaire based on a five (5) point Likert-type scale. Participants were asked to rate how much they agreed with each statement in numbers 1-5. The explanation for each number is as follows:

- 5 = Highest
- 4 = High
- 3 = Moderate
- 2 = Poor

1 = Very poor

Table 4 Range of mean and verbal interpretation for students' satisfaction

Range Value	Verbal Interpretation
4.50-5.00	Highest
3.50-4.49	High
2.50-3.49	Moderate
1.50-2.49	Poor
1.00-1.49	Very Poor

Part 2: This part is an open-ended questionnaire. Through live classes based on SuperStarLearn, participants express their suggestions and opinions on learning in order to enhance the materiality of the world of undergraduate students.

Step 2: Before attempting the questionnaire, ask three measurement and evaluation experts working in the field of measurement and evaluation or education to check that the language used in the questionnaire is appropriate. The data obtained were used to calculate the project objective Consistency Index (IOC). Evaluation criteria are used to check consistency between objectives and test items, as follows:

Table 5 Value of item objective congruence index (IOC) and verbal interpretation of questionnaire on students' satisfaction

+1	item is considered congruent with the objectives.
0	item is considered neutral in terms of whether it was congruent with the objectives.
-1	item is considered not congruent with the objectives.

For acceptable data, the overall average score of the project Objective Consistency (IOC) index should be higher than 0.50.

Step 3: Participants will use questionnaires to explore their satisfaction with their studies through online courses based on SuperStarLearn to enhance the materiality of the world of undergraduate students. The questionnaire is for undergraduate students.

Data Collection

Step 1: Introduce students to the application called SuperStarLearn to improve the efficiency of Chinese students.

Step 2: Create a pre-test for students to get a score.

Step 3: Conduct learning activities with students through SuperStarLearn to improve the use efficiency of Chinese students.

Step 4: After students learn SuperStarLearn, conduct a post-test to improve the efficiency of Chinese students, and use statistical methods to analyze results.

Data and Statistical Analysis

In this study, the data were analyzed by mean difference, standard deviation, and T-test.

This study evaluates the effectiveness of SuperStarLearn in online courses by analyzing its impact on student performance. The evaluation is based on statistical measures, including means and standard deviations, derived from assessments conducted by three content experts and three media experts. The content experts focus on the quality, relevance, and pedagogical alignment of the course materials, while the media experts assess the usability, engagement, and technological integration of the platform. By combining insights from both groups, the study aims to provide a comprehensive understanding of how SuperStarLearn enhances learning experiences and improves student outcomes in a digital education environment.

To assess the effectiveness of SuperStarLearn in enhancing student learning outcomes, this study compares achievement test results before and after students engage with the platform. By applying T-test-related statistical methods, researchers analyze whether the differences in pre-test and post-test scores are statistically significant, indicating measurable improvements in student performance. The paired T-test is used to compare the means of both sets of test scores, assessing the extent of knowledge gained through SuperStarLearn. Additionally, student

utilization metrics—such as engagement rates, completion rates, and time spent on interactive learning activities—are examined to identify patterns in how learners interact with the platform. By incorporating these insights, educators can refine instructional strategies and optimize the integration of SuperStarLearn to maximize student learning efficiency.

To evaluate students' satisfaction with SuperStarLearn and optimize their learning efficiency, this study collects and analyzes feedback through surveys and statistical measures. By examining ease of use, content quality, and learning effectiveness, researchers aim to identify factors contributing to high or low satisfaction levels. Utilizing mean and standard deviation calculations, the study quantifies variations in student usage patterns, assessing whether higher satisfaction correlates with improved learning efficiency. Furthermore, correlation analysis is conducted to explore relationships between student engagement and performance outcomes.

RESEARCH RESULT

Results of evaluation of online lessons on ideological and political theory courses to quality

Table 6 The online lessons on ideological and political theory courses to quality. from three media experts

Option	$\bar{X}$	SD.	Meaning
1. The knowledge structure design of Online Lessons is very reasonable.	4.67	0.47	Excellent
2. The organization mode and interface design of the online platform are very convenient.	4.67	0.47	Excellent
3. The communication and sharing functions of online platforms are very useful.	4.33	0.47	Good
4. Online Lessons' video explanations are comprehensive and clear.	4.33	0.47	Good
5. The video quality of Online Lessons is high, and the viewing is smooth.	4.33	0.47	Good
6. The Online Lessons navigation interface design is reasonable and easy to click.	4.33	0.47	Good
7. Online Lessons are rich in resources and can attract learners' interest.	4.00	0.00	Good
8. You can browse Online Lessons content quickly and easily.	4.33	0.47	Good
9. The content of Online Lessons is simple and suitable for learners to study independently.	4.67	0.47	Excellent
10. The Online Lessons page layout is reasonable, the color matching is coordinated, and the page information is moderate.	4.67	0.47	Excellent
Total	4.43	0.42	Good

In general, it is found that the quality level of online courses on ideological and political theory is at a good level, with an average score of 4.43.

Table 7 The online lessons on ideological and political theory courses to quality from three content experts

Option	$\bar{X}$	SD.	Meaning
1. Online lessons' content can stimulate learners' strong interest in learning.	5.00	0.00	Excellent
2. Online lessons are simple and knowledge-specific.	5.00	0.00	Excellent
3. Online courses are moderately difficult.	4.33	0.47	Good
4. Consistency between online course content and learning objectives.	4.67	0.47	Excellent
5. Consistency between online course content and assessment.	5.00	0.00	Excellent
6. Online course activities are consistent with the content.	5.00	0.00	Excellent
7. Online course content design is very interesting.	5.00	0.00	Excellent
8. Online course teaching content resources are very rich.	5.00	0.00	Excellent
9. The chapters of the online course are connected correctly.	5.00	0.00	Excellent
10. The chapters of the online course are in proper order.	5.00	0.00	Excellent
Total	4.90	0.09	Excellent

In general, it is found that the quality level of online courses on ideological and political theory is at an excellent level, with an average score of 4.90.

Results of comparing the pre-test and post-test scores of students after learning an online lesson on ideological and political theory courses

Table 8 Compares the pre-test and post-test scores of students after learning an online lesson on ideological and political theory courses.

Items	n	$\bar{X}$	SD.	t-test	Sig. (2-tailed)
Pre-test	20	62.33	11.84	3.93	.000
Post-test	20	76.97	11.69		

**p< .05

From table 5 the results of the pre-test and post-test tests of the students had an average score of 62.33 points and 76.97 points, respectively. When comparing the pre-test and post-test scores, it was found that the post-test scores were higher than the pre-test scores, with statistical significance at the level.

Results of the study the satisfaction of students who learned an online lesson on ideological and political theory courses

Table 9 The satisfaction of students who learned an online lesson on ideological and political theory courses

Option	$\bar{X}$	S.D.	Meaning
1. Easy to use, not complicated	4.12	1.30	High
2. All kinds of information on the screen have appropriate positions.	4.49	0.74	High
3. Easy and convenient access.	4.93	0.25	Highest
4. Testing is appropriate.	4.90	0.31	Highest
5. Demo control buttons are appropriate.	4.90	0.31	Highest
6. Font style is easy to read and clear.	4.80	0.41	Highest
7. Font size is appropriate.	4.97	0.18	Highest
8. Select a font and background color.	5.00	0.00	Highest
9. The difficulty of the content is appropriate to the level of the students.	4.49	0.69	High
10. Courses are fun.	4.54	0.71	High
Total	4.71	0.49	Highest

Table 6 shows that students' overall satisfaction with online courses is at the highest level in terms of quality, with an average score of 4.71.

CONCLUSION AND DISCUSSION

Conclusion

1) The online lessons on ideological and political theory courses to quality from three media experts are as follows: In general, it is found that the quality level of online courses on ideological and political theory is at a good level, with an average score of 4.43. The online lessons on ideological and political theory courses to quality from three content experts are as follows: In general, it is found that the quality level of online courses on ideological and political theory is at an excellent level, with an average score of 4.90.

2) The results of the pre-test and post-test tests of the students had an average score of 62.33 points and 76.97 points, respectively.

3) The results of the students' overall satisfaction with online courses is at the highest level in terms of quality, with an average score of 4.71.

Discussion

1) From the Results of ideological and political theory online courses, in general, it is found that the quality level of online courses on ideological and political theory is at a good level, with an average score of 4.43. Consistent with Zhang Qiankun's research results, Zhang Qiankun (2024) Research on the ways of integrating Chinese modernization into the ideological and political education of college students.

2) In general, it is found that the quality level of online courses on ideological and political theory is at an excellent level, with an average score of 4.90. Consistent with the research results of Zhang Xiajing; Liu Linyan;

Lv Jie (2024), Research on the influence and countermeasures of ideological and political education of young people under the network environment.

3) The results of the pre-test and post-test tests of the students had an average score of 62.33 points and 76.97 points, respectively. When comparing the pre-test and post-test scores, it was found that the post-test scores were higher than pre-test scores, with statistical significance at the level. Consistent with Gan Shouwei (2024) 's research results.

4) It can be found that students' overall satisfaction with online courses is at the highest level in terms of quality, with an average score of 4.71.

5) Impact of online course development on students: Increased learning flexibility: Online courses offer a "anytime, anywhere" approach to learning, which is especially important for students with work, family responsibilities, or other time constraints. Diversity of learning resources: While traditional classroom instruction often relies on textbooks and classroom explanations, online courses can utilize multimedia resources to provide a more vivid and interactive learning experience. Enhance independent learning ability: Online learning requires students to have a high degree of self-discipline and time management skills, which to a large extent, cultivate students' independent learning ability.

6) Impact on teachers: Diversity of teaching methods: Teachers need to be familiar with and master different digital tools. This not only improves the technical ability of teachers but also encourages them to explore new teaching methods and strategies and promotes the innovation of teaching. Timeliness of teaching evaluation and feedback: Online courses provide opportunities for immediate evaluation and feedback, and through automatic grading and instant interaction, teachers can gain a more timely understanding of student progress. Changes in teachers' workload: The development and management of online courses may change teachers' workload and increase the demand for course design and technical support.

7) Impact on the industry: Expand the education market: Educational institutions and companies can promote their courses to all over the world through online platforms, attracting students from different countries and regions. This not only increases the source of income for educational institutions but also promotes the global sharing and fair distribution of educational resources. Drive innovation in education technology: To provide a better online learning experience, EDTech companies and developers continue to introduce new teaching tools and platforms, such as virtual reality (VR), augmented reality (AR), artificial intelligence (AI), and big data analytics. These technologies not only make teaching more interactive and engaging but also open up more possibilities for personalized learning and real-time feedback. Change the way educational institutions operate: Educational institutions are no longer limited to teaching on physical campuses, and Online courses enable them to offer Blended Learning and Fully Online Learning options.

RECOMMENDATION

Recommendations from the research results

The small number of students participating in the implementation of online courses and the short duration of the implementation of courses may limit the quality and quantity of data.

Suggestions for future research

Online education is a hot research topic in the future of education, and mobile learning is also one of the potential directions. Based on the current achievements and shortcomings, the later research work mainly focuses on personalized teaching and learning, integration of multidisciplinary knowledge, improving the quality and attractiveness of content.

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E-Learning on Career Development and Career Planning for Fourth-Year Undergraduate Students from Yunnan, China

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ABSTRACT

The objectives of this study were to: 1) investigate the efficiency of E-learning on Career Development and Career Planning undergraduate from Yunnan, China, 2) compare students' achievements before and after learning through earning on Career Development and Career Planning from Yunnan, China, and 3) examine students' satisfaction with of using learning on Career Development and Career Planning The sample comprised 30 undergraduate from Yunnan China, derived through a purposive sampling technique. The instruments used for data collecting were 1) The E-Learning on Career Development and Career Planning for undergraduate from Yunnan, China enhanced learning achievement, pretest and a post-test, and a teacher satisfaction form. The statistics used for analyzing the data were percentage, mean, standard deviation, and t-test for dependent sample. The research findings revealed that applying basic on Career Development and Career Planning to enhance learning achievement was efficient by E_1/E_2 (82.40/81.33). The evaluation of content e-learning on Career Development and Career Planning teaching by the experts was totally appropriate at the excellent level ($\bar{x}=4.78$, $SD = .58$), and the evaluation of media by the experts was totally appropriate at the excellent level ($\bar{x}= 4.50$, $SD = .58$). After learning the application, the students' achievements were higher than before. The mean and standard deviation for before learning were 8.80 and 2.33, while for after learning, they were 16.27 and 1.48. The t-test score between before and after learning was 20.68, with a significant difference at the .05 level. According to fourth-year students from Yunnan, China, students' satisfaction with e- learning on Career Development and Career Planning for enhanced learning achievement was high, with a mean of 4.51.

Keywords: e-learning, career envelopment and career planning, undergraduate students, Yunnan, China.

INTRODUCTION

Online learning, a rapidly changing digital technology advancement across the world, has transformed the way students learn and develop their professional competencies. In Yunnan Province, China, online learning has been used to develop fourth-year undergraduate students and is playing a key role in bridging the gap between academic learning and career development. Online learning enhances professional competence development. Learning effectiveness depends on learning abilities, learning environment, and participation. Online learning management in China provides students with access to flexible resources and links academic learning with professional competence development. Key factors influencing professional competence development Self-directed learning ability to develop online learning ability, students need to have self-discipline and self-directed learning skills (Shen, Y., Xie, W., Wang, X., Qu, J., Zhou, T., Li, Y., Mao, X., Hou, P., & Liu, Y., 2020). Students need to prepare for the transition from university to work, equipping them with the skills to engage with digital learning environments, enabling them to gain greater flexibility, access and exposure to career opportunities. Online learning platforms allow students to explore diverse career paths, access specialized training in appropriate career skills and engage in self-directed learning experiences tailored to their individual goals. In line with the research, this study applied the Self-Determination Theory and studied the self-regulation and perceived autonomy of Chinese students in online higher education learning using a mixed-method research method. Semi-structured interviews were conducted with French students studying at a university in Guangxi, southern China. The results showed that online learning has developed rapidly, showing a strong positive relationship between self-regulation and learning outcomes, and a moderate positive relationship between self-regulation and perceived autonomy. Chinese students with good academic performance have high levels of self-regulation and self-controlled regulation. These findings are of great significance for the development of information technology in China's

higher education and the development of students' self-regulation ability and the promotion of their perceived autonomy in online education(Gu, L., Lee, H., Song, Y., & Gu, Z., 2023).

Economic development and educational innovation are progressing rapidly. Online learning is a strategic way to enhance employability and improve the alignment between university curricula and market needs. Therefore, e-learning also promotes lifelong learning habits, critical thinking, and digital literacy, which are crucial skills required in today's rapidly changing labor market. The Chinese government promotes digital education through national policies and programs, including online teaching, and universities in Yunnan are adopting e-learning models to prepare students for diverse professional environments. Therefore, understanding the impact of e-learning on career development and career planning among fourth-year undergraduates is crucial for educators, policymakers, and institutions seeking to develop graduates' readiness for the modern workforce. Competency growth, access to online resources or platforms. Students who practice these skills will benefit from online education in terms of professional skills and job readiness. Learning environment and platform quality A supportive learning environment characterized by strong teaching capabilities, effective assessment, and robust platform support can significantly enhance learning behaviors such as participation, communication, and collaboration. These behaviors are closely linked to the development of professional competencies, interaction, and communication. Opportunities for communication and collaboration between students and teachers are essential for improving the quality of online learning and promoting competencies such as teamwork and problem-solving, technological support, and instruction. The effectiveness of online learning in developing professional competencies is maximized when institutions invest in digital infrastructure, train teachers in online courses, and design curricula that meet the diverse needs of their students.

Based on the above background and significance, the researcher conducted a study on online learning on career development and career planning for fourth-year undergraduate students from Yunnan Province, China, to develop an online learning platform to enhance students' professional competencies. In Yunnan Province, China, online learning has been used to develop fourth-year undergraduate students and plays a key role in bridging the gap between academic learning and career development. This digital approach supports career planning by enabling students to assess their skills, identify career interests, and participate in virtual internships or professional development projects. In regions such as Yunnan Province, China.

LITERATURE REVIEW

In this study, the researcher reviewed the following literature. Online learning for career development, career skill development planning, and related literature by synthesizing the research results, emphasizing theoretical perspectives, summarizing empirical findings, and identifying gaps related to research in Yunnan Province.

Online learning in China's higher education system.

As policy changes and institutions in China focus on accelerating the adoption of online and blended learning in higher education, national policy frameworks and ministry guidelines have relaxed restrictions on online services and promoted the concept of "Internet and education", which aims to build a strong online learning infrastructure and legitimacy that can support students' learning and employment opportunities. The development of China's online education policy over the past 20 years has designed, created guidelines and designing methods for online education, designing content to be appropriate for professional skills, China's online education policy framework, and divided the development into 4 stages: the pilot exploration stage from 1999 to 2002, the standards development stage from 2002 to 2012, the transition stage from 2012 to 2017, and the governance improvement stage from 2017-present. China's online teaching policy development has three characteristics: meeting the needs of the times, shifting from a single-minded approach to a multi-stakeholder approach, and moving from a single-goal approach to a universal approach. The policy focuses on regulating institutions, content, and products, as well as guiding social capital to participate in online education, initiatives, and values. It promotes development from the perspective of educational policy and governance (Jiang, Y., Shang, J., & Jiao, L., 2022). Theoretical Concepts for Online Learning and Career Skill Development Outcomes.

This study examined the impact of online learning on career skill development using social cognitive career theory, self-perception of career skills and outcome expectations, self-determination theory, autonomy, competence, relationships, and self-regulated learning models. The online intervention promoted self-perception of career skill development competence, autonomy based on self-directed learning modules, and self-regulated planning, decision-making, and career readiness, online self-efficacy, learner-instructor interaction, and self-perception of career decision-making competence in practice. Online learning can significantly enhance career skill development, self-efficacy, and readiness by promoting independence, competence, and self-regulation. The impact of online learning on career skill development is well supported by social-cognitive career theory (SCCT), self-determination theory (SDT), and the self-regulated learning (SRL) model. Meeting the psychological needs

of autonomy, competence, and relatedness in an online environment can enhance students' intrinsic motivation, self-perceived efficacy, and engagement in self-directed learning activities (Brenner, C., 2022).

Online Career Planning Courses

Online vocational skills instruction and structured career courses can significantly improve job readiness, reduce career decision-making difficulties, and enhance job search performance. The combined impact of information on labor market knowledge, skills training, resumes, interviews, networking, and reflective activities, including self-assessment, values clarification, and program evaluation analysis, complements face-to-face and hybrid vocational skills counseling. The online career skills curriculum structure includes the following: Developing job readiness, career decision-making, job search enhancement, labor market knowledge, job skills training, resume writing, interview techniques, networking, reflective activities, self-assessment, values clarification, program evaluation analysis, and integrated career skills counseling. Job Readiness, Career Decision-Making, Curriculum Mechanisms and Features Key components driving the effectiveness of the online career curriculum include self-exploration and reflection, activities that help students identify their skills, interests, and values and relate them to career opportunities. Career Management and Planning Modules on job search skills, interview preparation, and goal-setting directly improve job performance, efficiency, and adaptability. The curriculum promotes confidence in career decision-making and the ability to adapt to a changing job market (Cao, H., & Han, C., 2024).

METHODOLOGY

Purpose of the Study

The objectives of the study are as follows: 1) To investigate the efficiency of E-learning on Career Development and Career Planning undergraduate Yunnan, China, 2) To compare students' achievements before and after learning through earning on Career Development and Career Planning Yunnan, China, 3) To examine students' satisfaction with of using learning on Career Development and Career Planning.

Research Questions and Hypothesis

1) E-learning on Career Development and Career Planning undergraduate Yunnan, China, was posttest higher than pretest after study form E-learning on Career Development and Career Planning ungraduated Yunnan, China, enhances the learning achievement which is different significantly on statistics at the level .05.

2)The satisfaction of the students towards e-learning on Career Development and Career Planning ungraduated Yunnan, China, enhances the learning achievement of undergraduate Yunnan is in average of 4.50, considerable level.

Conceptual Framework

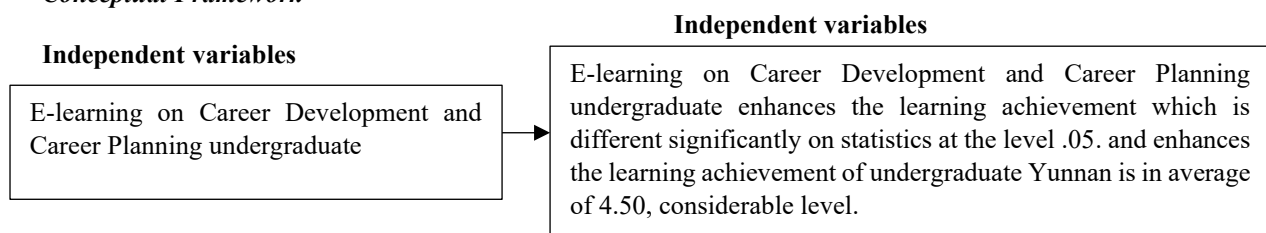


Figure 1: E-learning of Career Development Conceptual Framework

Population and Sample groups

The population consisted of 100 recent college students. The sample consisted of 30 recent college students from Yunnan Province, China, and was obtained using a purposive sampling technique. The research instrument was validated by experts to identify the main factors influencing self-identity development. Nine experts, selected for their expertise in vocational education, educational psychology, and student development, participated in four iterative rounds of sampling. In each round, the experts rated the importance of the considered factors using a Likert scale and measured statistical consensus. An iterative feedback mechanism allowed for improvements to the indicators, ensuring that the final set of indicators reflected both theoretical robustness and professional consensus.

$$W = \frac{12 \sum_{j=1}^n x(R_j - \frac{m(n+1)}{2})^2}{m^2(n^3 - n)} \quad (1)$$

Kendall's W formula is a formula for measuring the level of expert consensus opinion. The coefficient values range from 0 to 1, indicating that subjective expert judgments are converted into objective reliability measures.

For example, a factor with Kendall's W greater than 0.7 is a stable indicator suitable for inclusion in the next step. Discussion of this formula emphasizes the scientific foundation of the consensus building process. The data collection instruments included e-learning on career development and career planning for graduates from Yunnan Province, academic achievement gains, pre- and post-tests, and teacher satisfaction tests. Statistics used for data analysis included percentages, means, standard deviations, and t-tests for independent samples.

RESEARCH RESULT

Plash I: The investigate the efficiency of e-learning on Career Development and Career Planning undergraduate Yunnan, China

Table 1: Efficacy of e-learning in enhancing student achievement in career development and career planning.

Efficiency Indicators	Criteria Standard	Experimental Result	Interpretation
E ¹ (Efficiency of Learning Process)	80	82.40	Higher than standard – Effective
E ² (Efficiency of Learning Achievement)	80	81.33	Higher than standard – Effective
Overall Efficiency (E1/E2)	80/80	82.40/81.33	Meets and exceeds standard

Table1: The research results found that the application of e-learning to enhance students' academic achievement in career development and career planning was effective. The efficiency of the learning process (E₁) and the efficiency of the learning outcomes (E₂) were evaluated according to the standard efficiency criteria (80/80). The research results found that e-learning to enhance students' academic achievement in career development and career planning was effective at E₁/E₂ = 82.40/81.33, which was higher than the specified standard. Therefore, e-learning enhances students' academic achievement in career development and career planning is effective and appropriate for developing students' understanding and success in career development and career planning.

Thus, the development of e-learning courses on a career development and career planning platform demonstrated effectiveness exceeding the 80/80 benchmark, indicating that instructional design, learning content, and digital delivery effectively enhance student engagement and learning outcomes. The results confirm the suitability of e-learning as a means to develop career skills competencies for undergraduate students in Yunnan Province, China. The research findings revealed that applying basic on Career Development and Career Planning to enhance learning achievement was efficient by E₁/E₂ (82.40/81.33).

Plash II: The compare students' achievements before and after learning through earning on Career Development and Career Planning Yunnan, China.

Table 2: Comparison of Academic Achievement of Students Before and After Learning via E-learning on Career Development and Career Planning Undergraduate Program from Yunnan, China.

Evaluation Aspect	n	$\bar{x}$	SD	Level/ Interpretation	t	Sig. (p)	Result
Evaluation Aspect	5	4.78	0.58	Excellent	-	-	Appropriate
Experts' Evaluation of Content Appropriateness	5	4.50	0.58	Excellent	-	-	Appropriate
Experts' Evaluation of Media Design	30	8.80	2.33	-	-	-	-
Students' Achievement (Pre-test)	30	16.27	1.48	-	20.68	.05*	Significant Difference

*Significant at the 0.05 level

Table 2: Comparison of Academic Achievement of Students Before and After Learning via E-learning on Career Development and Career Planning Undergraduate Program from Yunnan, China. The results revealed that the content and format of the e-learning media were rated by experts as being highly appropriate. The average score for the content appropriateness assessment was $\bar{x} = 4.78$, SD = 0.58, and the average score for the media assessment was $\bar{x} = 4.50$, SD = 0.58, both of which fall within the "excellent" range on a 5-point Likert scale. Students' post-learning achievement scores were significantly higher than their pre-learning scores, with the average pre-learning score being 8.80 (SD = 2.33) and the average post-learning score being 16.27 (SD = 1.48).

A t-test value of 20.68 indicated a statistically significant difference at the .05 level, confirming that the online learning format effectively improves student academic achievement.

The evaluation of content e-learning on Career Development and Career Planning teaching by the experts was totally appropriate at the excellent level ($\bar{x}=4.78, SD = .58$), and the evaluation of media by the experts was totally appropriate at the excellent level ($\bar{x}= 4.50, SD = .58$). After learning the application, the students' achievements were higher than before. The mean and standard deviation for before learning were 8.80 and 2.33, while for after learning, they were 16.27 and 1.48. The t-test score between before and after learning was 20.68, with a significant difference at the .05 level.

Plash III: The examine students' satisfaction with learning on Career Development and Career Planning.

Table3: Report on the evaluation of student satisfaction level with e-learning on Career Development and Career Planning ungraduated Yunnan, China.

Evaluation Aspect	$\bar{x}$	SD	Interpretation
1. Content quality and relevance	4.60	0.52	High
2. Ease of use and accessibility	4.48	0.61	High
3. Interaction and engagement	4.45	0.57	High
4. Visual and media design	4.50	0.55	High
5. Usefulness for career development	4.52	0.49	High
Overall Satisfaction	4.51	0.55	High

Table3: The research results found that students had a high level of satisfaction with e-learning on Career Development and Career Planning ungraduated Yunnan, China. The satisfaction score was $\bar{x} = 4.51$, which corresponded to a high level according to the 5-level Likert scale. This indicated that students were satisfied with the content of the e-learning system on Career Development and Career Planning ungraduated Yunnan, China, the user interface, the flexibility of learning, the interactivity, and the relevance of the course content to the needs of career planning and development. According to Yunnan, China, students' satisfaction with e-learning on Career Development and Career Planning for enhanced learning achievement was high, with a mean of 4.51.

The results of the study revealed that students were highly satisfied with all aspects of the e-learning on Career Development and Career Planning ungraduated Yunnan, China. The highest-rated aspect was the quality and relevance of the content ($\bar{x} = 4.60$), indicating that students found the learning materials to be relevant to their academic and career needs. Other highly rated aspects included career development usefulness ($\bar{x} = 4.52$) and media design ($\bar{x} = 4.50$), indicating that the e-learning on Career Development and Career Planning ungraduated Yunnan, China approach effectively promoted students' engagement and motivation in learning.

CONCLUSION AND DISCUSSION

Conclusion

This study, titled "E-learning on Career Development and Career Planning for Undergraduate Students in Yunnan, China," aimed to design, implement, and evaluate an e-learning model that would enhance student academic achievement and career readiness. The results of the study from all three phases demonstrated the effectiveness and suitability of the developed e-learning system.

Phase 1: The learning effectiveness evaluation found that the e-learning on Career Development and Career Planning undergraduate students in Yunnan, China achieved an E_1/E_2 effectiveness level of 82.40/81.33, exceeding the standard score of 80/80. This confirmed that the e-learning on Career Development and Career Planning undergraduate students in Yunnan, China effectively supported the learning process and outcomes of students.

Phase 2: The comparison of pre- and post-learning scores showed that students' academic achievement significantly improved after participating in the e-learning on Career Development and Career Planning undergraduate students in Yunnan, China. The pre-test mean score ($\bar{x} = 8.80, SD = 2.33$) increased to the post-test mean score ($\bar{x} = 16.27, SD = 1.48$), with a t-test value of 20.68 ($p < 0.05$). This statistically significant difference indicates that the e-learning on Career Development and Career Planning undergraduate students in Yunnan, China Development and Career Planning undergraduates in Yunnan, China, had a significant positive impact on students' understanding and effectiveness in career development and planning. Expert evaluations also rated both content and materials as excellent ($\bar{x} = 4.78$ and 4.50, respectively).

Phase 3: Student satisfaction results revealed high levels of satisfaction with the e-learning experience on Career Development and Career Planning undergraduates in Yunnan, China ($\bar{x} = 4.51$). They were particularly impressed by the clear structure of the e-learning on Career Development and Career Planning, its relevance to real-world career planning, and the interactive design that supported self-directed learning. These results indicate that e-learning on Career Development and Career Planning not only improves academic achievement but also enhances user motivation, engagement, and satisfaction.

Discussion

The findings are consistent with research highlighting the effectiveness of e-learning on Career Development and Career Planning in promoting active learning, self-regulation, and personalized learning. The results of this study are consistent with the research of (Ally, 2019, & Means et al., 2020), which found that digital learning environments significantly improve student achievement and satisfaction compared to traditional classroom instruction in e-learning on Career Development and Career Planning. Constructivist learning theory enhances the effectiveness of learning based on assumptions that it helps learners learn actively through interaction, reflection, and application. The use of multimedia elements, online discussions, and career-focused case studies in the e-learning on Career Development and Career Planning platform facilitated deeper understanding and critical thinking. The high level of satisfaction indicated that students valued flexibility and autonomy, which are important factors in successful online learning. Consistent with the findings of (Sangsawang, T., 2020), self-directed learning (SRL) was found to be effective in improving student achievement. Developed through learner-directed online instructional design, it is beneficial for teaching and career training. Teaching styles such as firm focus, orientation, or intention comprise all teaching behavior patterns. This study demonstrated that self-directed learners can be described as those who manage themselves in situations where learners are engaged in learner-centered instruction. Career development and career planning are effective, efficient, and well-received by students, promoting academic achievement, providing career guidance, and promoting digital learning skills relevant to the 21st century workforce. They aim to develop students' career readiness and lifelong learning capabilities.

RECOMMENDATION

The e-learning on Career Development and Career Planning. The following recommendations are offered for educators, curriculum developers, and future researchers to improve the usability and impact of e-learning on Career Development and Career Planning in higher education.

- 1) Implementation. Universities and colleges should integrate e-learning on Career Development and Career Planning platforms as a supplementary method to career development and planning courses. Instructors should be encouraged to adopt blended learning approaches, combining online modules with practical guidance, career counseling, and real-world case studies.
- 2) E-learning on Career Development and Career Planning should be used to support personalized learning, enabling students to explore career paths that align with their interests, strengths, and career goals.
- 3) E-learning on Career Development and Career Planning content and systems should be regularly updated to reflect labor market trends, emerging industries, and the digital competencies employers require.
- 4) E-learning on Career Development and Career Planning should integrate interactive media, simulations, and hands-on learning, and self-assessment tools to increase engagement and promote self-directed learning. A user-friendly, user-centered design should be developed to improve accessibility for students in diverse learning environments.
- 5) Support for Teachers and Students: Instructors should receive training in digital pedagogy and instructional design to manage and deliver effective online learning experiences. Institutions should provide technical support and orientation to students to ensure sustainable use of the Career Development and Career Planning e-learning platform. Online career mentoring and coaching should be integrated to help students apply their learning to real-world career planning and decision-making.
- 6) Continuous Evaluation and Improvement of Career Development and Career Planning e-learning: Continuous monitoring and evaluation should be conducted to assess learning outcomes, user satisfaction, and usability of the Career Development and Career Planning e-learning platform. Student and instructor feedback should be used to improve course design, enhance learning materials, and enhance system functionality. Quantitative and qualitative research should be conducted.

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Ethnomusicological Preservation and Educational Application of Jaw Harp Music of the Yi Region in Liangshan, China

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ABSTRACT

This study examines the preservation and educational applications of the Yi jaw harp in the Liangshan Yi Autonomous Prefecture of China, drawing on ethnomusicological fieldwork, instrument classification, and pedagogical analysis. Rooted in oral traditions, spiritual symbolism, and linguistic resonance, the Yi jaw harp functions as both a musical instrument and a cultural artifact, deeply intertwined with the identity and emotional life of the Yi people. Field data collected from local masters reveals the instrument's historical trajectory through phases of decline, revival, and cultural protection, shaped by shifting sociopolitical contexts and revitalized through artistic innovation. The jaw harp has 18 distinct types, each with unique structural and tonal characteristics tied to regional use and symbolic meaning. Detailed educational strategies are proposed, including classification by technique, structural analysis, and resonance theory. The study also explores dialect-based melodic variations and the connection between Yi speech tones and musical intervals. By integrating traditional playing methods, instrument craftsmanship, and contemporary teaching practices, this work offers a comprehensive model for sustaining jaw harp music as an evolving form of intangible cultural heritage. The findings confirm that incorporating the Yi jaw harp into formal and community-based education ensures its continued vitality, while empowering younger generations to carry forward a rich legacy of sound, language, and identity.

Keywords: Yi jaw harp, Liangshan, ethnomusicology, cultural preservation, music education

INTRODUCTION

The jaw harp is among the oldest and most prevalent musical instruments globally, existing in many forms across several ethnic communities. It holds particular cultural and artistic significance for the Yi people of the Liangshan Yi Autonomous Prefecture in Sichuan Province, China. The jaw harp, referred to as honghuo in Yi, serves not only as a musical instrument but also as a vital medium for expressing identity, emotion, and communication (Shen & Xianyi, 2022). The Yi regard the jaw harp as a personal and expressive instrument that communicates emotion through a melodic and rhythmic language (Fiveash et al., 2021). The instrument is often meticulously constructed from bamboo or copper, with its structure differing, with reed plates that range from one to five. These diverse designs offer a broad spectrum of sounds that capture the geographical, linguistic, and cultural nuances of the Yi people (Nikolsky, 2020).

The Liangshan region, known for its mountainous terrain and ethnic diversity, poses unique challenges for preserving traditional knowledge systems. Among these is the Yi jaw harp tradition, which has historically played an essential role in daily life, courtship, rituals, and artistic expression (Wong, 2020). However, increasing urbanization, migration, and the weakening of oral transmission have led to a significant decline in the performance and meaning of jaw harp music (Liu et al., 2025). Despite its cultural richness, academic research on this tradition remains limited, and comprehensive historical documentation is largely absent. Without immediate preservation and scholarly efforts, much of this intangible heritage risks being lost with the passing of elder musicians and cultural bearers (Cao & Xu, 2023).

In recent years, the importance of preserving intangible cultural assets has grown. Traditional Yi jaw harp production techniques, which have been passed down through generations, are dying owing to a shortage of trained successors. Each stage of jaw harp production—from material selection and reed plate fabrication to final tuning—requires specific expertise and cultural sensitivity. This research aims to describe these processes as part of a broader ethnomusicological approach, focusing on technical proficiency and the instrument's symbolic meaning in Yi society (Li & Zhang, 2024; Zi, 2020).

In addition to preservation, this project investigates the instructional potential of jaw harp music. The melodies performed on the jaw harp frequently resemble speech patterns, tone fluctuations, and emotional signals, making the instrument a linguistic and musical combination (Long et al., 2024). Jaw harp music may be used in curriculum creation, digital learning tools, and interactive performance workshops. This study uses current educational tools such as audio-visual recordings, virtual demonstrations, and annotated digital archives to develop accessible materials that assist the learning and transmission of jaw harp traditions in local and global contexts (Chang et al., 2024; Liu & Chuangprakhon, 2024).

The objective of this study is to blend ethnomusicological fieldwork with pedagogical applications. The study aims to conserve the Yi jaw harp's musical history through in-depth documentation, categorization, and analysis and investigate novel teaching and transmission techniques. Doing so helps revive an endangered cultural heritage and promotes the continuous development of culturally appropriate music education. Finally, this research aims to preserve the history and encourage future generations to participate in and nurture the living heritage of Yi jaw harp music in the Liangshan region and elsewhere.

LITERATURE REVIEW

The Global Knowledge of Jaw Harps

Jaw harps are ancient musical instruments in many civilizations worldwide, most notably in China, Russia, Vietnam, and other Southeast Asian countries. Archaeological evidence indicates that the first bone jaw harps date back around 4,000 years. Depending on local availability, these instruments have historically been made of bone, bamboo, iron, or copper. In most cultures, the jaw harp has remained a basic, single-reed instrument, with melodic expression centered on rhythmic variety (Qiuxiao, 2022). However, more complex versions with multiple reed plates have emerged in Southeast Asia and Southwest China, which can produce harmonic textures. These regional modifications reflect the instrument's diverse musical aesthetics and cultural significance. Despite their long history and widespread use, jaw harps have often been overlooked in conventional academic music studies, and documentation in many regions is scarce (Chen & Sensai, 2024).

The Yi people of Liangshan, Sichuan, regard the honghuo (jaw harp) as a deeply expressive cultural instrument. Due to the region's isolation and linguistic diversity, Yi jaw harp traditions have remained largely undocumented (Santaella, 2022). The instrument mirrors the tonal patterns of Yi speech and serves as a powerful medium for emotional and cultural expression. Scholars have noted the jaw harp's unique ability to mimic human speech and its role as a cultural symbol among indigenous communities. Despite its simple design, it demands intricate playing techniques and holds significant ethnomusicological value (Lin & Gui, 2024).

The Knowledge of the Jaw Harps in China

Jaw harps are found across many regions of China, with each ethnic group developing its own methods of construction, classification systems, and musical traditions. Among them, the Li people of Hainan Island regard the jaw harp as a culturally important instrument, even though their musical heritage is relatively less documented. In contrast, ethnic minorities in Southwest China, such as the Yi, Naxi, Lisu, Pumi, and Atayal, have cultivated rich and dynamic jaw harp traditions. In particular, the Liangshan Yi Autonomous Prefecture in Sichuan Province stands out as a major center for the production of traditional Yi jaw harps. These instruments are typically made from bamboo or copper and are distinguished by their multi-reed structures, each designed to reflect the linguistic tones and expressive aesthetics of Yi musical culture (Nikolsky, 2020). Subtle tone fluctuations distinguish these instruments and are frequently employed in courting rituals. Other ethnic groups, including the Pumi, Lisu, Wa, Jingpo, and Qiang, also have distinct jaw harp traditions, with some, such as the Qiang, using finely carved bamboo jaw harps as ornamental emblems of their identity. In Yunnan's Ninglang Yi Autonomous County, the instrument known as "Xiangmie" is vital to romantic expressiveness. Similarly, in Guizhou, the Miao and Buyi peoples utilize the jaw harp in social and ceremonial settings, employing distinct playing styles and assigning different meanings to it (Chen & Seekhunlio, 2024).

Jaw harps are culturally significant among the Hui and Salar populations in Gansu, Qinghai, and Ningxia. For example, the Salar people of Qinghai view the jaw harp as their primary musical instrument, crafting miniature replicas from red copper or aluminum. Bamboo and metal jaw harps are employed in Gansu's hilly Longdong region to convey love and other elements of daily life. The instrument is popular among Ningxia Hui women and comes in two varieties: bamboo and iron, with extensive histories and distinct artistic appeal (Meng, 2022). In Taiwan, ethnic groups refer to the jaw harp as "galopos," with the Atayal people developing a unique multi-reed variant of bamboo and brass played with synchronized hand movement. Iron single-leaf jaw harps are popular in Inner Mongolia and the Altay area of Xinjiang, where they are frequently associated with shamanic ceremonies and folk performances. These look like the jaw harps in Russia's Yakutia and Tuva regions. Despite the instrument's widespread popularity and cultural significance, the number of experienced jaw harp producers is

fast decreasing, notably in Mongolia, where most instruments are now imported. Bamboo, copper, and iron are the principal materials used to make jaw harps in China, with bamboo being the most popular across all ethnic groups. Copper jaw harps are peculiar to the Yi and Miao cultures (Gong et al., 2024).

The Knowledge of the Jaw Harps in Liangshan

The Liangshan Yi Autonomous Prefecture in Sichuan Province is a culturally rich area where the Yi people, Sichuan's biggest ethnic minority group, have maintained a thriving musical culture. Yi music, influenced by the region's distinct natural and cultural environments, is integral to their cultural identity. According to cultural anthropology, Liangshan Yi music is a different storytelling style representing Yi society's spiritual outlook and social structure. This music is used for ritual, communication, and emotional expression in addition to its artistic goals. Among the many aspects of Yi musical culture, oral musical writing is notable for its historical richness and cultural significance. Traditional Yi instruments such as the Yueqin, while not unique to the Yi people, are profoundly ingrained in the region's folk traditions. However, due to industrialization and environmental changes, the transfer of instrument-making skills has slowed. Scholars have underlined the necessity of regional collaboration in Yi musical instrument research throughout Sichuan and Yunnan provinces to guarantee a more comprehensive knowledge and a successful preservation plan (Zhang et al., 2022; Yu & Choatchamrat, 2024).

Among the various folk instruments used by the Yi people, the jaw harp—locally known in Yi as Hehuo—is particularly prominent. The jaw harp, also known as kouxian in Chinese, is a plucked instrument that produces sound using a vibrating reed and the mouth cavity. Yi jaw harps in Liangshan are primarily constructed of bamboo or copper, with each material providing different tonal qualities: bamboo harps give a mellow and distant sound, whilst copper harps produce a brighter, more agile tone (Li & Woramitmitree, 2023). Despite its wide global presence, the Liangshan Yi jaw harp is especially notable for its intricate structural design, layered musical expressiveness, and enduring legacy within the Yi community. These qualities underscore the instrument's significance not merely as a tool for performance but as a living cultural artifact that carries historical memory and social meaning. Given this depth, there is an urgent need for greater scholarly attention, systematic documentation, and educational integration to ensure its preservation and transmission for future generations (Akpabio, 2023).

Research Theory

This study employs ethnomusicological theory to examine the Yi people's jaw harp music, a vital component of their cultural identity. The study investigates the jaw harp's role as an instrument for emotional expression, social communication, and cultural continuity. Fieldwork approaches, including interviews with local musicians and observations of traditional settings, help uncover the instrument's profound ties to Yi oral traditions, language, and symbolic meanings (Wang, 2022). Additionally, the study incorporates applied ethnomusicology concepts by translating field data into practical teaching tools. These resources are designed to preserve and revitalize the jaw harp heritage while making it accessible in community and academic settings (Mu, 2003; Cottrell, 2010).

METHODOLOGY

This study uses a qualitative ethnomusicological approach to investigate the preservation, performance practices, categorization, and pedagogical applications of jaw harp music among the Yi Region of Liangshan Yi Autonomous Prefecture, China. The technique combines fieldwork, interviews, participant observation, audiovisual documentation, and instrument analysis to capture both the tangible and intangible aspects of Yi jaw harp culture.

Fieldwork and Site Selection

The primary field research was conducted in numerous Yi communities throughout Liangshan Prefecture, including Butuo, Xichang, Zhaojue, Meigu, and Ganluo counties. These regions were chosen based on their linguistic diversity (Adu, Shiza, Suodi, and Yinuo dialect areas), the presence of active jaw harp practitioners, and their status as cultural centers for traditional Yi music. Fieldwork was conducted over several periods between 2024 and 2025, including large festivals, community meetings, and informal musical sessions.

Data Collection Methods

1) Participant Observations

The researcher immersed themselves in the local Yi community, engaging with jaw harp performers, craftsmen, and elders. Through direct involvement in musical instruction, rituals, and informal performances, the study captured embodied practices and cultural contexts. Informal learning sessions were recorded and analyzed to understand performance techniques and transmission modes.

2) In-depth interviews

Semi-structured and open-ended interviews were performed with key informants, including jaw harp performers,

instrument craftsmen, cultural experts, and music educators. Topics covered included the history of jaw harps, dialectal effect on melodies, instrument building, educational transfer, and modern improvements.

3) *Limitations*

Limitations include potential bias due to the researcher's outsider status, limited geographic coverage, and subjectivity in oral histories. Despite this, triangulation of data sources ensured reliability, and findings contribute to both cultural preservation and music education research.

4) *Audiovisual Documentation*

High-quality video and audio recordings were created to capture playing skills, rhythmic patterns, dialect-based tunes, and instructive demonstrations. These resources facilitate both analysis and future pedagogical usage by providing a realistic graphic depiction of complex actions.

5) *Instrument Measurement and Classification*

Eighteen different varieties of jaw harps (9 bamboo, 9 copper) were physically examined, measured (length, breadth), and tested for tonal qualities. To create a database for educational categorization, researchers captured basic pitches and resonance properties with digital tuners and spectrographic software.

6) *Language and Music Analysis*

Given the intimate association between Yi dialects and musical phrasing, a linguistic-musicological method was utilized to examine the melodic contours and intonation systems of the Adu, Shiza, Suodi, and Yinuo dialects. Songs and spoken sentences were transcribed and matched to the matching musical intervals to determine how tone language influences musical expression. These data were then applied to the music categorization technique employed by Yi players.

7) *Education Strategy Design*

Using field observations and interviews with educators, this project created a basic framework for adding jaw harp teaching into local music curricula. The techniques were divided into six teaching categories: breath, rhythm, dialect articulation, fingering, speed, and dynamics. The educational application approach is based on community-based pedagogy, which includes conventional imitation, customized instruction, and the use of audiovisual aids.

RESULTS

Development and Education Preservation of the Jaw Harps

Through ethnomusicological fieldwork and in-depth interviews with prominent Yi jaw harp practitioners and cultural bearers this study identified six key periods in the historical development of the Yi jaw harp: its origins, two periods of decline (1946–1949 and 1950s–1960s), a recovery phase (1970s–1980s), a prosperity period in the 1990s, and a phase of cultural protection from the 2000s onward. These results show how the jaw harp has remained a musical instrument and a cultural icon, closely connected to Yi oral history, folklore, and emotional expression. Even though it was banned in the past because of spiritual taboos and political unrest, the instrument lived on in secret among slaves and shamans. Radio shows, government cultural policy, and folk artists helped bring the jaw harp back into public life in the 1970s. This cultural revival sparked a desire in new generations to reconnect with their musical traditions, leading to innovative approaches in playing, instrument design, and teaching.

The Yi jaw harp has evolved from a little-known folk instrument to a protected and appreciated form of intangible cultural heritage over the last several decades. Key informants who have helped the instrument reach a wider audience by creating new multi-reed versions, writing instructional materials, and participating in cultural events and academic talks. People today learn how to play the jaw harp by imitating others, getting one-on-one help, and even using local notation systems. Its one-of-a-kind tonal features and speech-like resonance have not only drawn the attention of scholars worldwide, but they have also led to partnerships with contemporary music styles, such as electronic music. The Yi jaw harp is a prime example of ethnomusicological preservation in action, where tradition is not only kept alive but also revitalized through education, innovative ideas, and a sense of pride in one's culture. This story demonstrates how incorporating traditional music into school settings preserves its historical and cultural integrity while ensuring it can be passed on to future generations.

Types of Jaw Harps in Liangshan Yi Region, China

Through detailed ethnomusicological fieldwork and classification, this study identifies and documents 18 distinct types of jaw harps used by the Yi people in Liangshan, China, comprising 9 bamboo types and 9 copper types. These instruments vary in structure, tonal quality, tuning, and function, reflecting the deep craftsmanship and cultural expression embedded in Yi musical traditions. Bamboo jaw harps, typically larger than those made of copper, are known for their warm, earthy timbre and are often associated with poetic expression, love narratives, and ritual use. Copper jaw harps, more compact and durable, exhibit brighter, more resonant tones and are often utilized in rhythmically dynamic and expressive performances. Each type—such as the Sanxian, Maga, Sixian, and Yangchang—has unique musical roles, aesthetic qualities, and symbolic associations, some of which represent elements of nature, family structures, or spiritual beliefs. Informants confirmed that different Yi

subgroups prefer other types of jaw harps, and their musical use is shaped by both oral tradition and regional identity. As shown in Figure 1, the bamboo jaw harps display a longer and broader structure, reflecting their resonant, earthy sound and connection to ceremonial and lyrical use. In contrast, Figure 2 illustrates the compact and precisely crafted copper jaw harps, emphasizing their durability and suitability for intricate, fast-paced performances. These visual representations support the classification and cultural roles discussed in the text.



Figure 1. Bamboo jaw harps



Figure 2. Copper jaw harps

The preservation of this complex classification system is not only a matter of safeguarding physical instruments but also of protecting the intangible musical knowledge tied to each type. By documenting precise measurements, tunings, and cultural meanings of the jaw harps, this study contributes to a body of ethnomusicological data that supports both academic understanding and the practical preservation of these instruments. Furthermore, the classification framework provides a foundation for developing educational tools, such as comparative learning charts, audiovisual demonstrations, and community-based teaching methods. These instruments offer valuable opportunities for interdisciplinary learning, blending craftsmanship, acoustics, language, and performance. In this way, the jaw harp types of the Liangshan Yi Region are not just artifacts of heritage but living resources for cultural transmission and innovation in contemporary educational and musical contexts. As shown in Table 1, the jaw harps are categorized by material—bamboo and copper—and are further differentiated by size, tonal range, and structural complexity. Each instrument type reflects specific functions and cultural meanings within the Yi community, making this classification a valuable reference for ethnomusicological research and curriculum development.

Table 1. Types of Jaw Harps in Liangshan Yi Region, China

Type	Material	Length (cm)	Width (cm)	Fundamental Tone
Sheng Zhen Shi Bamboo	Bamboo	15.0	1.2	2F
Single Piece Bamboo	Bamboo	19.0	1.6	2#F
Two-piece Bamboo	Bamboo	16.5	1.4	2G–2A
Sanxian Bamboo	Bamboo	15.0	1.1	3bB–3G–3C
Maga Bamboo	Bamboo	13.5	1.0	3E–3#C–3#F
Yangchang Bamboo	Bamboo	13.8	1.0	3F–3bE–3bA
Sixian Bamboo	Bamboo	13.5	1.1	3F–3D–3G–3C
Cicada Bamboo	Bamboo	13.0	1.2	3G–3E–3A–2A
Five-piece Bamboo	Bamboo	14.5	1.0	3bE–3C–3G–3F–2bB
Sheng Zhen Shi Copper	Copper	7.7	1.3	2G
Single Piece Copper	Copper	7.4	1.6	2bB
Two-piece Copper	Copper	7.6	1.5	2G, 2A
Sanxian Copper	Copper	7.0	1.3	4C, 3A, 3D
Maga Copper	Copper	6.5	1.2	3G, 3E, 3A
Yangchang Copper	Copper	7.0	1.3	3#G, 3#F, 3B
Sixian Copper	Copper	8.2	1.6	3bA, 3F, 3bB, 3bE

Type	Material	Length (cm)	Width (cm)	Fundamental Tone
Cicada Copper	Copper	8.0	1.6	3bA, 3F, 3bB, 2bB
Five-piece Copper	Copper	7.5	1.3	3bE, 3C, 3G, 3F, 2bB

Educational Introduction to the Yi Jaw Harp Instrument

In the context of educational application, a foundational understanding of the Yi jaw harp begins with its physical structure and basic playing setup. The opening of the jaw harp follows a distinctive method: the instrument is opened in a fan shape from top to bottom, with the top reed being designated as the first and the subsequent reeds arranged in order. This orientation serves not only acoustic but also pedagogical purposes, helping learners easily identify the order and role of each reed during performance.

When teaching beginners, the proper holding position is crucial for accurate sound production and control. The first and second fingers of the left hand are used to hold the “source” part of the jaw harp, forming a stable grip with the palm shaped like a loose fist. Meanwhile, the right hand is responsible for plucking the “touch” part of the reed, which generates the initial vibration. This coordination between both hands enables students to develop the motor skills and muscle memory essential for optimal performance. Visual aids and demonstrations—such as using the Maga copper jaw harp as a model—greatly enhance comprehension and technique acquisition in classroom settings. Visual aids play a critical role in reinforcing these practical skills. The three-piece Maga jaw harp—available in both copper and bamboo forms—serves as an effective model for teaching. Figure 3 displays the copper jaw harp in its closed, resting position, where all three reed plates are aligned and dipped together, emphasizing compact storage and careful handling. In contrast, Figure 4 illustrates the same copper instrument in its open position, fanned out to reveal each reed’s placement and angle, which is essential for airflow and resonance understanding. Similarly, Figure 5 shows the bamboo version of the jaw harp in its closed form, highlighting its larger, earthy aesthetic and handcrafted quality. Figure 6 demonstrates the open layout of the bamboo jaw harp, offering a visual guide to proper spacing and balance.



Figure 3. Three-piece Maga copper jaw harps are dipped together



Figure 4. The open position of the three-piece Maga copper jaw harps



Figure 5. Three-piece Maga bamboo jaw harps are dipped together



Figure 6. The open position of the three-piece Maga copper jaw harps

Educational Strategies for Yi Jaw Harp Performance

For educational purposes, Yi jaw harp performance can be divided into six main technique categories, each of which serves as a course of study in an organized music curriculum. 1) Breathing Techniques, 2) Rhythm Techniques, 3) Dialect Techniques, 4) Fingering Techniques, 5) Speed Techniques, 6) Dynamics Techniques.

1) Breath techniques for students are introduced to two breathing techniques, exhalation and inhalation. These approaches help manage airflow, which in turn influences sound resonance and continuity. By adding breath control exercises, students may eventually grasp longer, more expressive articulation.

2) Rhythm techniques for teaching rhythm in Yi jaw harp music entail practicing four basic rhythmic patterns: quarter notes, eighth notes, sixteenth notes, and dotted rhythms. Exercises using these patterns help students develop their timing, coordination, and musical interpretation, allowing them to play in a variety of venues. As shown in Figure 7, the rhythm patterns for 2/4 and 4/4 time signatures illustrate essential beat groupings and accent placements, which guide learners in maintaining a consistent tempo and understanding phrasing.

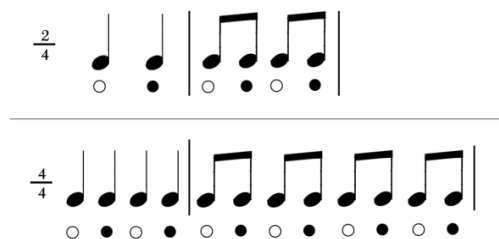


Figure 7. Rhythm for 2/4 and 4/4

3) Dialect techniques for Yi jaw harp music are inextricably linked to language; many dialect approaches are critical to its expressive potential. Students in an educational context can learn four dialect-based articulations: Shiza, Adu, Suodi, and Yinuo. Each dialect has its tonal hue, allowing students to integrate ethnic variety within the Yi musical environment.

4) Fingering techniques for students begin by practicing with the index finger, then proceed to more difficult methods that require coordinated movement of the index and middle fingers. The finger-wheel method, popularized by master musician Ma Guoguo, is presented at the intermediate level to help pupils improve their speed and fluidity.

5) Speed techniques for students are taught to perform compositions at various speeds, including slow, medium, and rapid. Lessons include tempo exercises to help students understand pace and its emotional impact on the listener.

6) Dynamics techniques for dynamic teaching focus on loudness and expression control. While the Yi jaw harp naturally has slight accentuation, students are trained to control these dynamic shifts gently so that they blend into the melodic flow without seeming abrupt.

Educational Understanding of the Sound Principle

To expand their theoretical understanding, students investigate the sound generation process of the jaw harp, which consists of two major components: reed vibration and sonorous cavity resonance. An external force, typically finger plucking, activates the reed and causes it to vibrate. The physical properties of the reed (length, breadth, thickness, and substance) have a direct impact on pitch. For example, a longer reed generates a lower tone, and a shorter reed produces a higher pitch. This information is essential for instrument manufacturing lessons and pitch training sessions. Understanding how the human body contributes to sound amplification is also essential for classroom learning. The five sonorous cavities (cephalic, nasal, oral, pharyngeal, and thoracic) serve as resonators. The mouth cavity, in particular, functions as a megaphone, amplifying the vibration caused by the reed. Learn how to adjust mouth shape, tongue position, and breathing to improve tone quality and projection.

Each develops a distinctive timbre through activities that investigate personal resonance chambers, which contribute to both personal expressiveness and ensemble variation in group performances. This thorough approach, which includes physical skill, musical expression, and acoustic theory, guarantees that Yi jaw harp music is preserved and taught in a systematic and culturally significant manner.

The Skills of the Jaw Harps of the Yi Region

Yi jaw harp music is inextricably linked to the player's oral articulation, where adjustments in mouth shape, breath, and tongue position result in shimmering harmonics layered atop fundamental tones. These polyphonic effects create a diatonic and triphonic framework based on the Yi language. Yi artists tailor the harp to fit regional speech intonation, allowing performers to create improvised melodies that express their inner feelings. The expressive power of the jaw harp is heightened by the performer's physical control and language rhythm, making each performance distinct. The jaw harp is played in several ways, including finger pulling or plucking (typically with fingers 1 or 2) and breath modulation. Players rely on several anatomical resonating chambers, such as the oral, nasal, and chest cavities. Design variations, ranging from single to five-piece jaw harps, need greater coordination and breath control. Dialect and regional identity influence playing methods and harmonic textures, resulting in an oral-intonation-based musical system that reflects Yi cultural values. This close relationship between language and music highlights the importance of incorporating jaw harp teaching into ethnomusicological education to preserve its cultural heritage.

Melody Classification in Yi Jaw Harp Music

Yi jaw harp tunes are influenced by the Yi language's tones and rhythms, which vary depending on dialect. Traditionally used to express love and emotion, the harp has varied meanings across dialect groups. Regardless of geography or language, the instrument acts as a cultural unifier. The music is classified into four dialect-based categories: Adu, Shiza, Suodi, and Yinuo, each having its own phonetic, rhythmic, and lexical qualities. The Yi tonal system, which includes high, sub-high, medium, and low descending tones, has a direct impact on melodic intervals and expressiveness. These tones, which are deeply ingrained in regional speech, shape how melodies are created and interpreted. Because each dialect adds a unique musical vocabulary, preserving and educating these variants is vital to maintaining the cultural diversity of Yi jaw harp music. By incorporating dialect-specific musical genres into educational practice, the Yi jaw harp serves as both an instrument for artistic expression and language preservation. As shown in Figure 8, the classification principles help illustrate how each dialect contributes a distinct layer to the overall tapestry of Yi musical heritage, reinforcing the jaw harp's dual role as a tool for artistic performance and a vehicle for language preservation.

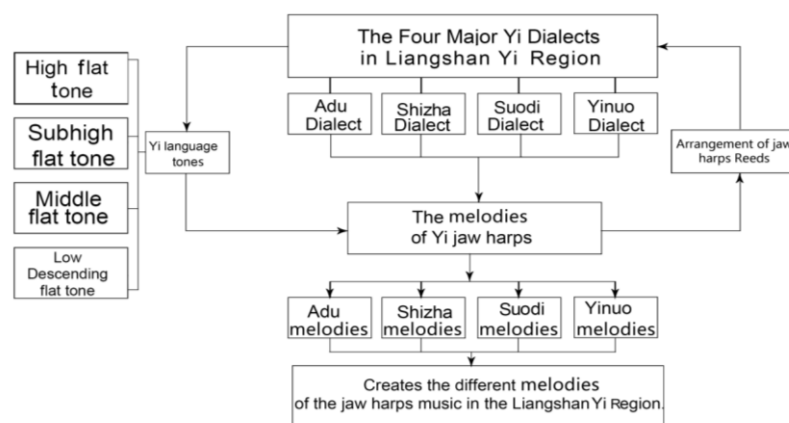


Figure 8. Principles of melody classification in Yi jaw harps

DISCUSSION AND CONCLUSION

The preservation and educational application of Yi jaw harp music in the Liangshan region is a multidisciplinary endeavor encompassing ethnomusicology, linguistics, cultural studies, and pedagogy. Ethnomusicological fieldwork and interviews with tradition bearers reveal that the jaw harp—locally called honghuo—is more than a musical instrument; it is a deeply embedded symbol of Yi cultural identity, emotional expression, and spiritual connection. Its functions extend beyond music to include oral storytelling, romantic communication, ritualistic healing, and ancestral remembrance. Despite historical periods of repression—particularly during political campaigns in the mid-20th century—the jaw harp remained resilient through underground transmission by shamans, slaves, and elder performers (Chang, 2007; Wang, 2014). This cultural resilience underscores the instrument's dual role as both a vessel of expression and a means of cultural protection, sustaining Yi identity across generations (Yao et al., 2024).

The instrument's resurgence from the 1970s onward—and especially during the cultural renaissance of the 1990s and 2000s—has transformed it into a platform for innovation and education. Pioneering artists and researchers have introduced modern adaptations, including multi-reed designs, notation systems, and dialect-based instruction methods. These innovations have facilitated the integration of Yi jaw harp music into wider musical landscapes, such as contemporary world music and electronic genres (Liu et al., 2018). Simultaneously, the dialectal diversity of Yi speech—reflected in Adu, Shiza, Suodi, and Yinuo dialects—directly influences the tonal, rhythmic, and expressive structure of jaw harp compositions. This linguistic-musical interface has produced region-specific performance styles and articulation patterns, making dialectal sensitivity essential in both musical training and linguistic preservation (Pu et al., 2023; Bozkaya et al., 2012).

From a pedagogical perspective, the Yi jaw harp is uniquely positioned for educational enrichment across formal and informal learning settings. Its compact structure, bodily engagement, and improvisational nature make it ideal for integrative education that bridges music, language, cultural studies, and even cognitive development (An et al., 2025). Instruction in the jaw harp includes dialect-specific melodies, rhythm systems, breath control, oral resonance techniques, and traditional storytelling—all contributing to a culturally responsive curriculum. Methods such as oral transmission, imitation, and gesture-based guidance have been successfully integrated into structured learning environments, preserving both cultural authenticity and academic rigor (Lau, 2007; Horlor, 2019; Göğüş et al., 2012). The Yi jaw harp thus serves not only as an artifact of heritage but also as a living pedagogical tool that fosters cultural continuity, emotional expression, and artistic innovation.

In conclusion, the Yi jaw harp is more than a musical instrument—it is a vessel of cultural memory, linguistic expression, and communal identity. This study illustrates that its preservation requires not only documentation but a deep engagement with the lived experience of the Yi people. Through a unique combination of dialectal analysis, instrument classification, and pedagogical integration, this research contributes a multidimensional model for heritage conservation that centers both tradition and innovation. By linking the tonal structures of the Yi language to melodic construction, the study demonstrates how the jaw harp functions as a speech-like musical system. The classification of jaw harp types—across bamboo and copper materials—not only reveals technical diversity but also shows how different Yi subgroups express identity through instrumental design and performance. Most significantly, the development of rhythm-based, dialect-specific educational strategies offers a framework for transmission that aligns with both local oral traditions and modern curriculum design. If embedded into community education, village-level instruction, and institutional ethnomusicology programs, this integrated approach ensures that the Yi jaw harp will not merely survive but evolve—serving as a living emblem of cultural resilience in the 21st century.

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Evaluation of the Applicability of Full-Day Education in TRNC in Two Different Dimensions

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ABSTRACT

This study examines the perspectives of school administrators working in state-affiliated primary schools in the Turkish Republic of Northern Cyprus (TRNC) regarding the management of the full-day education schedule, as well as the experiences of teachers in implementing the program. The research aims to explore the effects of full-day schooling on school management, teacher motivation, and instructional processes. The study was conducted with a total of 50 participants, including 7 school principals, 6 vice principals, and 37 classroom teachers working in primary schools under the jurisdiction of the TRNC Ministry of National Education.

A qualitative research approach was adopted, employing a case study design. Data were collected through a semi-structured interview form consisting of eight open-ended questions developed by the researcher. The interviews were conducted using the semi-structured interview technique, and the collected data were analyzed using the content analysis method. Themes were generated and interpreted based on participants' views to provide insights into the challenges and opportunities associated with implementing full-day education in TRNC primary schools. The findings revealed that the existing physical and technological infrastructure and equipment in schools are not at a level compatible with the requirements of the current century. It was concluded that the current full-day education model is neither effective nor efficient when evaluated in terms of both educational and social aspects. Furthermore, the instructional programs currently in use were found to be insufficient in meeting the expected standards for supporting full-day education within the context of 21st-century educational needs. These findings emphasize the necessity of implementing full-day education only after ensuring that schools are adequately prepared in terms of physical infrastructure, technological equipment, and instructional programs. Such preparation is essential not only for enhancing the quality and efficiency of education but also for significantly contributing to the professional development of teachers and the academic and social growth of students.

Keywords: Northern Cyprus, Full-Day Education Model, School Administrators, Teachers.

Introduction

The current information society era is predominantly shaped by globalization and technological advancements. This transformation, which influences every aspect of life, has led to the emergence of new paradigms in education, causing teaching and learning approaches, as well as educational models, to be restructured. Education is considered one of the most significant elements in shaping and planning the future of a nation.

Education is a lifelong process that begins at birth and continues until death, making social life an inevitable necessity. Through interaction with their environment, individuals acquire knowledge, skills, cultural values, and attitudes, while simultaneously transferring these to others (Güneş, 2015). The content of education varies according to the social context and the characteristics of the era, leading to the emergence of different definitions (Oktay, 2020). An educational model is a structured process that involves planning and implementing teaching practices based on a specific educational philosophy and targeted learning objectives. It focuses on how teachers deliver knowledge to students, how students access and construct knowledge, and how learning outcomes are evaluated (Kıyak et al., 2020). Within this framework, the full-day education model refers to the continuation of instructional and learning activities within the same school setting, starting at a designated time in the morning and continuing until a specified time in the afternoon (Doğan & Erbüyük, 2020).

In 2023, the Ministry of National Education of the Turkish Republic of Northern Cyprus (TRNC) introduced the implementation of the full-day education model within primary education institutions under its authority as part of the initiative titled “*Extending Learning Time.*” Under this model, instruction was conducted on Mondays and Tuesdays from 08:00 to 15:20. According to the 2024 academic calendar, the schedule was revised to be implemented on Mondays and Thursdays instead. From this perspective, considering the requirements of the 21st century, it is evident that educational systems are in a constant state of transformation. The educational reforms adopted by countries are shaped by their societal structures, cultures, and economic conditions, which naturally lead to differences in implementation. Each nation possesses a unique educational system, structure, and cultural framework, while its educational philosophy and practices are strongly influenced by political, economic, geographical, social, and cultural factors. For schools — as the primary institutions that produce and shape individuals for society — to raise qualified individuals and integrate with contemporary developments, they must establish a forward-looking vision and mission and focus on improving the quality of educational services (Özdoğan, 2021). In order to adapt to the modern global landscape and provide individuals with the necessary skills and competencies, it is essential that educational institutions carefully plan and structure their systems. In this context, the adoption of the constructivist approach in today’s educational settings plays a significant role. This approach emphasizes enabling individuals to construct their own meaning, access information independently, and discover knowledge through inquiry while developing essential skills. Processes such as observation, investigation, curiosity-driven learning, and guided facilitation are considered crucial in fostering deeper understanding and supporting learners’ personal development (Güneş, 2015, pp. 4–5).

In their study on full-day education and its effects, Doğan and Erbiyık (2021) concluded that spreading instructional hours throughout the day allows students more adequate breaks for rest. They emphasized that adopting a constructivist approach, which centers on the student and provides appropriate learning environments, positively contributes to students’ social development and academic achievement. Similarly, Onarıcıoğlu (2018), in research conducted with students, found that the transition to full-day education enabled students to spend longer hours at school. This extended time fostered their socialization and improved their reading skills, particularly in Turkish language classes. In contrast, Gökçe (2012) argued that academic success is not directly related to the amount of time spent at school but rather to how effectively the instructional time is utilized. Consequently, this study reported no significant positive correlation between full-day education and student achievement.

The primary aim of this study is to evaluate the feasibility and applicability of the full-day education schedule implemented in primary schools under the authority of the Ministry of National Education and Culture (MEKB) in the Turkish Republic of Northern Cyprus (TRNC). This evaluation seeks to understand the perspectives of school administrators regarding the management of the full-day education schedule and the experiences of teachers concerning its implementation, focusing on both the positive and negative aspects they encounter during the process. In this context, the main research question of the study is formulated as follows: “*What are the views of school administrators and teachers on the feasibility and applicability of the full-day education schedule in the TRNC?*”

Based on this central question, the specific research objectives are defined as follows:

1. 1. What do participants think about the implementation of the full-day education schedule in our country, considering the educational requirements of the 21st century?
2. 2. What are your thoughts on the suitability of the current curriculum used during the full-day education schedule in relation to the physical and technological infrastructure available in your school?
3. 3. How do you assess the impact of the current full-day education curriculum on students? Please share your thoughts and experiences regarding this matter.
4. 4. How do you evaluate the effects of the full-day education schedule on students’ academic performance and social development?
5. 5. What are your views on the applicability of the constructivist approach within the full-day education schedule? Specifically, how do you feel about providing opportunities for students to engage in active participation and hands-on experiences?
6. 6. How do you evaluate the impact of the full-day education schedule on teachers in terms of workload, motivation, and professional practices?
7. 7. What challenges or difficulties might teachers face when implementing the full-day education schedule? What are your thoughts on this issue?
8. 8. What challenges or difficulties might students encounter within the current full-day education model? How do you evaluate this situation??
- 9.

Methodology

Research Design

This study utilized a qualitative research approach, which aims to provide a comprehensive understanding of a specific phenomenon by focusing on events and behaviors that occur in natural settings and collecting in-depth data (Büyüköztürk et al., 2024). Among the various qualitative research designs, a case study design was adopted for this research. This design, also known as case analysis or the case study approach, can be used in both qualitative and quantitative research. It is particularly valuable for its ability to provide rich and vivid descriptions of events, combine analyses with comprehensive explanations, and highlight critical aspects of the situation being investigated (Baş & Gök, 2024). Moreover, the case study approach enables researchers to thoroughly analyze and understand real-life situations and processes. It offers opportunities to investigate complex phenomena in depth, especially in contexts where the researcher has limited control over the variables involved (Yıldırım & Şimşek, 2011).

Study Group and Sampling

In qualitative research, participants are carefully selected based on the purpose and research questions of the study. The individuals who make up the study group are those observed and interviewed by the researcher in order to collect data. Establishing a trust-based relationship between the researcher and participants is crucial for obtaining accurate, reliable, and in-depth information (Yıldırım & Şimşek, 2021). The study group for this research consists of school administrators and teachers working in state-affiliated primary education institutions under the authority of the Ministry of National Education of the Turkish Republic of Northern Cyprus (TRNC) during the Spring Semester of the 2024–2025 Academic Year. These institutions are located in the regions of Lefkoşa, Gazimağusa, İskele, Güzelyurt, and Girne. For participant selection, the purposive sampling method was employed. This approach enables researchers to select participants who can best address the research questions and provide rich, relevant data, making it a widely used strategy in qualitative research (Yıldız, 2017). Among the purposive sampling techniques, the snowball sampling method was applied. According to Merriam (2013), snowball sampling helps researchers identify the most suitable participants who meet the predefined criteria of the study, thereby facilitating access to information-rich cases.

Data Collection Tool

In this study, a semi-structured interview format was utilized as the qualitative data collection tool. Data were gathered through interviews comprising open-ended questions. The semi-structured interview technique, which has a flexible structure, allows the researcher to prepare a set of planned questions in advance while also enabling the researcher to ask additional or alternative questions during the interview based on its progress. This flexibility allows for adjustments to the interview framework when necessary (Türnüklü, 2000). The interview form was developed by the researcher and subsequently reviewed by five field experts to ensure content validity and relevance. After incorporating the feedback from these experts, a pilot study was conducted involving one school principal, one vice principal, and one primary school teacher to test the usability of the interview form. Based on the results of the pilot study, the interview form was confirmed to meet usability and effectiveness criteria, making it suitable for use in the actual research process.

Data Collection Procedure

Before data collection began, the necessary permissions were obtained from the Primary Education Department of the Ministry of National Education of the Turkish Republic of Northern Cyprus (TRNC-MEB) (see Appendix 1). An application was also submitted to the Ethics Committee of the Institute of Social Sciences at Akdeniz Karpaz University. All required documents were submitted to the ethics committee in full, and ethical approval for the study was granted. The study group consisted of school principals, vice principals, and teachers working at state-affiliated primary education institutions governed by the TRNC Ministry of National Education, specifically in the regions of Lefkoşa, Gazimağusa, Güzelyurt, Girne, and İskele. Data collection commenced after obtaining ethical approval and official permission from the TRNC Ministry of National Education. The schools involved in the study were visited, and face-to-face interviews were conducted with the participants. During these interviews, the researcher utilized a semi-structured interview form containing open-ended questions tailored specifically for school administrators and primary school teachers. The data collection process took place in March 2024, during the Spring semester of the 2024–2025 academic year, at times and locations convenient for the participants, ensuring minimal disruption to their schedules.

Data Analysis

In this study, data were collected using a semi-structured interview format, accompanied by a qualitative data analysis approach. We employed both descriptive analysis and content analysis techniques to interpret the findings. The content analysis technique consists of three main stages: data collection, data coding and categorization, and interpretation. In the first stage, we gathered participants' responses to the interview questions.

During the second stage, the collected data were coded and transformed into themes. In the third stage, we interpreted the data to extract meaning and establish connections between the findings. At the initial stage of thematic classification, we applied a descriptive analysis approach at the conceptual level to organize the data. Content analysis was used to ensure consistency and integrity in the development of themes (Yıldırım & Şimşek, 2021). Qualitative data analysis is defined as the process of organizing, synthesizing, and interpreting large volumes of raw data to derive meaningful insights, identify relationships, and achieve conceptual understanding before reporting the findings. At the core of qualitative analysis is the coding of data, where flexibility and diversity are prioritized over rigid standards (Gürbüz & Şahin, 2014).

Validity and Reliability

One of the most important aspects that enhances the value of a scientific study is the researcher's ability to establish the validity and reliability of their findings. Regardless of the type of research conducted, ensuring both validity and reliability is essential for achieving the study's objectives and increasing the credibility of the results.

In qualitative research, validity refers to the appropriateness of the data collection tools used to measure the intended phenomenon, as well as their ability to evaluate the research problem accurately and objectively. Validity involves not only selecting the correct instruments but also ensuring that the measurements accurately represent the phenomenon being investigated. A comprehensive presentation of the research problem and a detailed focus on all relevant characteristics are considered key indicators of validity. Moreover, ensuring the validity and reliability of the data collection methods, research design, and data analysis procedures is crucial for the acceptance and credibility of the study's findings (Arslan, 2022). Techniques such as member checking—where researchers confirm participants' responses by asking questions like “Is this what you intended to express?”—also significantly enhance the overall validity of the study (Aziz, 2020).

Results

Table 1. Demographic Characteristics of the Participants

Themes	f (n)	%
Gender		
Female	40	80%
Male	10	20%
Position		
Principal	7	14%
Vice Principal	6	12%
Primary School Teacher*	37	74%
Age Distribution		
Below 30	9	18%
31–35	10	20%
36–40	7	14%
41–45	8	16%
46 and above	16	32%
Total Years of Teaching Experience		
0–5 years	4	8%
6–10 years	7	14%
11–15 years	10	20%
16–20 years	2	4%

Themes	f (n)	%
20–25 years	6	12%
25 years and above	8	16%
Total Years of Administrative Experience		
0–5 years	10	20%
11–15 years	1	2%
20–25 years	2	4%

Table 1 presents the demographic characteristics of the participants in the study. Among the teachers who contributed, 80% were female and 20% were male. In terms of professional roles, 14% of the participants were school principals, 12% were vice principals, and 74% were teachers, which included classroom teachers, English teachers, music teachers, and physical education teachers. Regarding age distribution, 18% of the participants were under 30 years old, 20% were aged 31 to 35, 14% were between 36 and 40, 16% were aged 41 to 45, and the largest group, comprising 32%, consisted of participants aged 46 years and older. When it comes to teaching experience, 8% of the teachers had 0 to 5 years of experience, 14% had 6 to 10 years, 20% had 11 to 15 years, 4% had 16 to 20 years, 12% had 21 to 25 years, and 16% had more than 25 years of experience. In terms of administrative experience, 20% of participants had 0 to 5 years, 2% had 11 to 15 years, and 4% had 21 to 25 years of experience in school administration.

Table 2. Evaluation of Participants' Views on the Full-Day Education Schedule

Themes	N	%
Lack of physical and technological infrastructure	22	44%
Inadequacy of existing physical and technological infrastructure	30	60%
Excessive duration of instructional time	2	4%
Insufficiency of the current curriculum	2	4%
The current educational model does not fully represent full-day schooling	2	4%

As shown in Table 2, most participants emphasized the lack of physical and technological infrastructure, stating that this deficiency negatively impacts the effectiveness and efficiency of the teaching and learning process within the full-day education schedule. They highlighted that insufficient resources and inadequate facilities pose significant challenges in achieving desired educational outcomes. Additionally, several participants noted that the current curriculum used during the full-day education schedule does not meet expected standards and fails to adequately address the needs of both students and teachers. Furthermore, a smaller group of participants expressed concerns that the duration of the full-day education schedule is too long for students, which they believe may lead to fatigue and decreased engagement in the learning process.

Table 3. Evaluation of the Compatibility of the Full-Day Education Program with the School's Physical and Technological Infrastructure

Themes	N	%
Lack of physical infrastructure and equipment	39	78%
Inadequacy of technological infrastructure and equipment	36	72%
Need for restructuring the instructional programs	4	8%
Need for improvement of physical and technological resources	7	14%

Themes	N	%
Need to address students' nutritional requirements	4	8%

As shown in Table 3, most participants reported encountering significant challenges related to their schools' physical and technological infrastructure during the teaching and learning process. They emphasized that the current facilities and resources, especially regarding educational technologies, do not meet the standards required for the 21st century. Additionally, several participants noted that the instructional programs implemented within the full-day education model need to be revised and restructured to better align with the needs of both students and teachers. Another critical theme highlighted by the participants was the necessity of addressing students' nutritional needs. Many reported difficulties arising from the absence of adequate facilities, such as canteens or cafeterias, which hinder their ability to provide students with proper nutrition during extended school hours.

Table 4. Evaluation of the Full-Day Educational Schedule and Program's Impact on Students

Themes	N	%
Personal and social development	13	26%
Lack of positive effects of the full-day education schedule	17	34%
Students' reluctance and low participation in activities	12	24%
Students' happiness when choosing activities based on their interests	5	10%
Increase in students' physical and mental fatigue	8	16%

As shown in Table 4, participants expressed two contrasting yet closely related perspectives regarding the impact of the full-day education program on students. A majority of participants indicated that the current full-day education program does not leave a positive impression on students, suggesting that its overall effectiveness is limited. Conversely, another group of participants emphasized that the activities implemented within the program positively contribute to students' personal and social development, indicating potential benefits when the program is executed effectively. Additionally, most participants reported that students demonstrate low motivation and reluctance to engage in school activities during the extended instructional hours. Many participants also noted that the full-day education schedule increases students' physical and mental fatigue, which they believe may negatively affect students' engagement, concentration, and overall learning performance.

Table 5. Evaluation of the Impact of the Full-Day Education Schedule on Students' Academic and Social Development

Themes	N	%
Providing opportunities for repetitive learning	9	18%
Offering opportunities for social development	17	34%
Supporting students' personal development	12	24%
Lack of impact on students' academic performance	36	72%
Lack of support for students' social development	19	38%

According to the findings presented in Table 5, the participants observed that the full-day education model implemented in the TRNC does not significantly enhance students' academic performance. Additionally, several participants highlighted the need for increased opportunities for students' social development within this full-day education program. They emphasized the importance of creating environments that foster holistic growth for students. Moreover, participants suggested that providing greater access to subject-based learning opportunities, as well as expanding extracurricular and sports activities, would more effectively help students develop their

social skills and personal competencies. They stressed that these initiatives are essential for improving both the social development and personal growth of students within the full-day education model.

Table 6. Evaluation of the Use of the Constructivist Educational Approach within the Full-Day Education Schedule

Themes	N	%
The constructivist educational approach is currently applied	8	16%
Lessons are designed based on the constructivist educational approach	14	28%
The constructivist educational approach cannot be effectively implemented due to the current education system	23	46%
The use of the constructivist educational approach in the country should be improved	8	16%

As displayed in Table 6, most participants indicated that the current education system and existing instructional programs do not support the effective implementation of the constructivist educational approach. They believe that systemic limitations and traditional teaching practices hinder the full integration of constructivist principles into the instructional process. However, a significant number of participants reported that they do incorporate the constructivist approach into their teaching practices within the existing educational framework and design their lessons according to constructivist principles. Additionally, participants emphasized the need to improve the application of constructivist strategies, particularly during afternoon sessions in the full-day education model, suggesting that these practices would enhance student engagement, active participation, and learning outcomes.

Table 7. Evaluation of the Impact of the Full-Day Education Schedule on Teachers

Themes	N	%
Increased workload	12	24%
Managing the process through teachers' personal dedication	8	16%
Lack of resources is causing demotivation and dissatisfaction	23	46%
Causing physical/mental fatigue and stress among teachers	13	36%
Inefficient use of time	10	20%

Participants reported several challenges related to the full-day education schedule, as demonstrated in Table 7. Many respondents pointed out that inadequate physical and technological infrastructure, a lack of a clear instructional program, and students' reluctance to engage in activities during full-day education days lead to higher absenteeism and decreased efficiency in educational activities. These factors contribute to lower motivation and a general sense of dissatisfaction among teachers. Additionally, participants noted that the increased workload demanded by the full-day education model negatively impacts teachers' motivation. They highlighted that the program requires more preparation time, intensifying teachers' workloads and resulting in physical and mental fatigue, as well as increased stress levels. On a positive note, several teachers recognized beneficial aspects of the full-day education model. They mentioned that this approach allows for lesson repetition, reinforces learning, and contributes to their personal and professional development through involvement in diverse activities. Moreover, teachers emphasized that spending extended periods with their students improves teacher-student interaction and strengthens the classroom learning environment.

Table 8. Evaluation of the Challenges Faced by Teachers in the Full-Day Education Model

Themes	N	%
Large class sizes	5	10%
Increased workload due to preparation requirements	9	18%
Stress caused by student-related responsibilities	13	26%

Themes	N	%
Challenges related to teacher-on-duty practices	7	14%
Lack of discipline and security measures	6	12%
Limited opportunities for extracurricular activities	30	60%
Absenteeism reduces lesson quality	4	8%
Student misbehavior complicates classroom management	14	28%
Lack of a structured education program is causing uncertainty	19	38%
Parental differences and lack of involvement	6	12%
Negative impact of low teacher motivation	12	24%

As shown in Table 8, participants identified several significant challenges faced by teachers in the full-day education model. The most frequently mentioned issues included a lack of opportunities for extracurricular activities, the absence of a structured educational program, student misbehavior complicating classroom management, and the stress associated with increased student-related responsibilities. Many participants expressed that the current educational and instructional programs within the full-day model do not effectively improve the quality of teaching and learning. They emphasized the need for reforms aimed at addressing these shortcomings to ensure a more effective and efficient learning process.

Additionally, participants noted that the growing multicultural structure of the TRNC has introduced new challenges for teachers. Differences among families, together with parental disengagement or lack of involvement, have been identified as factors that complicate the teaching process and increase the difficulties teachers face in managing diverse classrooms.

Table 9. Evaluation of the Challenges Faced by Students in the Full-Day Education Model

Themes	N	%
Transportation difficulties	20	40%
Inadequate access to proper nutrition	39	78%
Safety and security issues	14	28%
Negative impact on the family economy	9	18%
Differences among families	10	20%
Negative effects of extended instructional hours	28	56%
Disciplinary and violence-related incidents	4	8%
Physical infrastructure limitations and financial challenges	18	36%
Lack of a structured educational program	8	16%

According to Table 9, participants noted several challenges that students face in the full-day education model. The most frequently mentioned difficulties include transportation issues and inadequate nutrition facilities, which create additional financial strain for families and students. Many participants pointed out that the extended duration of the full-day schedule negatively affects students, leading to fatigue, reduced concentration, and lower overall academic performance. Additionally, participants highlighted that socioeconomic disparities among families are more pronounced in the full-day model, impacting students' ability to access equal learning opportunities. Furthermore, some respondents reported incidents of disciplinary problems and violence among

students, emphasizing the need for stronger behavioral and safety measures in schools to support students' well-being and engagement.

Discussion

When examining participants' perceptions of the full-day education schedule, a significant concern identified is the belief that the schedule is neither feasible nor efficient due to inadequate physical and technological infrastructure in schools. Participants noted that the lack of facilities such as cafeterias, rest areas, sports halls, indoor spaces, laboratories, computer rooms, and smart boards poses considerable challenges to effectively implementing the full-day education model. They emphasized that current school structures do not meet the requirements necessary for a full-day instructional schedule. These findings align with the results of Doğan and Erbiyik's (2021) study, which indicated that insufficient classrooms, sports areas, cafeterias, and rest spaces limit the effective application of the full-day education model. Similarly, Özdoğru (2021) reported that challenges such as nutritional issues, inadequate physical infrastructure (e.g., insufficient classroom numbers), large class sizes, problems related to school buildings, lack of resources and teaching materials, and technological deficiencies are among the most significant obstacles faced during the transition from double-shift schooling to a full-day education system. Furthermore, a study conducted in the TRNC in 2019 highlighted that limitations in physical infrastructure, technological shortcomings, and gaps in the educational program persist as pressing issues within the current education system (Erden & Erden, 2019). These findings support the results of the current study, suggesting that without substantial improvements in school facilities, technological resources, and instructional planning, the full-day education model is unlikely to achieve its intended effectiveness.

In full-day education models, students spend longer hours at school, creating a greater need for diverse and student-centered instructional programs. These programs should focus on students' interests and individual needs rather than adhering to rigid, monotonous, and overloaded curricula that do not account for individual differences. It is essential for programs to adopt a constructivist approach, which actively engages students in the learning process and encourages participation, critical thinking, and problem-solving. If an instructional program merely delivers information without incorporating interactive activities or experiential learning opportunities, it is unlikely to capture students' attention and may negatively affect their motivation. Such programs can also contribute to physical and mental fatigue, ultimately leading to lower productivity and reduced learning outcomes. Therefore, effective full-day education models should integrate balanced curricula that include active learning strategies to sustain student engagement and maximize both academic and personal development (Kazu, 2011).

Educational programs that utilize a constructivist approach, which places students at the center and encourages active participation, provide a strong foundation for students to discover their potential and meaningfully construct knowledge. Learning environments designed according to constructivist principles not only enhance students' academic achievement but also support their social development and boost their motivation (Yılmaz, 2024). Similarly, the findings of Özan and Öztürk (2018) indicate that full-day education systems can positively impact students' socialization when opportunities for extracurricular and social activities are offered during non-instructional hours. These findings align with the views of participants in the current study, who emphasized that incorporating structured social activities into the full-day model helps students develop stronger peer relationships, build self-confidence, and achieve a more balanced educational experience.

An overall analysis of the study's findings indicates that the full-day education model has a predominantly negative impact on teachers under the current conditions. Many teachers reported experiencing an increased workload, mental and physical fatigue, and decreased motivation, suggesting that the system places significant pressure on educators. However, a small number of participants noted that the extended instructional hours offer opportunities to enhance teacher-student interactions and develop closer relationships with their students. This observation aligns with the findings of Korkmaz and Sadık (2011), who reported that the transition to a full-day education model enables teachers to better understand their students' needs, interests, and learning styles, ultimately fostering a more supportive and personalized learning environment.

Conclusion

The findings of this study indicate that participants feel the current physical and technological infrastructure in schools is inadequate for effectively implementing a full-day education model. They emphasized the need for significant improvements in school facilities and technological resources to create a more supportive and efficient learning environment. Additionally, participants highlighted the importance of restructuring the instructional programs used within the full-day education schedule. They stressed that revising the curriculum to better align with students' needs and current educational demands is crucial for ensuring equity in education and enhancing learning outcomes. These findings underscore the necessity of adopting a comprehensive development strategy

that integrates infrastructure improvements, technological advancements, and curriculum reform to enhance the overall effectiveness of the full-day education system.

Participants reported that the current instructional program implemented in the full-day education schedule in Northern Cyprus presents several challenges for students. They highlighted issues related to nutrition and transportation, as well as difficulties concerning students' personal and social development. According to the findings, the full-day education model has not positively impacted students. Many participants observed that students exhibit low motivation and are often reluctant to engage in lessons and extracurricular activities. Additionally, participants noted that the lack of flexibility and choice within the existing program—particularly the absence of opportunities for students to select courses or activities based on their interests and talents—leads to negative consequences for students' engagement and well-being. Furthermore, it was found that the extended full-day schedule contributes to increased physical and mental fatigue, which adversely affects students' academic performance, concentration, and overall learning experience.

Participants discussed the impact of the full-day education schedule on students' academic and social development, emphasizing the need for opportunities that foster emotional and social growth. They highlighted the importance of creating hands-on, experiential learning environments that actively engage students and support their personal development. However, many participants reported that the current full-day education model leads to increased physical and mental fatigue among students and offers limited benefits to their academic progress. Additionally, they pointed out that the program does not sufficiently support students' social development. Overall, they suggested that significant improvements are necessary to create a more balanced, inclusive, and student-centered approach within the full-day education framework.

Participants discussed the applicability of the constructivist approach within the full-day education model in Northern Cyprus, highlighting that the current education system lacks adequate opportunities for effectively implementing constructivist principles. They emphasized that the existing instructional structure and program limitations impede the development of student-centered and activity-based learning environments. Furthermore, participants stressed the need for a comprehensive and well-organized plan that allocates sufficient time to successfully integrate the constructivist approach into the full-day education model. They underscored the importance of designing learning environments and planning instructional activities that align with constructivist principles to enhance student engagement, critical thinking, and active participation in the learning process.

The impact of the full-day education schedule on teachers in Northern Cyprus reveals that teachers primarily cope with this process through their personal dedication and efforts. However, many participants reported that the increased workload associated with the full-day model negatively affects teacher motivation and contributes to heightened physical and mental fatigue. Additionally, several participants expressed the belief that the full-day education schedule is inefficient and often viewed as a loss of valuable instructional time. These findings indicate a need for policy adjustments and structural improvements to better support teachers, reduce workload-related stress, and enhance the overall effectiveness of the full-day education model.

Regarding the challenges and difficulties faced by teachers in the implementation of the full-day education schedule in Northern Cyprus, participants reported that teachers are confronted with limited opportunities and insufficient institutional support, which negatively affect their performance and well-being. They highlighted issues such as large class sizes, extended instructional hours leading to increased student-related responsibilities and stress, and student misbehavior that complicates classroom management. Additionally, the findings revealed that the lack of a well-structured educational program further intensifies these challenges, resulting in reduced teacher motivation and lower instructional effectiveness. Moreover, participants emphasized that differences among families and parental disengagement also negatively impact the teaching process, creating additional obstacles for teachers in managing the demands of the full-day education model effectively.

Recommendations

Recommendations for Future Research

- Future research could explore similar or related topics using quantitative and mixed-method research designs that incorporate larger and more diverse participant samples. This approach would facilitate comparisons between the findings of this study and those from future studies, leading to a deeper understanding of the subject.
- Additionally, under the same research title, a detailed examination of students' and parents' perceptions, attitudes, and experiences regarding the full-day education schedule could be conducted. Such studies would provide broader insights, helping to identify differences in stakeholders' views and supporting the development of more effective educational policies and practices.

Recommendations for Researchers

- Efforts should be made to improve and upgrade the physical infrastructure, technological resources, and overall facilities of schools to support the effective implementation of the full-day education model.
- To ensure the efficiency and effectiveness of the full-day education schedule, the current instructional programs should be revised and redesigned in accordance with contemporary educational approaches and tailored to students' individual needs and interests.
- The implementation of the full-day education model should initially begin with pilot schools, and after identifying and addressing potential deficiencies, the model can be extended gradually to all schools across the country.
- Student-centered activities and experiential learning opportunities that are aligned with the demands of the 21st century should be designed to support students' interests, talents, and personal development, enabling them to learn by doing and experiencing.
- In-service training programs should be organized for teachers to enhance their knowledge and skills regarding the implementation of the constructivist educational approach, supporting more active and student-focused teaching practices.
- Teachers should also be provided with contemporary professional development opportunities in classroom management, enabling them to strengthen their instructional strategies and effectively manage diverse classroom dynamics.
- Schools should foster stronger teacher-student collaboration by enhancing communication and cooperation with families. Organizing family education seminars and workshops would support parents in understanding and contributing to their children's learning and development.

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Evaluation of the Current Education System in TRNC According to the Opinions of School Managers at Secondary Education Stage

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ABSTRACT

This study was conducted to examine the structure of the current secondary education system in Northern Cyprus and identify the views of school administrators (principals and vice-principals) regarding teacher motivation. The research employed a case study design, one of the qualitative research approaches. The study group consisted of 40 school administrators working at the secondary education level under the Ministry of National Education in the Turkish Republic of Northern Cyprus (TRNC). As a qualitative data collection tool, a semi-structured interview form was used, which was developed to include a preliminary information section and seven open-ended interview questions. For data analysis, descriptive analysis and content analysis techniques were applied.

The research findings show that the education system in the TRNC has not entirely adapted to modern requirements, particularly in areas such as physical infrastructure, updated curricula, teacher competencies, and motivation. Although some school-based practices have been introduced to improve teacher motivation, there is still a need for more comprehensive and sustainable policies at the systemic level.

The study recommends revising curricula and instructional programs to align with the requirements of the 21st century. It also suggests restructuring educational policies and prioritizing practices aimed at enhancing teacher motivation. Additionally, the study emphasizes the need to strengthen the existing physical and technological infrastructure of schools.

Keywords: Northern Cyprus, School Administrator, Inspector, Education System

INTRODUCTION

In the current century, education is a dynamic process designed to help individuals acquire knowledge, skills, and values, which in turn foster their adaptation to society and promote personal development. A widely accepted definition of education is that it is the process of intentionally prompting positive changes in an individual's behavior through personal experiences (Fidan, 1986).

In developing countries like the Turkish Republic of Northern Cyprus, education is considered the cornerstone of social development. An education system is a cohesive framework in which educational activities within a society are organized according to specific principles and objectives, allowing educational institutions to work together effectively. This system encompasses a set of policies, programs, and practices designed to foster students' academic, vocational, and personal development. Education systems can differ significantly from one country to another and are typically shaped by legal regulations, curricula, and teaching methods (Turan, 2019). Moreover, the educational process should be seen as a crucial mechanism that enables individuals to adapt to society and promotes their development. However, the successful continuation of education is closely linked not just to the quality of educational processes, but also to how these processes are managed. In this context, educational processes should be grounded in strategic thinking and effective decision-making. As noted by Çelebi (2023), strategic thinking involves effective communication, quick decision-making, and strong problem-solving skills.

In the current century, education systems are continuously evolving to adapt to technological, economic, and social changes. The main goal of this transformation is to create a framework that supports individual development

and equips learners with skills that meet the demands of the modern world. A study by Öznacar and Dericioğlu (2017) highlighted the challenges faced by school administrators in public schools in the Turkish Republic of Northern Cyprus (TRNC) regarding their physical and technological infrastructure. It was observed that the education system in Northern Cyprus does not fully meet contemporary standards, and many schools lack the technological equipment and infrastructure necessary for today's educational needs (Dericioğlu & Öznacar, 2020). To address these issues, it has been recommended that the Ministry of National Education collaborate with secondary-level schools in the TRNC to improve the quality of education (Dericioğlu, Öznacar & Köprülü, 2022).

Evaluations conducted by school administrators regarding the current secondary education system typically focus on several key themes: the feasibility of educational policies, the effectiveness of curricula, the competencies of teachers, and the levels of student achievement. Domestic studies indicate that school administrators often express dissatisfaction with centralized control in education (Kara, 2020). In contrast, some international studies have shown that educational policies that adopt decentralized governance tend to yield more successful outcomes (Harris & Jones, 2019).

Teacher motivation is a crucial factor that directly impacts the effectiveness of the educational system. School administrators emphasize that both material and moral incentives play a vital role in enhancing motivation (Yılmaz & Kamile, 2021). In particular, elements such as workload, opportunities for professional development, and internal support mechanisms are key in shaping motivation. International studies indicate that opportunities for professional development significantly contribute to improving teacher motivation (Hargreaves & Fullan, 2012). Research conducted in Turkey indicates that the majority of administrators perceive teacher motivation as generally low (Öztürk, 2023).

The purpose of this study is to evaluate the strengths and weaknesses of the current education system in secondary schools within the Turkish Republic of Northern Cyprus (TRNC) from the perspective of school administrators. This evaluation aims to identify factors that influence the motivation levels of both teachers and administrators, ultimately contributing to the development of educational policies. The main research question guiding this study is: "What are the views of school administrators regarding the current education system in the TRNC?" In line with this main research question, the sub-objectives of the study are as follows:

1. What are school administrators' evaluations of the physical infrastructure and technological equipment in public schools in Northern Cyprus?
2. How do school administrators assess the structural and operational aspects of the current education system in Northern Cyprus?
3. What are school administrators' views on the feasibility of transitioning to a full-day education model in Northern Cyprus?
4. Considering the requirements of the 21st century, what do school administrators think about the content of the current curriculum implemented in Northern Cyprus?
5. What internal and external factors affect the motivation of teachers working in secondary schools under the Ministry of National Education in Northern Cyprus, and what solutions do school administrators propose for these factors?
6. How do school administrators in secondary schools under the Ministry of National Education in Northern Cyprus perceive the administrative, bureaucratic, and professional conditions that influence their own motivation?
7. What evaluations do school administrators have regarding the impact of issues in the current education system of secondary schools under the Ministry of National Education in Northern Cyprus on the motivation of both teachers and administrators?

METHODOLOGY

Research Design

In this study, a qualitative research approach was utilized. Qualitative research is a method in the social sciences that aims to examine human behavior, experiences, and the meanings individuals assign to them in depth. This approach explores how people perceive and interpret the world (Creswell, 2013). Unlike quantitative research, which emphasizes numerical data, qualitative research focuses on verbal information and is primarily exploratory in nature (Merriam, 2009). Qualitative studies are typically conducted in participants' natural settings, allowing for the collection of data within real-life contexts (Patton, 2002).

Study Group and Sampling

In qualitative research methods, the study group consists of individuals whom the researcher interviews or observes. This group is chosen based on the research questions and objectives. It is crucial to select the study

group carefully and to build trustworthy relationships between the researcher and the participants, as the study group is considered a vital component of qualitative research (Yıldırım & Şimşek, 2021).

The study group for this research included school administrators, specifically principals and vice-principals, from public secondary schools affiliated with the Ministry of National Education (MoNE) of the TRNC. These schools are located in the districts of Nicosia, Famagusta, Kyrenia, Güzelyurt, and İskele during the spring semester of the 2024–2025 academic year. For this study, the snowball sampling method, a type of purposive sampling technique, was employed. Snowball sampling is beneficial in qualitative research for exploring groups that are difficult to access or relatively hidden. In this method, a few initial participants recommend other individuals who share similar characteristics, allowing the participant pool to grow progressively, similar to a rolling snowball (Noy, 2008).

Data Collection Tool

In this study, a qualitative data collection tool was utilized, consisting of semi-structured interview questions. The researcher developed the interview form based on a review of relevant literature and expert opinions, which included a total of seven questions. This form aimed to gain an in-depth understanding of the perspectives of school administrators—specifically, principals and vice-principals—regarding the current education system in secondary schools in Northern Cyprus. The questions were designed in an open-ended format, allowing participants to express their experiences freely and openly.

The purpose of using structured interview forms in qualitative studies is to enable participants to share their experiences and perceptions without being limited by predetermined constraints. This approach facilitates the collection of more authentic information (Merriam, 2013). The semi-structured interview form used in this study was developed in consultation with experts and subsequently tested in a pilot study. Based on the feedback received during the pilot study, the form was revised, which improved the effectiveness of the data collection process (Yıldırım & Şimşek, 2021).

Data Collection Process

The required permissions were obtained from the TRNC Ministry of National Education, specifically from the Primary Education Department (see Appendix 1). An application was also submitted to the Ethics Committee of the Institute of Social Sciences at Mediterranean Karpaz University, including all necessary documents. The study group consisted of school administrators, such as principals and vice-principals, working in secondary education institutions under the Ministry of National Education across the districts of Nicosia, Famagusta, Güzelyurt, Kyrenia, and İskele in the TRNC. The selected schools were visited, and interviews were conducted. During these interviews, the semi-structured interview form created by the researcher for school administrators was utilized.

The research process began after receiving ethical approval from the Ethics Committee of the Institute of Social Sciences at Mediterranean Karpaz University. The interviews took place in March of the 2024–2025 spring semester, following the required permissions from the Ministry of National Education. They were conducted at times and locations that were convenient for the participants.

Data Analysis

In this study, we utilized descriptive analysis and content analysis techniques as qualitative data analysis methods. Data analysis is a crucial stage in the research process, as it provides in-depth answers to research questions, helps interpret the collected data, and offers contextual insights (Creswell, 2013). The analysis of qualitative data is typically conducted through a descriptive and interpretive approach, requiring the researcher to actively engage at every stage of the process (Merriam, 2009).

Qualitative data analysis is inherently exploratory and interpretive in nature. This means that researchers interpret the collected data not based on predetermined hypotheses, but instead according to the dynamic nature of the research process (Denzin & Lincoln, 2011). As a result, qualitative analysis is more flexible and adaptable. Descriptive analysis, in particular, allows for the systematic presentation of data collected under predetermined categories, such as participants' demographic information. In this approach, data are organized into specific themes and sub-themes, supported by direct quotations. For instance, variables like participants' roles (teacher, vice-principal, inspector, etc.), levels of education (undergraduate, graduate), and years of service—which can be expressed statistically—were analyzed within the framework of descriptive analysis (Karahan et al., 2022).

In this study, we employed inductive analysis, which is a standard method in content analysis. Inductive analysis involves uncovering fundamental concepts and their relationships through the coding of qualitative data. This process organizes the complex data collected during qualitative research, making it meaningful through

abstraction and interpretation. By utilizing exploratory and creative thinking skills, this approach allows researchers to reveal hidden connections and themes within the data (Kıncal et al., 2015).

Validity and Reliability

In this study, several strategies were used to ensure the validity and reliability of the qualitative data collection and analysis processes. Validity and reliability are essential parts of qualitative research because they support the scientific quality of the study and the trustworthiness of its results (Creswell, 2013). Since qualitative research depends on subjective data, it is important to collect, analyze, and interpret this data accurately and consistently (Lincoln & Guba, 1985).

Validity pertains to the extent to which a study achieves accurate results aligned with its purpose (Merriam, 2009). In qualitative research, validity indicates how well the collected data effectively address the research questions. Internal validity in qualitative research involves assessing whether the data collected and the interpretations made by the researcher truly reflect reality.

Reliability relates to the consistency and reproducibility of the collected data (Patton, 2018). In qualitative research, reliability concerns the accuracy of the data and the likelihood of obtaining similar results under the same conditions. It is also an important criterion for the scientific rigor of the research and the consistency of its findings. Reliability can be achieved through strategies such as coding consistency, clarity of the researcher's role, audit trails, and member checking.

Findings

Table 1: Demographic Characteristics of the Participants

Gender	Frequency (n)	Percentage (%)
Female	22	55
Male	18	45
Total	40	100

Distribution of Participants by Position

Position	Frequency (n)	Percentage (%)
Principal	16	40
Vice-Principal	24	60
Total	40	100

Distribution of Participants by Years of Service

Years of Service	Frequency (n)	Percentage (%)
12–19 Years	10	25
20–24 Years	20	50
25 Years and above	10	25
Total	40	100

Total Years of Experience in Administration

Duration	Frequency (n)	Percentage (%)
0–4 Years	12	30
5–9 Years	20	50

Duration	Frequency (n)	Percentage (%)
10 Years and above	8	20
Total	40	100

According to the demographic information shown in Table 1, 55% of the participants were female and 45% were male. Additionally, 60% of the participants served as vice-principals, while 40% held the position of principal. Regarding years of service and teaching experience, 50% of the participants had 20–24 years, 25% had 12–19 years, and another 25% had 25 years or more of professional experience. In terms of administrative experience, half of the participants (50%) had served as administrators for 5–9 years, 30% for 0–4 years, and 20% for 10 years or more. Data were collected from a total of 40 educational administrators representing 15 different schools. Since the number of participants from each school was relatively balanced, comparisons across institutions were possible; moreover, including general high schools, vocational high schools, and secondary schools allowed for the assessment of administrative practices across various types of educational institutions.

Table 2: Evaluation of Educational Administrators Regarding the Physical and Technological Infrastructure of Schools

Themes	N	%
Insufficient physical and technological infrastructure	37	92.5
Adequate physical and technological infrastructure	3	7.5
Educational policies implemented in our country are not compatible with the requirements of the 21st century	40	100.0
Total	40	100.0

As shown in Table 2, according to the views of the educational administrators who participated in the study, the physical and technological infrastructure of schools does not meet the requirements of the 21st century. Additionally, the disconnect between educational policies and current needs is seen as a fundamental systemic issue. This reveals that administrators have a highly critical outlook on the current education system. A total of 92.5% of the participants (37 administrators) reported that the physical and technological infrastructure in their schools was inadequate. This finding indicates that learning environments in schools do not fulfill the demands of modern educational methods. The lack of technological equipment, which is crucial for promoting equality of opportunity in education and supporting student-centered teaching, was identified by school administrators as a serious problem.

Table 3: Evaluation of Educational Administrators Regarding the Structure of the Current Education System

Themes	N	%
Structural characteristics of the education system	40	100.0
Administrative flexibility and autonomy	6	15.0
Applicability and richness of curriculum content	30	75.0
Teacher training and development programs	4	10.0
Effectiveness of the student-centered approach	8	20.0
Assessment and evaluation methods	37	92.5

As shown in Table 3, all participants (100%) shared their opinions about the structural features of the education system, indicating a strong awareness of its overall function and organization. The most emphasized theme was the relevance and richness of the curriculum content, with 75% of participants stressing its vital role in the system's operation. This suggests that educational administrators critically examine issues like the curriculum's currency, its relevance to real-world situations, and how well teachers can apply it. The second most emphasized theme was assessment and evaluation methods (92.5%), highlighting notable criticisms of examination systems, student

performance assessments, and the adequacy of evaluation tools. Conversely, themes such as administrative flexibility and autonomy, as well as teacher training and development programs, received comparatively less focus. However, this does not mean these areas are less important; instead, it indicates that administrators see structural challenges within the system and curriculum-related issues as more urgent.

Table 4: Evaluation of Educational Administrators Regarding the Full-Day Education Model in Secondary Education

Themes	N	%
Applicability of the full-day education model	40	100.0
Adequacy of school infrastructure	40	100.0
Contribution to the quality of education and instruction	40	100.0
Consideration of student and parent opinions	2	5.0
Need for financial and logistical support	4	10.0
Impact of extended education time on academic achievement	35	87.5
Total	40	100.0

As shown in Table 4, all participants (100%) expressed views regarding the applicability of full-day education, its contribution to the quality of teaching and learning, and the inadequacy of current infrastructure to support this model. This indicates that educational administrators possess both awareness and willingness toward the transformation of the system. Regarding the impact of extended instructional time on academic achievement, 87.5% of the participants (35 administrators) provided opinions, highlighting that administrators place significant importance on how increased time affects students' academic development. In contrast, only 5% of participants emphasized the consideration of student and parent perspectives. This suggests that participatory processes in the formulation of educational policies are limited, and the voices of families and students are not sufficiently taken into account in decision-making mechanisms.

Table 5: Evaluation of Educational Administrators Regarding the Motivation of Teachers Working in Secondary Education

Themes	N	%
Financial incentives and rewards	3	7.5
Professional development and in-service training	36	90.0
Improvement of the working environment	4	10.0
Psychological support and motivational activities	5	12.5
Participatory management and involvement in decision-making processes	20	50.0
Total	40	100.0

As shown in Table 5, the participants expressed their views on which supportive factors they considered most important for teachers' job satisfaction, motivation, and productivity, as well as the initiatives they undertook as school administrators to enhance teacher motivation. A total of 90% of the participants emphasized *professional development and in-service training* as the most effective factor in supporting teacher motivation. This finding indicates that administrators strongly recognize the contribution of improving teacher qualifications to the education system. The second most frequently highlighted theme was *participatory management and involvement in decision-making processes*, emphasized by 50% of participants. This reflects a growing understanding that teachers should not only be viewed as implementers of the curriculum within the classroom but also as active contributors to decision-making processes. Such a perspective demonstrates that a significant proportion of administrators have developed awareness of the importance of transitioning toward a democratic school culture.

Table 6: Evaluation of Educational Administrators Regarding the Effects of the Full-Day Education Model on Teacher Motivation in Secondary Education

Themes	N	%
Effect of the full-day education model on teacher motivation	40	100.0
Administrative support in enhancing motivation	5	12.5
Contribution of physical and infrastructural improvements to motivation	5	12.5
Impact of working hours in full-day education on motivation	40	100.0
Contribution of social and professional support to motivation	5	12.5
Prolonged instructional time and increased workload	17	42.5
Communication between administrators and teachers and its effect on motivation	6	15.0
Total	40	100.0

As shown in Table 6, participants regarded the impact of the full-day education model on teacher motivation as significant. The themes “Effect of the Full-Day Education Model on Teacher Motivation” and “Impact of Working Hours on Motivation” were the most prominent (n=40). This suggests that administrators believe full-day education has a direct influence on teachers. A total of 42.5% of participants highlighted that extended instructional hours and increased workload negatively impact teacher motivation. This finding indicates that implementing full-day education creates not only theoretical but also practical pressures regarding workload for teachers. Lengthening working hours may lead to both physical and emotional burnout, indicating that teachers’ physical and psychological limits are being pushed to the limit. It further suggests that continuous instruction may, at some point, reduce efficiency. Additionally, when teachers’ job satisfaction drops, their performance is likely to decline as well; therefore, sustainable motivation policies are crucial.

Table 7: Evaluation of Educational Administrators Regarding the Adequacy of the Current Curriculum, the Need for Transformation, and the Requirements of the Contemporary Era

Themes	N	%
Currency and relevance of the curriculum	40	100
Alignment with technology and digitalization	19	47.5
Presence of a skills-based approach	12	30
Inclusion of critical thinking and problem-solving skills	17	42.5
Flexibility of the curriculum and compatibility with localization	5	12.5
Incorporation of student-centered learning approaches	28	70
Challenges faced by teachers in implementing the curriculum	3	7.5
Total	40	100

As indicated in Table 7, all participants (100%) stressed the importance of evaluating the current curriculum to ensure its relevance and up-to-date content. This indicates that administrators recognize the crucial need to equip students with the knowledge, skills, and values required in today’s world. Additionally, 70% of administrators highlighted the need for student-centered learning approaches to be incorporated into the curriculum. This significant percentage reflects a growing belief among administrators that education should focus on active student engagement rather than passive learning.

Regarding the theme of alignment with technology and digitalization, 47.5% of participants shared their opinions, while 42.5% noted that the curriculum does not sufficiently develop critical thinking and problem-solving skills. This suggests that many curricula still rely on traditional knowledge transfer models, which may hinder students' development of higher-order thinking skills. Fostering these skills is essential for individuals to tackle the complex challenges of the 21st century effectively.

Discussion

The research findings show that school administrators in the TRNC have a strong awareness of the current education system and teaching methods. A consensus has formed that the core parts of the education system—such as the curriculum, teacher qualifications, school facilities, and educational policies—must be reevaluated to match the needs of today's era better.

All participants agreed that curricula need to be updated and aligned with digitalization. These views align with Trilling and Fadel's (2009) framework of 21st-century skills and the curriculum alignment studies of Voogt and Roblin (2012). It was highlighted that the curriculum should be designed not only with content richness but also with a clear emphasis on implementation flexibility, skills-based learning, and individualized instruction.

On the other hand, the findings about teacher motivation show that administrators mainly focused on professional development opportunities and participation in decision-making. At the same time, structural supports like physical conditions, reward systems, and social support mechanisms were mostly ignored. Herzberg's two-factor motivation theory (1959) is especially relevant here: just as motivators boost motivation, the lack of fundamental hygiene factors can harm employee productivity.

The findings on the full-day education model reveal gaps in systemic planning. Due to issues with infrastructure, meals, rest opportunities, social activities, and staffing, implementation has proven to be ineffective in practice. Additionally, teachers' motivation was observed to decrease because of the increased workload. These results support Fullan's (2016) warnings that ignoring practitioners in systemic reforms is likely to lead to failure.

Another notable finding of the study is the significant criticisms aimed at assessment and evaluation methods. Most participants stated that the current system emphasizes exam preparation more than measuring students' individual growth. This underscores the need to better incorporate Black and Wiliam's (1998) concept of assessment for learning (formative assessment) into the education system.

Most administrators pointed out the lack of sustainability in educational policies, their frequent changes, and the limited involvement of teachers and administrators in decision-making as key weaknesses of the system. This highlights once again the importance of governance in education (OECD, 2019).

Results and Conclusions

This study revealed that participants believe the current secondary education system in Northern Cyprus lacks adequate physical and technological infrastructure and equipment to meet the demands of the modern era. It also concluded that the current full-day education model is neither practical nor efficient when considering educational and social aspects. Additionally, the curricula in use are seen as falling short of meeting the needs and expectations of the contemporary age.

School administrators stated that the current education system fails to meet the needs of the modern era in both content and practice, thus requiring a comprehensive overhaul. A strong consensus was reached on the need to update the curriculum's relevance, flexibility, and skills-based focus. Student-centered approaches, critical thinking, and digital skills were identified as lacking. Although the full-day education model is supported in theory, its practical implementation has been hindered by deficiencies in physical infrastructure, social facilities, financial resources, and human resource planning.

It was revealed that supporting teacher motivation requires a comprehensive approach, not only through in-service training and participation in decision-making, but also by improving working conditions, offering psychosocial support, establishing reward systems, and improving communication quality. Additionally, assessment and evaluation methods should move away from an exam-centric focus toward a more process-oriented and developmental perspective. Administrators stressed that educational policies should be developed independently of political changes, aiming for long-term, sustainable, scientifically evidence-based solutions that address local needs.

Recommendations

Practical Recommendations for Implementation

- Development of the Education and Training Curriculum: It is recommended that the curriculum be redesigned with flexible structures that are responsive to local needs and aligned with the requirements of the digital age. The revised curriculum should be skill-oriented, promote critical and creative thinking, and foster competencies relevant to the 21st century.
- Replanning the Duration of Full-Day Education: Full-day education practices should be comprehensively planned in terms of physical infrastructure, staffing, social activity areas, and nutrition facilities. A phased transition model is recommended to ensure effective implementation.
- Developing New Policies to Enhance Teacher Motivation: In addition to in-service training, policies should focus on balancing workload, establishing reward systems, strengthening social support mechanisms, and clarifying professional career pathways to improve teacher motivation.
- Adopting a Participatory Governance Approach: Structures should be established to ensure the active participation of school administrators and teachers in decision-making processes, with an emphasis on school-based management.
- Renewing Assessment Systems: Rather than grade-oriented evaluation, systems should be developed that support students' individual development and rely on alternative assessment tools such as projects and portfolios.

Recommendations for Future Research

- Expanding Perspectives Beyond Administrators: Since this study's findings are based on the views of school administrators in the TRNC, it is advisable to conduct similar research from the viewpoints of teachers, students, and parents.
- Employing Mixed-Methods Research on Teacher Motivation: Mixed-methods studies exploring the relationship between teacher motivation and factors such as school climate, leadership style, and working conditions are recommended, as they may offer more comprehensive data.
- Conducting Comparative Cross-Country Research on Educational Policies: Comparative studies focused on the consistency, continuity, and applicability of educational policies are suggested. Such research could identify structural models that may serve as references for the TRNC education system.

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Exploring Collocational Awareness in Teaching Turkish as a Second Language: A Narrative Inquiry with Instructors

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ABSTRACT

This qualitative study investigates collocational awareness among instructors of Turkish as a Foreign/Second Language (TFSL), focusing on how regular collocation-focused activities influence their teaching practices. While the study was conducted in the Teaching Turkish as a Second Language (TSL) context at a private university in Türkiye, the term TFSL is employed as an inclusive designation, encompassing both foreign and second language learning contexts. Although collocations are critical for fluency and idiomaticity, limited research has investigated how TSL instructors conceptualize and integrate them into classroom instruction. Using a narrative inquiry design, data were collected from three instructors through semi-structured interviews and reflective journals. Over a four-week period, participants implemented collocation-based activities such as matching, substitution, and contextual exercises in their classes. Thematic analysis with MAXQDA, supported by triangulation across data sources, revealed that instructors initially treated collocations incidentally, but systematic integration led them to perceive improvements in students' vocabulary breadth, fluency, and motivation. Participants also reported greater awareness of their own pedagogical practices, recognizing collocations as requiring different instructional approaches than single-word vocabulary teaching. While all expressed commitment to sustaining collocation-focused teaching, their varying practices underscored the absence of a standardized framework for collocational pedagogy in TFSL contexts. The study concludes that collocation-oriented activities benefit both learners and instructors, though findings remain exploratory due to the small sample.

Keywords: Collocational awareness, Teaching Turkish as a Foreign/Second Language (TFSL)

Vocabulary instruction, Narrative inquiry, Instructor perceptions

1. INTRODUCTION

Language teaching is traditionally divided into three categories, which are skills teaching, grammar teaching, and vocabulary teaching. While teaching skills and grammar are usually prioritized, vocabulary teaching is usually neglected (Amiryousefi & Dastjerdi, 2010). According to DeCarrico (2001) the reason behind this is the widespread belief that vocabulary learning could be handled on its own. However, the majority of a language's meaning is contained in its lexicon (McCarthy, 1988) and vocabulary teaching itself can result in a notable increase in language competency (Nunan & Carter, 2001). Manangkari (2018) asserts that vocabulary learning may present some problems for language learners. When learners try to expand their vocabulary in target language, the number of words that need to be learned might be discouraging for them. Additionally, Willis and Willis (2006) state that learners that only learn individual words will find it far more difficult and time-consuming to express themselves which might be one of the reasons why the lexical approach prioritizes introducing the words in linguistic chunks rather than separately.

Chunks are words that operate as one unit (Altuwairesh, 2017) and teaching words in chunks can significantly increase the vocabulary one can use while negotiating meaning (Nattinger & DeCarrico, 1992). Moreover, chunks help learners to sound more native-like since they are thought to be related to how native speakers store vocabulary, as chunks as well as individual words (Rahimi & Momeni, 2012). It can be said that a language classroom in which chunks are utilized during vocabulary teaching have a better chance to make the learning process faster and lasting. Thornbury (2002) claims that the most fundamental chunks of language are phrasal verbs, idioms, and collocations. The difference between idioms and collocations is sometimes overlooked and they might be thought to be the same thing, but this is not the case. However, the border between idioms and collocations is not rigid (Nesselhauf, 2003). One way to make the distinction is to know that the meaning of an idiom cannot be deduced from the meanings of individual words (O'Dell & McCarthy, 2008) as the literal and figurative meanings of an idiom are completely different (Bui, 2021). In other respects, a collocation is a combination of two or more words that occur together in a predictable way to describe a situation (Rao, 2018). For example, in Turkish, collocations such as "*ağır ceza*" (heavy penalty) or "*karar almak*" (to make a decision) are semantically transparent and can be understood from the meanings of their individual words. Idioms, however, work differently: their figurative meaning cannot be deduced from the literal meaning of the components. For instance, "*pabucu dama atılmak*" (literally "to have one's shoe thrown onto the roof") actually means "to lose

importance or value,” and “*etekleri zil çalmak*” (literally “for one’s skirts to jingle”) means “to be very happy.” Thus, while collocations support learners’ fluency through predictable combinations, idioms require separate cultural and semantic explanation.

The Latin origin of the term ‘collocation’ can give us a clue about the concept. The term was derived from ‘col-’ which means together, and ‘locare’ which means to place. So, it is fair to say that collocations are a group of words that have been placed together to express a certain situation. A significant characteristic of collocations is their arbitrariness. It appears that there is no logic behind why some words collocate with some and not with others (Farrokh, 2012). Due to this arbitrary nature it is neither possible nor practical to predict which words collocate with which since it will lead to failure and unusual word combinations (El-Dakhs, 2015). That is why it is unlikely for learners to achieve collocational competence unless collocations are introduced in the language classroom with special care. McCarthy (1988) draws attention to the point by likening teaching vocabulary without collocations to exhibiting an unfinished painting. In consequence, teaching collocations ought to be a major component of our teaching from the very first lesson since they constitute 70% of our utterances (Hill, 2000) and they are the most prevalent and outstanding examples of English multi-word expressions (Lewis, 2000). Furthermore, using collocations correctly increases fluency by enhancing learners’ comprehensibility (El-Dakhs, 2015) and contributes to their idiomaticity (James, 1998) all of which leads to enhanced nativelikeness Nation (2001) states that collocational competence is required for appropriateness and fluency in a language. Similarly, Duan and Qin (2012) claim that learners can gain a deeper understanding of a word’s meaning and expand their vocabulary by using the context and intentional associations, such as collocations, to make connections. The collocation-based word learning approach allows learners to apply the appropriate words at the appropriate time and place while simultaneously providing a hint for memorization of new words.

In Teaching Turkish as a Foreign/Second Language (TFSL)¹, collocations are especially crucial due to Turkish’s agglutinative morphology and syntactic complexity. Corpora and pedagogical materials underscore the prevalence of light verb + noun constructions (e.g., *karar al*, *yardım et*) and case-marked collocations (e.g., *-A + dikkat et + -A + ihtiyaç duy*). Corpus-based analyses and teaching resources, such as those developed by Karadağ (2018), emphasize the instructional value of collocation-focused word lists derived from authentic Turkish usage, reinforcing semantic naturalness and communicative competence. Research drawing on TS Corpus and the Turkish National Corpus has shown that collocations are among the most frequent and essential lexical units in Turkish (Çetinkaya, 2017; Sezer, 2017). For learners, mastering these structures is critical for achieving fluency, yet collocational competence is not always given systematic emphasis in TSFL classrooms.

In Turkish linguistics, significant efforts have been made to document and analyze collocations. Özkan (2010) compiled *Türkçenin Öğretiminde Sıfatların Eşdizim Sözlüğü: Yöntem ve Uygulama* (A Collocations Dictionary of Adjectives in Teaching Turkish: Methodology and Practice), providing one of the first systematic resources in this field, and later introduced the *Türkiye Türkçesinin Eşdizim Sözlüğü* (A Collocations Dictionary of Turkish), a large-scale, corpus-based resource that maps collocations across verbs, nouns, adjectives, and adverbs (Özkan, 2012). Research has also highlighted the challenges learners face in acquiring collocational competence. Doğan (2019) observed that TFSL learners frequently rely on literal translations or transfer collocational patterns from their first language, a difficulty attributed to the limited treatment of collocations in existing textbooks. Similarly, Çetinkaya (2017) emphasized that collocational competence is critical for semantic naturalness and fluency in Turkish, yet teaching materials rarely present collocations as central lexical units. Supporting this view, Erten and Özer (2019) documented common learner errors such as overgeneralization and L1 transfer, concluding that explicit and systematic collocation-focused pedagogy is necessary. Finally, Karadağ (2020) noted that over 70% of both spoken and written Turkish consists of fixed expressions, arguing that collocations should be embedded directly into CEFR-based word lists to ensure learners’ fluency and idiomaticity.

Despite the considerable research on collocations in general, there is a noticeable gap in studies concerning collocational awareness among TFSL instructors. While previous studies often focused on learners’ knowledge and production of collocations (Biskri, 2012; Gençer, 2004; Putrawan, 2015; Soleimani et al., 2013), much less is known about how instructors conceptualize and teach collocations in Turkish. Without adequate instructor awareness, learners may not receive sufficient exposure to these structures, which are central to fluency and idiomatic expression. Therefore, research examining the collocational awareness of TFSL instructors and exploring how collocation-focused activities influence their teaching practices is needed.

¹ In this study, the term Teaching Turkish as a Foreign / Second Language (TFSL) is employed as an inclusive designation, encompassing both foreign and second language learning contexts. This usage ensures terminological consistency while recognizing that pedagogical frameworks and learner profiles frequently intersect across these domains.

In line with this, the present paper aims to investigate the collocational awareness of TFSL instructors and the effect of regular implementation of collocational activities on their vocabulary teaching. The research questions are as follows:

1. What is the level of collocational awareness among TFSL instructors?
 - a) How do TFSL instructors define collocation?
 - b) How often do they teach collocations?
 - c) How do they integrate collocations into their lessons?
 - d) What is the importance and necessity of teaching collocations according to their self-perception?
2. How does implementing collocation activities regularly contribute to TFSL instructors' collocational awareness?

2. METHODOLOGY

This study employed a qualitative research design grounded in narrative inquiry to explore instructors' perspectives on collocational awareness in TFSL. Data collection and analysis were structured to capture both spoken and written reflections of the participants, ensuring depth, validity, and triangulation. The following subsections detail the participants, data collection procedures, and analytical framework adopted in the study.

Research Design

Qualitative research aims to discover ideas, understandings, and perspectives by conducting thorough fieldwork and evaluations, typically using small sample sizes to perform comprehensive analyses of the research topics being investigated (Patton, 2005). Within the narrative inquiry approach, participants are anticipated to articulate and convey their experiences, while it is incumbent upon the researcher to decipher the significance within the data to address the research questions at issue (Clandinin & Caine, 2013). Given that the research questions of this study necessitate detailed information from participants and an in-depth examination of the gathered data (Creswell, 2009), this study has been structured as a qualitative narrative inquiry to reveal new insights and gain a complete understanding.

Participants

The participants were three TSL instructors affiliated with a private university in Türkiye. The selection of instructors was intentional, as it aimed to capture perspectives shaped by diverse teaching experiences within the second language context, thereby offering exploratory insights into the topic rather than broad generalizability. Participants were recruited through purposive sampling, following non-random criteria aligned with the study's objectives. All participants were Turkish nationals, a deliberate choice to examine collocational awareness among educators teaching their native language to international students in Türkiye. The detailed demographic characteristics of the participants are presented in Table 1.

Table 1: Demographics of Participants

Participant	Experience	Language They Teach	Level They Teach
P1	3 years	Turkish	A2
P2	2 years	Turkish	B1
P3	6 years	Turkish	B2

Data Collection

The data collection process lasted for four weeks. Since the research questions required personal experiences of the participants, semi-structured face-to-face interviews were realized with the participants both prior to and after the study. The data from the first interviews, which were held prior to study, were employed to answer the first research questions and its sub-questions.

In the following four weeks, the participants employed the collocation activities in their classes which were shared with them weekly by the researcher. These collocations were carefully prepared by the researcher in accordance with the subject, theme, and pedagogical aim of the observed week. The activities included tasks such as replacement exercises in which students substituted words with given collocations; fill-in-the-blank questions requiring students to complete sentences with appropriate collocations; matching collocations with definitions or statements; and identifying errors within provided sets. Additionally, students were supposed to find the incorrect collocation; choose correct collocations to fit sentences or contexts; or put words in the correct order to form sentences with collocations for some of these tasks. Multiple-choice exercises for selecting appropriate collocations and open-ended questions with relevant collocations were also included in the activities. These tasks were implemented with students to assess their proficiency in understanding and using collocations effectively. The data from the second interviews, which were held after the data collection process ended, were employed to

answer the second research question. After all interviews were completed, they were transcribed verbatim by the researcher.

In addition to the interviews, participants kept reflective journals on the activities they applied in the classroom weekly, which enabled them to thoroughly assess the activities and their results. The reflective journal included two sections, the first section required participants' reflection before implementing the activities in the class and the other required reflection after implementing the activities. The former section included topics of *Expectations from the activities*, *How to implement the activities*, *Anticipated problems regarding the activities and their possible solutions* and the latter included topics of *Outcome*, *How to modify the activities to enhance their effectiveness in the future*, *My reflection on the contribution of the collocation activities to my vocabulary teaching*, respectively. A total of 12 reflective journals were received from the participants, four from each participant. The data from the reflective journal entries were also employed to strengthen the findings from the second interviews to answer the second research question.

Data Analysis

The data analysis was conducted through MAXQDA 2020, with codes and themes emerging throughout the analysis phase. Since the interviews were designed as semi-structured and pre-determined questions were asked during interviews to elicit specific answers that were hoped to answer the research questions in hand, the researcher analyzed and coded the data collaboratively. Once the codes were created, the reflective journal entries from each participant were examined and the parts that can be related to their answers in the interviews were determined. Since personally kept written documents are another typical data collection for narrative inquiry, such parts were used to triangulate the already obtained data with the aim of strengthening the findings.

3.RESULTS

Findings Regarding the 1st Research Question

The first interviews were analyzed via thematic analysis to answer the 1st research question and its sub-questions. These interviews were structured as semi-structured sessions, entailing the administration of predetermined questions to all participants. However, the nature of the semi-structured design allowed for the emergence of additional themes throughout the course of the interviews. The findings regarding the 1st research question and its sub-questions are presented below. The hierarchical code-subcodes map regarding the 1st research question can be seen in Figure 1.

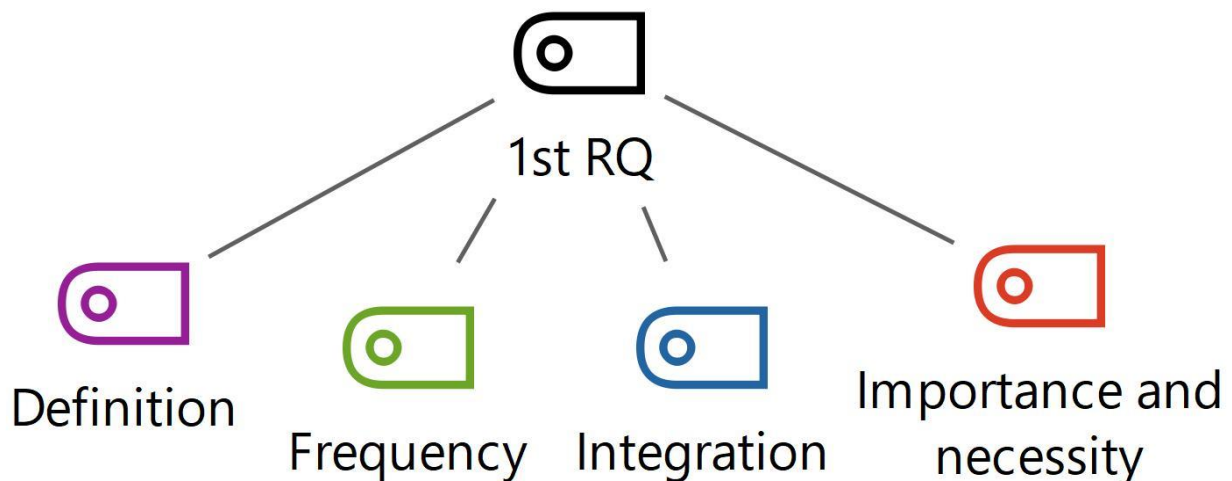


Figure 1: The Hierarchical Code-Subcodes Model Map Regarding 1st Research Question

Collocational Awareness

Two sets of codes were generated in order to find out the participants' collocational awareness, which are *definition of collocation* and *kind of collocation activities*. While the former is related to how they define collocation, the latter is related to the types of collocation activities they implement in the classroom. The findings from the aforementioned codes are presented separately in the following paragraphs to ensure a clear understanding.

Definition of Collocation

When they were asked how they defined collocation, all of the participants defined collocation correctly. P1 said "Collocation is the juxtaposition of two or more words together to gain a new meaning." Similarly, P3 said

“Collocation is using the words in a connected way.” The definitions of P2 was also in line with the definitions in the literature.

Kind of Activities They Implement

Next, the participants were asked what kind of collocation activities they use in vocabulary teaching, if any. It was seen that instructors all preferred activities that are suitable to teach vocabulary in the collocations separately, rather than in chunks.

P1 stated that she pays attention to giving multiple examples that can be related to real life by saying “I always give authentic examples such as song lyrics, quotes from movies or books, etc. to help my students to internalize collocations.” P2 stated that she prefers a game-like approach to teaching collocations. She also said “I usually give the words separately and ask my students to match the words to form collocations, then we do various exercises with those collocations once they have matched them.” P3 asserted that he favors individual exercises rather than group work. He said “When I teach collocations, I always try to give multiple examples, for instance, if the collocation includes a verb, I give other collocations that include the same verb to help my students comprehend it better.”

The activity preferences of participants differed. P1 stated that she prefers teaching the meanings of the words separately, “First of all, if they don't know the meanings of the words individually, I divide the collocation into pieces and teach them separately. Then I try to teach it as a collocation.” In line with her approach, P2 asserted that when she teaches an individual word, she mentions different collocations that include that word so that students would learn that single word better. “When a word pops up in a text that the students do not know, I teach the meaning of that word by giving collocations.” P3 stated that she prefers a game-like approach to teaching collocations. She also said “I usually give the words separately and ask my students to match the words to form collocations, then we do various exercises with those collocations once they have matched them.”

How Often Do They Teach Collocations

When the participants were asked about their frequency of teaching collocations, two patterns were observed. P1 asserted that she tries to teach collocations almost every day, whereas P2 shared that collocation teaching takes place in her lessons randomly. On the issue, P3 said “There is no specific frequency, it completely depends on the topic.”

Importance and Necessity

Participants unanimously believe that it is highly important to include collocation activities in vocabulary teaching, additionally, they all believe that collocational knowledge is necessary for both fluency and proficiency in Turkish. Regarding the importance and necessity of teaching collocations P1 said “I think that the more contextual the word connections created by the brain, the stronger the collocations are, the more memorable they are.” In accordance, P2 and P3 said “I think that teaching collocations is for the benefit of the students both in daily life and academically. Due to their frequent usage in daily life, as well as in academic contexts.”

Findings Regarding the 2nd Research Question

The second interviews were analyzed via thematic analysis to answer the 2nd research question, following the data collection process. In addition to the data from second interviews, some parts of first interviews and reflective journal entries were also employed to help to answer the question in hand. The hierarchical code-subcodes map regarding the 2nd research question can be seen in Figure 2.

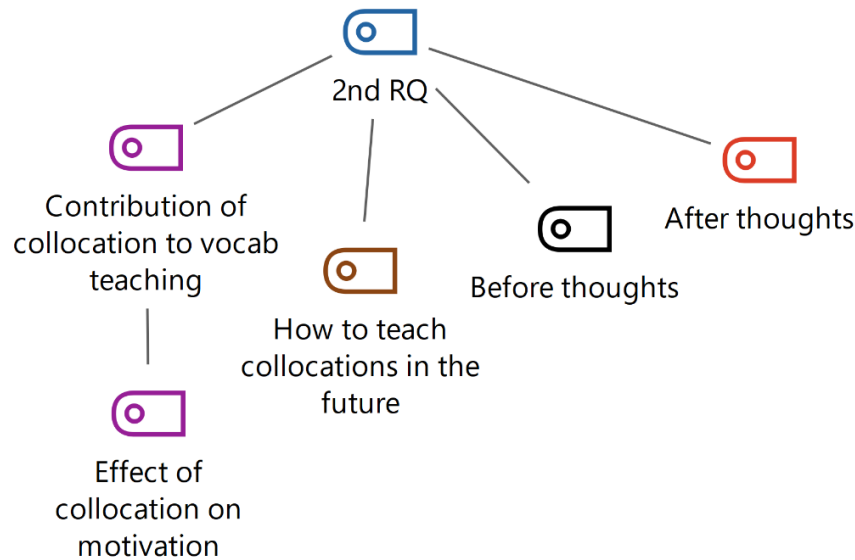


Figure 2: The Hierarchical Code-Subcodes Map Regarding The 2nd Research Question

Contribution of Collocation to Vocabulary Teaching

Regarding the effect of vocabulary teaching through collocation, participants unanimously stated that they perceived it helped their students to broaden vocabulary knowledge and fluency, which they believed contributed to overall proficiency in Turkish. “I believe it affected their vocabulary development in a really positive way since they have learned multiple words at the same time.” said P1. Similarly, P2 said “In the speaking tasks, it was clear that they had learned a lot regarding vocabulary. They had learned new vocabulary in a simpler way, and I realized that they benefited a lot from it. Their speaking skill was affected positively thanks to collocations since they used multiple words together, which led to speaking more fluently. Also the knowledge was lasting due to the lack of confusion which resulted in improvement in their speaking.” P3 also pointed out that since collocation are commonly used in daily speech, teaching them helped students to be exposed to authentic language which she believes enabled her students for the language outside of the classroom.

Effect of Collocation on Motivation

All three participants reported perceiving an increase in their students’ motivation towards Turkish as a result of collocation activities. P1 said “The students were really eager to learn more and always asking me to share the collocation activities with them after the lessons.” P2 said “When I taught collocations, I always gave multiple contexts which helped students to internalize what they have learned. As a result, they perceived improvements in proficiency, which they believed supported reading skills, as texts seemed more understandable to students. In accordance, P3 asserted “They gained self-confidence in Turkish and when students’ self-confidence increases, their motivation also increases. In addition, diversifying vocabulary teaching with collocation activities also had a positive impact on students’ motivation.”

Before Thoughts

When the participants were asked about what they anticipate from the process of implementing collocation activities on regular, various answers were received. P1 anticipated some problems regarding the process by saying “They can feel perplexed when they see that individual words have different meanings when they are uttered as a collocation, and this might hinder their vocabulary learning.” P2 expected an enhancement in her students’ vocabulary knowledge. In addition to vocabulary and grammar knowledge, P3 stated that she expected improvements in her students’ confidence and Turkish culture awareness. She said “I think they will be more confident in Turkish which is the most important thing. They will have more ways to express themselves and they will also be more eager to learn about Turkish culture as well as the language.”

After Thoughts

When the participants were asked about if their perception has changed regarding employing collocation activities, they unanimously stated that they realized, in their perception, that teaching collocations systematically differs substantially from teaching words individually. Regarding her thoughts, P1 said “I used to teach collocations when I felt like it, but I have discerned that it is needed is to allocate a whole lesson to solely teach collocations. As it necessitates various activities and exercises to help students fully comprehend them.” P2 made a self-criticism by saying “I have realized that by simply following the curriculum and teaching collocations only when

I must was a mistake. It is simply not enough as it requires more time and attention to ensure students actually learn collocations.” In line with this statement, P3 said “During the process I realized that I hadn’t been teaching collocations before. The process has made me reflect on my teaching of collocations and notice what I lack which will help me tailor the exercises and activities I use to teach collocations in the future.”

How to Teach Collocations in the Future

All of the participants expressed their willingness to keep teaching collocations after the study. P1 asserted that she plans to teach collocation in more authentic contexts by saying “I plan to create certain scenarios and situations they might experience in real life and teach collocations in such contexts. I also plan to integrate collocations teaching in writing activities.” P2 said she also intends to keep teaching collocations by saying “Turkish is a really rich language in which collocations are used frequently. The more collocations my students know, the more proficient they will become in the language.” Lastly, P3 stated that with the awareness she has gained from the study, she will insert more collocation activities in her teaching. “I will definitely integrate collocations more in my teaching starting from A2 level. I will expect my students to have a certain level of collocational knowledge especially in the advanced levels, such as B1 and B2, from now on.”

4. DISCUSSION

The present study aimed to explore the collocational awareness of TFSL instructors and to examine how regular implementation of collocation activities shaped their perceptions and teaching practices. Data from interviews and reflective journals provided insight into four aspects of collocational awareness: definitions of collocation, frequency of instruction, integration of collocations into lessons, and perceptions of importance and necessity.

Defining Collocation

The instructors demonstrated an accurate understanding of collocation, defining it in ways consistent with the literature. Nation (2001) emphasizes that conceptual awareness is a prerequisite for effective integration of collocations into teaching, and the findings suggest that the participants possessed this theoretical grounding. This foundation is essential, particularly in the TFSL context, where learners often encounter challenges related to Turkish’s agglutinative structure and case-marked collocational patterns (cf. Özkan, 2012; Doğan, 2019).

Frequency of Teaching Collocations

The study revealed variation in how frequently collocations were taught. While some instructors reported addressing collocations almost daily, others noted that their inclusion depended on the weekly lesson theme. This inconsistency reflects the absence of a standardized collocation-focused framework in TFSL classrooms. Hill (2000) stresses that collocations should be systematically integrated into teaching from the very beginning of instruction. The uneven practices observed here highlight the need for structured curricular guidelines to ensure consistent exposure.

Integration into Lessons

Instructors reported using multiple strategies to incorporate collocations, including authentic examples (e.g., song lyrics, quotations, dialogues), game-like matching exercises, and linking collocations to unknown words encountered in texts. However, many still tended to begin by teaching the individual words before combining them into collocations. While this approach provides learners with initial semantic grounding, Willis and Willis (2006) caution that teaching words in isolation may hinder learners’ ability to internalize collocational patterns. James (1998) similarly argues that fluency and idiomaticity are best achieved through teaching words as chunks rather than as separate units. Thus, while the participants demonstrated creative and context-based approaches, their reliance on individual word instruction suggests a partial, rather than full, adoption of chunk-based pedagogy.

Importance and Necessity of Collocational Teaching

All instructors emphasized that collocational knowledge is essential for vocabulary expansion, fluency, and natural language use. They highlighted that collocations are vital both for everyday communication and for academic language proficiency. Their views resonate with Lewis’s (2000) assertion that collocations are central to vocabulary development and with Karadağ’s (2020) finding that fixed expressions form a significant portion of Turkish usage. These perspectives reinforce the idea that systematic collocation teaching is not a supplementary practice but rather a core requirement for effective TFSL pedagogy.

In sum, the findings suggest that TFSL instructors are aware of the importance of collocations and are willing to integrate them into instruction, though their practices remain uneven and at times reliant on word-level teaching. This reflects broader gaps in collocation-oriented pedagogy within TFSL. Addressing these gaps may require the development of a Turkish-specific collocation framework to guide instructors and curricula in embedding collocations systematically into teaching practices.

The second research question focused on how regularly implementing collocation activities influenced TFSL instructors' collocational awareness and their teaching practices. Data were drawn from the second set of interviews, conducted after the four-week intervention, as well as reflective journals that documented instructors' evolving perceptions. Together, these sources revealed significant developments in the instructors' conceptualization and classroom practices.

Vocabulary Development and Fluency

All participants observed that systematic collocation activities led to clear gains in students' vocabulary breadth and fluency. They highlighted that collocation-based instruction exposed students to multiple lexical items simultaneously, accelerating their vocabulary growth while making retention more durable. Students demonstrated increased ability to retrieve and apply collocations in speaking tasks, which in turn enhanced fluency and reduced hesitation. These findings support Rahimi and Momeni's (2012) claim that collocational competence directly strengthens communicative performance and reduces learner errors. In the TFSL context, this is particularly significant given the high frequency of collocational patterns in Turkish, such as light verb + noun constructions or case-marked phrases, which are central to idiomatic usage.

Motivation and Confidence

Participants unanimously reported that students' motivation increased as a result of collocation-focused instruction. The engaging nature of the activities—ranging from matching tasks to contextualized production exercises—appeared to make vocabulary learning more enjoyable. Students' greater ability to use collocations in authentic tasks contributed to a stronger sense of accomplishment and self-confidence, which in turn reinforced their willingness to engage in further language learning. These observations align with El-Dakhs's (2015) argument that collocations enhance comprehensibility and provide learners with accessible entry points into authentic language use, thereby supporting motivation and persistence in study.

Shifts in Instructors' Perceptions

A central outcome of the intervention was the shift in instructors' understanding of their own teaching practices. Prior to the study, participants often treated collocations incidentally, focusing on them only when they appeared in texts or when students raised questions. Through regular exposure to collocation-focused activities, instructors came to recognize that teaching collocations systematically differs substantially from teaching single words. Several reflected critically on their earlier reliance on word-level instruction, acknowledging that this approach underestimated the complexity of collocational learning. This change resonates with Duan and Qin's (2012) assertion that collocations must be taught through context-rich, pattern-based activities rather than as isolated lexical items.

Towards Systematic Pedagogy

By the end of the study, participants expressed strong commitment to incorporating collocations as a sustained focus in their teaching. They emphasized the need to design lessons specifically dedicated to collocations, to integrate collocations into both receptive and productive skills activities, and to expand the range of classroom tasks beyond substitution or matching exercises. Hill (2000) stresses that collocations should be deliberately foregrounded in language curricula to be effectively internalized, and the participants' reflections suggest that they came to similar conclusions through their practical experience. Importantly, they also recognized that collocation teaching should not be confined to advanced levels, but rather should begin early (e.g., at A2 level) to establish a strong foundation for later proficiency.

Overall, the findings from the second research question indicate that regular collocation-focused activities functioned as both a pedagogical tool for students and a professional development mechanism for instructors. On the one hand, students benefited in terms of vocabulary development, fluency, and motivation. On the other, instructors deepened their own awareness of collocations, critically reassessed their earlier practices, and articulated intentions to adopt a more systematic, contextually rich approach to collocation teaching. In this way, the study demonstrates that collocation-focused pedagogy serves not only to enhance learners' outcomes but also to recalibrate instructors' pedagogical orientations within TFSL.

5. CONCLUSION

The present study investigated collocation awareness and teaching practices among instructors of TFSL and examined the effect of regular collocation-focused activities on their instructional practices. Data were collected through semi-structured interviews and reflective journals to enable an in-depth qualitative analysis. The findings revealed that instructors often approached collocations in isolation rather than through integrated and contextually rich methods. Among the three participants, practices differed: one instructor incorporated collocation activities

almost daily, while the others did so more sporadically. Overall, participants expressed a shared recognition of the importance of collocation instruction for enhancing learners' fluency and accuracy. The implementation of collocation activities on a regular basis was further associated with observable improvements in learners' vocabulary development, communicative fluency, and motivation. At the same time, instructors highlighted the need for more systematic and structured approaches, reflecting on past shortcomings and expressing willingness to adopt more effective practices in the future.

Limitations and Implications for Future Research

While the present study yielded meaningful insights, it is not without limitations. As is typical in qualitative research, the results are not intended to be generalizable. Expanding the participant pool to include instructors from diverse institutional and educational contexts may provide a broader understanding of collocation instruction in Turkish language teaching. Furthermore, the current study focused on the short-term and immediate effects of collocation-oriented activities. Future research should address this limitation by investigating the long-term and sustained impact of such practices, as well as by engaging with larger and more varied participant populations.

The findings suggest that a standardized training program aimed at enhancing collocational awareness could significantly benefit instructors of TFSL. Further research is also needed to design a comprehensive instructional framework or guideline that incorporates a wide range of collocation-focused activities and is adaptable across different teaching contexts.

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Exploring the Integration of Corpus-Based Approach in Vocabulary Instruction in Thai EFL School Context: A Quantitative Report

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ABSTRACT

Concordance analysis has highlighted the value of electronic corpora in enhancing vocabulary acquisition in language education. However, the integration of the corpus-based approach into vocabulary instruction remains underexplored, especially for low-level EFL learners. Despite the potential benefits of the approach in vocabulary acquisition, it is unclear to what extent Thai EFL teachers have adopted this approach in their classroom practices. Guided by the TPACK framework, this article presents quantitative results from a survey designed to examine how EFL in-service teachers in Thai secondary schools incorporate corpus-based approach into their instruction. 138 secondary school teachers from Narathiwat province, Thailand, were selected through stratified sampling to participate in the study. Data were collected via questionnaires and analyzed.

The results showed that although Thai EFL teachers were aware of corpus tools for pedagogical use, they lacked comprehensive understanding of these tools and the corpus-based approach. This gap in knowledge hindered their ability to effectively integrate corpus methods into vocabulary instruction. The study highlighted challenges in classroom application and, through the lens of the TPACK framework, underscored the need for targeted professional development to enhance teachers' corpus literacy and competence in using corpus technology for vocabulary teaching in Thai school contexts.

Keywords: corpus-based approach, concordance, vocabulary instruction, TPACK, Thai EFL school context

1. Introduction

Vocabulary plays a central role in language education, serving as the foundation upon which all other language skills are built. A robust vocabulary is essential not only for constructing grammatically correct sentences but also for expressing ideas clearly and conveying meaning effectively (Bai, 2018). It promotes advancement in listening, speaking, reading, and writing by enabling learners to comprehend and produce language with greater fluency and accuracy (Huyen & Nga, 2003). Nation (2001) emphasizes the reciprocal relationship between vocabulary knowledge and language use, noting that a rich vocabulary enhances learners' ability to engage in meaningful communication. Furthermore, lexical knowledge is widely recognized as a key determinant of both language acquisition and communicative competence (Schmitt & Schmitt, 2020), making vocabulary instruction a vital component of any effective language education program.

For effective vocabulary instruction, language teachers should focus on three essential aspects: form, meaning, and use (Nation, 2001). Each of these components includes both receptive and productive dimensions of vocabulary acquisition. When instructors aim to enhance learners' vocabulary and phrase knowledge, supporting the development of these elements significantly contributes to learners' general vocabulary knowledge and usage. Several scholars have proposed various techniques to facilitate vocabulary learning, one of which is teaching vocabulary in rich, meaningful contexts (Celce-Murcia, 2001). Words embedded in context are more likely to be retained and understood by learners, making contextualized instruction a powerful strategy for vocabulary development.

The integration of digital technologies into educational environments has become increasingly widespread. Incorporating technology into teaching is now essential for educators, both to support effective learning and to foster students' 21st-century skills (Shafie et al., 2022). The advent of digital tools has significantly transformed professional practices across various domains, including education. Mishra and Koehler (2006) introduced the Technological Pedagogical Content Knowledge (TPACK) framework, for using technology to enhance teaching and learning processes. This framework assists teachers in selecting appropriate technologies that align with instructional content and pedagogical strategies (Lestari & Asari, 2022). Through technology integration,

educators can enhance their creativity in designing instructional materials, thereby increasing student motivation, engagement, and comprehension (Lestari & Asari, 2022).

In language education, particularly within the English as a Foreign Language (EFL) context, corpus tools represent an emerging technology with significant potential for pedagogical integration through corpus-based instruction. According to Flowerdew (2012), a corpus is a large, compiled set of authentic written or spoken language, stored electronically for analysis. Corpora expose learners to real-world language use and serve as valuable tools for enhancing EFL learners' ability to use language more naturally and accurately (Nakkaew, 2020). The use of corpus tools has gained increasing attention among educators and researchers, with applications in language teaching expanding rapidly. Moreover, language corpora have revolutionized dictionary compilation and significantly influenced the development of language teaching materials (O'Keeffe et al., 2007).

The effectiveness of corpus-based approach in vocabulary instruction has been well-documented in recent studies. Research by Siddiq et al. (2021), and Sinturat et al. (2022) demonstrates that corpus tools significantly enhance vocabulary learning by enabling learners to understand word meanings in varied contexts and retain vocabulary over extended periods. Additionally, Paker and Ergül-Özcan (2017) found that students held positive attitudes toward corpus-based vocabulary activities, with interview data highlighting their perceived benefits in supporting vocabulary acquisition. Collectively, these findings suggest that corpus-based instruction plays a valuable role in promoting vocabulary development, particularly in EFL settings, by allowing learners to get exposure to authentic language use and fostering deeper lexical understanding.

Despite growing attention to vocabulary instruction through corpus tools in EFL contexts, significant gaps remain in both pedagogical practices and teacher preparedness. Research indicates that many teachers lack confidence and clear strategies for effective vocabulary instruction, often relying heavily on textbooks or unsystematic materials that may not address the diverse needs of learners (Berne & Blachowicz, 2008; Fonghoi et al., 2019; Sangkapan et al., 2015). Students frequently struggle to acquire vocabulary due to ineffective instructional methods and limited exposure to authentic language use, particularly in contexts where English proficiency is low (Elmahdi & Hezam, 2020). Traditional approaches, such as grammar-translation and decontextualized word teaching, remain prevalent, limiting students' ability to infer meanings from context and apply vocabulary in real-life communication (Pookcharoen, 2007; Sun & Wang, 2003). Furthermore, there is insufficient evidence regarding the extent to which Thai EFL teachers utilize corpus tools alongside context-based strategies in vocabulary instruction, highlighting a critical need for further research and innovation in this area.

Previous studies indicate that while the corpus-based approach—particularly the concordance function within corpus tools—has been widely explored in university-level vocabulary instruction, their application in school-level EFL contexts, especially with low-level learners, remains underexplored (Li et al., 2025). It is unclear to what extent EFL teachers in secondary education are familiar with or effectively implement these tools in classroom practice. Moreover, the potential of corpus-based approach to enhance vocabulary acquisition in these settings has not been sufficiently examined. Existing research has also paid limited attention to the technological competencies of EFL teachers in integrating corpus tools into pedagogy. Few studies have investigated how Thai EFL teachers perceive, adopt, and adapt corpus tools in real teaching contexts, particularly in relation to their technological, pedagogical, and content knowledge and competencies. To address these gaps, this study adopts the TPACK framework to examine how corpus tools (technology), corpus-based instruction (pedagogy), and vocabulary teaching (content) intersect in Thai secondary school EFL classrooms.

These gaps present a valuable opportunity to expand the existing body of knowledge by investigating how corpus-based approach is integrated into vocabulary teaching practices in school contexts. By addressing this under-researched area, the current study contributes to a deeper understanding of how corpus tools can be operationalized in diverse educational settings, offering insights that inform teacher training, instructional design, and curriculum development. Ultimately, this research supports the broader call for innovative, data-driven methods in language education that align with the demands of 21st-century learning.

2. Purpose and Research Questions

To address the research gaps identified above, this article—part of a larger project—aims to report quantitative findings by investigating whether Thai EFL teachers integrate corpus-based approach into their vocabulary instruction, and to examine the extent and manner in which these approaches are applied in classroom practice. Based on this objective, the study is guided by the following research questions:

1. Do Thai EFL teachers integrate the corpus-based approach in vocabulary instruction?
2. To what extent do they implement the corpus-based approach in vocabulary teaching within the classroom?

3. Literature Reviews

3.1 TPACK in Language Learning

The concept of the Technological Pedagogical Content Knowledge (TPACK) framework by Koehler and Mishra (2009), highlights the complexities involved in integrating technology into teaching. As Information and Communication Technology (ICT) continues to evolve, technological integration has become a crucial component of educational transformation. The TPACK framework emphasizes the need for teachers to effectively incorporate digital tools—such as computers, software, and other technological resources—into their instructional practices. It encompasses not only the presentation and teaching of subject matter, but also the understanding of relevant theories and approaches, the productive use of technology, and the selection of appropriate instructional methods (Dietrich, 2018).

Research has highlighted the positive impact of the TPACK framework on pedagogical practices involving technology integration. Studies have shown that TPACK supports teachers in selecting appropriate technology-based educational activities and enhances classroom management (Lestari & Asari, 2022). Increasing attention has been given to its application in English language classrooms. For instance, Alamri and Awjah (2023) investigated Saudi EFL teachers' perceptions of TPACK in vocabulary instruction, revealing that it helps learners identify synonyms and antonyms, categorize vocabulary by parts of speech, understand meanings, and increase motivation in virtual environments. Their study found that teachers viewed TPACK positively for improving vocabulary learning. With ongoing advancements in ICT within the Saudi education system, EFL teachers are increasingly adopting TPACK-based approaches to engage students in language learning. As technology continues to evolve, future research is needed to explore the effective implementation of new pedagogical approaches across diverse learning contexts.

3.2 Corpus-Based Approach in Learning and Teaching Vocabulary

A corpus—a large, principled collection of authentic written or spoken language stored electronically for linguistic analysis (Flowerdew, 2012)—plays a vital role in language education by providing realistic examples of language use in various contexts (McEnery & Xiao, 2011). It also raises learners' awareness of target lexical items and accelerates vocabulary acquisition (Chapelle, 2003; Schmidt, 2001). One of the primary tools associated with corpus analysis is concordance, which serves as a key function for examining corpora. According to Gavioli (2005, p. 11), "A concordance is a list of occurrences (all or selected number) of a word or phrase in a corpus." Concordance lines display multiple instances of a searched word or phrase, allowing users to observe its usage in context. This display, often referred to as "Key Word in Context" (KWIC), enables learners to explore how a target word functions across different contexts (Cobb, 1999). The concordance function is capable of searching through extensive text collections and compiling all occurrences of specific words, phrases, or structures (Cobb, 1999).

Early research established the pedagogical value of concordance tools in language learning, particularly for vocabulary acquisition, collocation, grammar, and writing (Chapelle, 2003; Schmidt, 2001; Cobb, 1999). These tools enable learners to explore authentic language use through searchable corpora, enhancing lexical awareness and retention via contextualized input and wildcard search functions. Subsequent studies reinforced these findings. Boonyarattanasontorn et al. (2020) and Sinturat et al. (2022) demonstrated improvements in collocational knowledge and writing skills, respectively, while Daskalovska (2015) confirmed the effectiveness of corpus tools in developing verb-noun and verb-adverb lexical patterns. More recently, Siddiq et al. (2021) and Nontasee (2020) extended this line of inquiry to EFL contexts, showing that corpus-based instruction supports gradual vocabulary development and real-life usage. Notably, Nontasee emphasized the importance of incremental word knowledge, aligning with earlier cognitive models of vocabulary acquisition.

At the secondary education level, several studies have explored learners' attitudes toward corpus-based instruction. Jantarabang and Tachom (2021) reported that high school students responded positively toward corpus use and concordance lines, which supported their understanding of word meanings, spelling, and common phrases. These findings have led to recommendations for integrating corpus technology into core curricula to enhance vocabulary acquisition among English language learners. Additionally, the importance of contextual vocabulary learning is crucial for language learning. This perspective is supported by Siddiq et al. (2021), who assert that corpus-based vocabulary learning fosters deeper lexical understanding and is more engaging than traditional methods.

Despite these promising findings, several gaps remain. Much of the existing research has focused on higher education or advanced learners (Li et al., 2025), with limited exploration of how corpus-based approach can be adapted for younger or lower-proficiency students. Furthermore, although the TPACK framework offers a valuable model for integrating technology into pedagogy, more research is needed to understand how teachers can

be effectively trained to use corpus tools in diverse classroom settings. There is also a need for further investigation into how corpus tools can be tailored to meet the needs of varied learner populations, including younger students, those with lower English proficiency, and learners in different instructional and cultural contexts.

4. Research Methodology

4.1 Research Design

This study adopts a survey research design to explore whether Thai EFL teachers incorporate corpus-based approach into vocabulary instruction. As part of a larger mixed-methods project, this article specifically aims to examine the degree of implementation and identify the pedagogical practices through which the corpus-based approach is applied in classroom settings.

4.2 Participants and Research Context

This survey study involved 138 Thai EFL teachers from five secondary school zones in Narathiwat Province, Thailand. The sample size was determined using Cochran's (1977) formula, applying a 90% confidence level suitable for exploratory studies in educational contexts. Stratified random sampling was employed to ensure proportional representation of individuals with specific characteristics, thereby enhancing the accuracy and generalizability of the findings. This technique ensures that the sample reflects the broader population by including participants based on relevant demographic or professional traits (Creswell, 2009).

4.3 Instruments and Data Collection

As part of the larger project, this study employed a five-point Likert scale questionnaire to measure the extent to which Thai EFL teachers integrate the corpus-based approach into vocabulary instruction at the secondary education level. The Likert scale allowed participants to express their level of agreement or disagreement, ranging from "strongly disagree" to "strongly agree." To gain deeper insights into teachers' perceptions and experiences, an additional option—"0"—was included, enabling respondents to indicate lack of experience with corpus-based instruction. This design provided a more nuanced understanding of teachers' familiarity with and application of corpus tools in vocabulary teaching.

4.4 Data Analysis

To address the research questions, the quantitative data were analyzed using descriptive statistics, including percentages, means, and standard deviations. In alignment with the TPACK framework, the results were reported based on its seven core knowledge domains: Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical and Content Knowledge (TPACK). In this study, the TPACK framework is applied to examine the interaction among concordance features (technology), corpus-based instruction (pedagogy), and vocabulary knowledge (content), providing a comprehensive lens through which to interpret teachers' integration of corpus tools in the targeted EFL classrooms.

4.5 Ethical Considerations

This study adhered to established ethical standards and received approval from the Center for Social and Behavioral Science Instructional Review Board, Prince of Songkla University (IRB No. 2024-St-Libarts-025). The research was guided by main ethical principles, namely respect for individuals, beneficence, and justice. These principles were applied during data collection process through various measures such as obtaining informed and voluntary consent, safeguarding participants' right, and ensuring the privacy and confidentiality of all participant-related information.

5. Research Results

This study aims to investigate the integration of corpus-based approach in vocabulary instruction by Thai EFL teachers and to explore how these approaches are implemented in their teaching practices. To address the research questions, quantitative data were analyzed, and the TPACK framework was employed to examine the interaction among concordance features (technology), the corpus-based approach (pedagogy), and vocabulary teaching (content).

Based on Research Question 1—"Did Thai EFL teachers integrate the corpus-based approach in vocabulary instruction?"—the results indicated that although the majority of participants (73%) were aware of the approach, they lacked sufficient knowledge to implement it effectively in their teaching practices ($M = 2.58$, $SD = 1.10$). Approximately one-third of the teachers (27%) reported that they neither knew about nor used the corpus-based approach in vocabulary instruction, particularly through concordance features, as illustrated in Figure 1. These findings suggested that the corpus-based approach was relatively underrecognized and underutilized among Thai

EFL teachers.

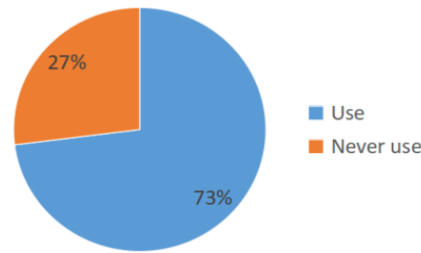


Figure 1. *Corpus awareness among Thai EFL teachers in vocabulary instruction*

To further explore the integration of corpus-based approach, Research Question 2 aimed to investigate the extent to which teachers implemented these approaches in vocabulary instruction within classroom practice. While the majority of teachers in this study were aware of corpus-based instruction, they demonstrated limited knowledge and experience in applying it effectively in school contexts. The following section presents the quantitative results based on the seven components of the TPACK framework.

Technological Knowledge (TK) – Concordance Function

Based on the quantitative data, the results showed a generally negative perception among respondents regarding their ability to use the concordance function. As presented in Table 1, the teachers expressed uncertainty about their ability to use concordance features to search for specific words, including using keywords or wildcard characters to specify variations ($M = 2.53$, $SD = 1.13$). The data also indicated that they disagreed with statements suggesting they could use concordance features to display vocabulary in various formats—such as showing keywords in context (Key Word in Context) or presenting word collocations ($M = 2.49$, $SD = 1.24$). Furthermore, they rarely guided students on how to use the concordance function ($M = 2.49$, $SD = 1.13$).

Table 1. *Teachers' Integration of Corpus-Based Approach in Vocabulary Instruction – Technological Knowledge*

Technological Knowledge	n	M	SD	Interpretation
I know how to use a concordance function to search for desired words, such as searching with a keyword or using a wildcard to specify special characters	137	2.53	1.13	Neutral
I can use concordance lines to display vocabulary in various ways, such as showing keywords with context (KWIC) or displaying word collocations	138	2.49	1.24	Disagree
I can guide students on how to use a concordance function	138	2.49	1.13	Disagree

Content Knowledge (CK) - Vocabulary

Among the elements of the TPACK framework, content knowledge—specifically vocabulary knowledge—was ranked highest in terms of teachers' self-perception. As shown in Table 2, the data indicated that teachers reported having comprehensive vocabulary knowledge, particularly in the areas of form and meaning, though less so in usage. They agreed that they possessed sufficient knowledge to teach students the meaning of vocabulary items and their meanings within sentences ($M = 3.82$, $SD = 0.83$). Additionally, they agreed that they had adequate knowledge to teach vocabulary form, including pronunciation, spelling, and morphological components such as roots, prefixes, and suffixes ($M = 3.59$, $SD = 0.88$). However, they expressed uncertainty regarding their ability to teach vocabulary usage in context, especially in relation to grammatical functions and common word collocations ($M = 3.48$, $SD = 0.91$).

Table 2. *Teachers' Integration of Corpus-Based Approach in Vocabulary Instruction – Content Knowledge*

Content Knowledge	n	M	SD	Interpretation
I have sufficient knowledge to teach students to understand the meaning of vocabulary and the meaning of words in sentences	138	3.82	0.83	Agree
I have sufficient knowledge of teaching English vocabulary in terms of form, such as pronunciation, spelling, and morphemes (root, prefixes, suffixes)	138	3.59	0.88	Agree
I have knowledge of teaching vocabulary usage in contexts related to the grammatical functions of words or	138	3.48	0.91	Neutral

phrases, as well as common word collocation

Pedagogical Knowledge (PK) - Corpus-based approach

According to the data presented in Table 3, the teachers expressed uncertainty regarding their pedagogical knowledge in adapting instruction to align with students' current understanding using a corpus-based approach ($M = 2.96$, $SD = 1.01$). They also reported uncertainty about how to effectively teach vocabulary through corpus-based methods ($M = 2.82$, $SD = 0.97$).

Table 3. *Teachers' Integration of Corpus-Based Approach in Vocabulary Instruction – Pedagogical Knowledge*

Pedagogical Knowledge	n	M	SD	Interpretation
I can adapt my teaching to align with students' current understanding by using a corpus-based approach	138	2.96	1.01	Neutral
I know how to teach using a corpus-based approach	138	2.82	0.97	Neutral

When examining the combination of two elements within the TPACK framework, the teachers reported a lack of experience in implementing the corpus-based approach in vocabulary instruction and in using concordance outputs effectively. The data are presented as follows.

Pedagogical Content Knowledge (PCK)

As shown in Table 4, when it came to the integration of corpus-based approach with vocabulary instruction, the data revealed that teachers expressed uncertainty and lacked sufficient knowledge in applying these methods. Specifically, they were unsure about how to use the corpus-based approach to help students learn vocabulary form ($M = 2.89$, $SD = 0.93$), understand word meanings ($M = 2.88$, $SD = 0.95$), prepare activities to enhance vocabulary knowledge ($M = 2.87$, $SD = 0.98$), and guide students in using vocabulary correctly in sentences to convey meaning accurately ($M = 2.85$, $SD = 0.96$).

Table 4. *Teachers' Integration of Corpus-Based Approach in Vocabulary Instruction – Pedagogical Content Knowledge*

Pedagogical Content Knowledge	n	M	SD	Interpretation
I can apply a corpus-based approach to help students learn about form.	138	2.89	0.93	Neutral
I can apply a corpus-based approach to help students learn the meaning of vocabulary	138	2.88	0.95	Neutral
I can prepare activities using a corpus-based approach to enhance vocabulary knowledge	138	2.87	0.98	Neutral
I can apply a corpus-based approach to help students learn how to use vocabulary correctly in sentences and convey meaning accurately	138	2.85	0.96	Neutral

Technological Content Knowledge (TCK)

With regard to the use of the concordance function in vocabulary instruction, the teachers demonstrated limited knowledge and experience in this area. As shown in Table 5, the findings revealed that teachers occasionally employed concordance-based activities to illustrate vocabulary usage across various contexts ($M = 2.68$, $SD = 1.21$). Furthermore, they expressed uncertainty about implementing instructional activities focused on word forms, including pronunciation, spelling, and morphological components such as roots, prefixes, and suffixes ($M = 2.67$, $SD = 1.17$). This uncertainty extended to teaching strategies aimed at helping students comprehend word meanings both at the lexical level and within sentence contexts ($M = 2.63$, $SD = 1.13$), as well as enhancing vocabulary instruction in diverse communicative settings ($M = 2.61$, $SD = 1.06$).

Table 5. *Teachers' Integration of Corpus-Based Approach in Vocabulary Instruction – Technological Content Knowledge*

Technological Content Knowledge	n	M	SD	Interpretation
I can use the concordance function with activities to teach the usage of vocabulary in different contexts	138	2.68	1.21	Neutral
I can use the concordance function with vocabulary teaching activities focused on form, such as pronunciation, spelling, and morphemes (root, prefixes, suffixes)	138	2.67	1.17	Neutral
I can use the concordance function with vocabulary teaching activities to help students understand the	138	2.63	1.13	Neutral

meaning of words, both at the word level and when they appear in sentences

I can use the concordance function to enhance the teaching and learning of English vocabulary in different contexts	137	2.61	1.06	Neutral
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Technological Pedagogical Knowledge (TPK)

Table 6 illustrates that the teachers exhibited uncertainty regarding their knowledge and experience in applying the corpus-based approach through the concordance function. They reported occasionally encouraging students to utilize the concordance function and corpus-based methods to support English language learning ($M = 2.80$, $SD = 1.22$), and to promote accurate language use ($M = 2.74$, $SD = 1.13$). These findings suggest a general unfamiliarity with the implementation of corpus-based instructional strategies.

Table 6. *Teachers' Integration of Corpus-Based Approach in Vocabulary Instruction – Technological Pedagogical Knowledge*

Technological Pedagogical Knowledge	n	M	SD	Interpretation
I encourage students to use the concordance function and a corpus-based approach to learn English.	138	2.80	1.22	Neutral
I can use the concordance function and a corpus-based approach to help students use language correctly	138	2.74	1.13	Neutral

6. Discussion

This study investigated Thai EFL teachers' integration of the corpus-based approach into vocabulary instruction at the secondary education level in a southern province of Thailand, using the TPACK framework as an analytical lens. The overall findings revealed that the teachers were generally uncertain about their knowledge and ability to effectively incorporate corpus-based methods into classroom vocabulary teaching, particularly with the concordance feature. While they expressed positive perceptions regarding teaching word forms and meanings, they demonstrated less confidence in guiding low-level students on how to apply vocabulary in real-life communicative contexts.

The results indicated that Thai EFL teachers' uncertainty in integrating corpus-based vocabulary instruction was largely due to limited corpus literacy and a lack of pedagogical integration skills. This mirrors international research (Leńko-Szymańska, 2015; Oktavianti et al., 2022), which identifies unfamiliarity and technical constraints as common barriers. Eslek-Onur and Tosun (2023) similarly report low corpus proficiency among EFL teachers, with no correlation to teaching experience—suggesting that access alone does not ensure pedagogical use.

Despite awareness of corpus tools, Thai EFL teachers in this study had not incorporated them into vocabulary instruction, suggesting a gap in Technological Pedagogical Knowledge (TPK) as framed by the TPACK model. This highlights the need for targeted teacher training that goes beyond technical access to focus on pedagogically meaningful integration of corpus tools. Without such support, teachers may resist or lack confidence in adopting corpus-based approaches, limiting opportunities for contextualized and learner-centered vocabulary learning.

The limited adoption of corpus-based instruction in the studied context reflects both pedagogical and technical constraints, including insufficient professional development and restricted access to corpus tools. This reliance on traditional vocabulary teaching methods inhibits innovation and deprives learners of exposure to authentic, contextualized language use, as emphasized by Klungthong and Wasanasomsithi (2024). From a TPACK perspective, the gap lies in teachers' underdeveloped Technological Pedagogical Knowledge—the ability to integrate technology (TK) meaningfully into vocabulary instruction (PK). Without targeted training that bridges content, pedagogy, and technology, educators are unlikely to explore concordance tools or corpus-informed strategies that enhance vocabulary acquisition and communicative competence (Schmitt & Schmitt, 2020). To address this, teacher education programs must prioritize TPACK-aligned professional development, equipping Thai EFL teachers with the skills to leverage corpus tools as part of a broader shift toward data-driven, context-rich language teaching.

The results of the present study indicated that Content Knowledge (CK) was rated highest among the three TPACK domains, surpassing both Technological Knowledge (TK) and Pedagogical Knowledge (PK). This suggests that while Thai EFL teachers possess strong foundational knowledge of vocabulary content, they exhibit lower proficiency in integrating technological tools—such as concordance features within corpus tools or the broader corpus-based approach—into their instructional practices. Quantitative data further indicate that teachers are more confident in their understanding of vocabulary, particularly in relation to word forms and meanings. They

demonstrated adequate knowledge in teaching vocabulary forms, including pronunciation, spelling, and morphological components such as roots, prefixes, and suffixes. Moreover, they expressed confidence in guiding students to comprehend word meanings and their contextual usage within sentences.

These results are consistent with Pookcharoen (2007), who reported that Thai EFL teachers continue to rely on traditional vocabulary teaching methods, such as the grammar-translation approach. Instruction in Thai school contexts remains largely decontextualized, with vocabulary often taught in isolation rather than through strategies that promote contextual understanding. This presents challenges in supporting EFL learners to acquire vocabulary in rich and meaningful contexts, as emphasized by several scholars (Celce-Murcia, 2001).

The negative perception surrounding the implementation of the corpus-based approach in vocabulary instruction—particularly through the use of the concordance feature—may reflect limited exposure to this technology, insufficient training opportunities supported by educational institutions or national policy, and the perceived complexity of integrating such tools into classroom practice, as noted by Li et al (2025). These factors suggest that teachers may either undervalue the potential benefits of the corpus-based approach or encounter significant challenges in its application. This interpretation warrants further investigation to better understand the underlying causes and contributing factors behind these negative perceptions.

7. Conclusion

This study found that Thai EFL teachers hold a neutral stance toward understanding and applying corpus-based vocabulary instruction, highlighting key pedagogical challenges. The results underscore the need for targeted professional development to build teachers' skills and confidence in using corpus tools—especially concordancers—in school-based vocabulary teaching.

To contextualize these findings, the study situates the challenges within Thai secondary schools, where corpus-based instruction is still rare. Unlike higher education settings abroad, Thai teachers work within a traditionally structured curriculum with limited exposure to digital tools. This gap reflects a lack of Technological Pedagogical Knowledge (TPK), as outlined in the TPACK framework, emphasizing the need for localized training that supports meaningful integration of corpus-based methods.

However, the scope of this study was limited to secondary school English teachers in Narathiwat province, Thailand. To gain a more comprehensive understanding of the integration of corpus-based instruction, future research should consider expanding the sample to include a wider range of educational settings and participant groups. Such expansion would provide deeper insights into the broader applicability and impact of corpus-based approach in diverse EFL contexts. Although this study is limited to a specific area within Narathiwat province, its findings may be relevant to other regions with comparable cultural, socioeconomic, and educational contexts. However, due to significant regional differences across Thailand, the results may not be fully generalizable. This underscores the need for further research to examine how these findings can be adapted to diverse educational settings nationwide or a longitudinal study to see how the findings might change over time or across different policy environments. Such efforts would strengthen the validity of the conclusions and offer more comprehensive insights into policymaking and educational practice at both regional and national levels.

The implications of this study highlight that by meditating corpus tools as emerging technology to support professional development for EFL teachers, it is essential to conceptualize the use of technology through the mediation of cognition, the expansion of learning design opportunities within appropriate educational contexts, and the stimulation of reflective practice regarding its implementation (Jou et al., 2025). A key policy priority for Thai school directors and the Ministry of Education should be to improve access to corpus resources and provide targeted teacher training. Professional development programs should revise their curricula to align with 21st-century skills by incorporating corpus literacy training. This would support the effective integration of technology, pedagogy, and content knowledge, moving beyond mere access toward meaningful pedagogical application. This current study contributes to the body of knowledge in technology-enhanced language learning through the TPACK framework that the use of corpus-based approach calls for making use of the context of authentic language learning in the classroom, especially for young EFL learners.

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Integrating Generative AI in Teacher Education: A Qualitative Exploration of TPACK Growth and Critical Reflection

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Abstract

This study investigates how generative AI technologies influence pre-service teachers' pedagogical thinking and instructional design practices within a vocational education context. Drawing on a qualitative framework, the research engaged students in a task-based learning environment that integrated tools such as ChatGPT and image generators into authentic teaching design tasks. Data were collected through reflective journals, interviews, and teaching artifacts.

Thematic analysis revealed three core trajectories of professional growth: (1) a shift from uncertainty to confidence in using AI tools; (2) the situated development of TPACK through iterative design and reflection; and (3) the emergence of critical awareness regarding AI ethics, accuracy, and bias. Students not only explored how AI could support their instructional creativity, but also expressed concerns about content reliability and the limitations of automated outputs. Their reflections illustrated an evolving understanding of AI not just as a tool, but as a co-participant in instructional reasoning.

The findings suggest that meaningful integration of generative AI requires more than technical training; it calls for pedagogical framing, ethical discourse, and reflective space. Teacher education programs must therefore cultivate not only AI fluency, but also critical and adaptive instructional mindsets capable of navigating the complexities of AI-supported teaching.

Keywords: Generative AI, TPACK, Pre-Service Teachers, Critical Reflection, Vocational Education, Instructional Design

1. Research Background and Rationale

The rapid advancement of generative artificial intelligence (AI) tools—such as ChatGPT, DALL·E, and other content generation systems—has introduced new possibilities and tensions in teacher education. While such technologies offer novel forms of instructional support, they also challenge pre-service teachers to rethink the roles of creativity, authorship, and judgment in designing learning experiences. In vocational education contexts, where instructional precision and applied problem-solving are crucial, these tensions become even more pronounced.

Pre-service teachers, often lacking extensive teaching experience, may struggle to make informed, pedagogically sound decisions when confronted with powerful yet opaque AI tools. Traditional teacher training programs tend to emphasize technological fluency or tool functionality, yet seldom provide the reflective space needed to critically interpret AI-generated outputs or ethically navigate their use in educational settings.

This study emerges from the need to better understand not just *how* pre-service teachers use generative AI in instructional tasks, but *how they make sense of it*. Rather than treating AI as a neutral aid, the study conceptualizes it as a co-actor in the instructional design process—one that mediates teacher cognition, amplifies design possibilities, and provokes reflection. By situating the research in an authentic, task-based learning environment, this study aims to explore the following:

- How do pre-service teachers experience the integration of generative AI tools into their instructional design practices?
- In what ways does AI use influence their development of TPACK-related thinking and teaching identity?
- What challenges, tensions, and ethical reflections arise in the process of using AI to solve authentic pedagogical problems?

In addressing these questions, this study contributes to a growing body of scholarship calling for critical, experience-based approaches to AI in education—ones that honor the complexity of teaching, and the evolving identity of teachers as designers, evaluators, and ethical agents in AI-supported classrooms.

2. Literature Review

2.1 TPACK as Situated Knowledge Construction

The Technological Pedagogical Content Knowledge (TPACK) framework has long been used to conceptualize how teachers integrate technology into subject-specific instruction. Originally proposed by Mishra and Koehler (2006), TPACK emphasizes the dynamic interaction between technological, pedagogical, and content knowledge. However, recent scholarship suggests that TPACK is not merely a static knowledge set but a contextualized and situated form of professional reasoning that unfolds through practice, negotiation, and reflection (Chai, Koh, & Tsai, 2013).

In vocational education, this situated nature becomes especially salient. Pre-service teachers must navigate highly specialized content, practical problem-solving, and the demands of instructional clarity. Yet, due to limited teaching experience, many struggle to enact TPACK in a purposeful and reflective manner. Studies have shown that meaningful TPACK development requires engagement in authentic teaching tasks, where technology is not taught in isolation but embedded within pedagogical decision-making processes (Angeli & Valanides, 2009).

This study builds on this perspective by framing TPACK not as a competence to be measured, but as a developmental trajectory revealed through how teachers talk about, justify, and reflect on their instructional choices—particularly when interacting with emergent technologies like generative AI.

2.2 Generative AI as Pedagogical Mediator and Ethical Disruptor

Generative AI tools—capable of producing text, images, code, and assessment content—are increasingly seen as promising supports for lesson design (Xie et al., 2023). For novice teachers, these tools offer accessible scaffolds for planning, visualization, and language refinement (Lo, 2023). However, researchers have raised critical concerns about the opacity, bias, and reliability of AI-generated content. AI systems often lack domain precision and may embed cultural or gendered stereotypes due to limitations in their training data (Floridi & Chiriatti, 2020). More importantly, the process of interacting with AI itself becomes pedagogically consequential. Rather than simply enhancing productivity, AI tools shape how pre-service teachers frame instructional problems, imagine teaching scenarios, and construct knowledge. Holmes et al. (2022) suggest that AI may function as an “external cognitive agent,” with the power to both extend and distort human reasoning. This calls for educators to approach AI not just as a tool, but as a pedagogical co-participant—one that requires interpretation, critique, and discernment.

In response, recent literature advocates for embedding AI ethics and critical AI literacy into teacher education. Students must learn to ask: *What does the AI assume? Whose knowledge is being represented? How might these outputs shape learner understanding?* (Zawacki-Richter et al., 2019). These are not technical questions, but deeply pedagogical ones, and they must be addressed through dialogic, reflective instructional design experiences.

2.3 Self-Efficacy and Reflective Growth in AI-Supported Learning

Bandura’s (1997) concept of self-efficacy offers a valuable lens to understand how pre-service teachers develop confidence in technology-mediated teaching. Self-efficacy arises not only from mastery experiences, but also from vicarious observation, social feedback, and emotional regulation. In the context of AI-supported instruction, efficacy is shaped by how students interpret their successes and failures when using unfamiliar tools in high-stakes learning design tasks (Teo, 2011).

However, elevated confidence in using AI does not always equate to pedagogical soundness. Research warns of the risk of overconfidence or uncritical dependence when students are not trained to evaluate or contextualize AI outputs (Lo, 2023). Therefore, self-efficacy in AI contexts must be developed alongside critical reflection, dialogic learning, and iterative redesign—practices more commonly found in qualitative, narrative-rich teacher education models.

This study thus positions self-efficacy not merely as a belief state, but as an emergent construct, visible through the language, struggles, and adaptive strategies students employ as they learn to use AI reflectively and responsibly in their teaching practice.

3. Instructional Design and Course Implementation

The instructional intervention in this study was grounded in a task-based learning (TBL) framework, designed not merely to teach pre-service teachers how to operate generative AI tools, but to immerse them in reflective, authentic experiences of instructional design. The goal was to cultivate both technical fluency and critical pedagogical reasoning within a situated, vocational education context.

3.1 Course Structure and Pedagogical Philosophy

The course was structured around the principle that teachers learn best by designing for real learners. Over a fifteen-week period, students were tasked with developing complete instructional units for vocational subjects (e.g., mechanical engineering, applied design, electronics), with generative AI used as a support rather than a directive force. Students were encouraged to make autonomous decisions about when, how, and why to incorporate AI-generated content into their lesson plans, materials, and assessments.

Each week introduced a new design challenge, accompanied by reflective prompts that asked students to evaluate their choices, difficulties, and discoveries. The learning environment emphasized creative experimentation, peer dialogue, and iterative revision.

3.2 Learning Phases and Activities

The course unfolded in three interrelated phases, each designed to scaffold both knowledge construction and reflective insight:

Phase 1: Exploration and Critical Familiarization

Students were introduced to a range of generative AI tools (e.g., ChatGPT for text generation, Bing Image Creator for visual design, and AI-based quiz generators). Rather than focusing solely on functionality, the instruction emphasized critical exploration: What kinds of knowledge can these tools generate? What do they obscure? Where might they mislead?

Students engaged in hands-on experiments with prompts, followed by group discussions about bias, accuracy, tone, and instructional applicability.

Phase 2: Design-in-Action

Each student selected a vocational topic and began constructing an instructional unit. AI tools were used to support:

- Drafting instructional goals and outlines,
- Generating teaching texts and diagrams,
- Designing formative assessment items.

However, students were explicitly encouraged to critique, adapt, or discard AI outputs as needed. This phase emphasized *productive struggle*—allowing students to encounter breakdowns, confront uncertainty, and engage in pedagogical decision-making.

Phase 3: Reflection and Iterative Redesign

Throughout the course, students maintained reflective journals, documenting their evolving beliefs, challenges, and strategies. Weekly peer review sessions were held, where students presented their AI-enhanced designs, received feedback, and discussed ethical or practical tensions encountered.

By the end of the course, each student submitted a comprehensive teaching unit along with a reflective narrative analyzing their use of AI, their reasoning behind instructional decisions, and their evolving understanding of technology's role in pedagogy.

3.3 Role of the Instructor

The instructor acted as a facilitator and provocateur, guiding students to not only use tools effectively, but to ask difficult pedagogical questions. When students struggled with AI-generated inaccuracies or ambiguous outputs, the instructor prompted deeper analysis:

- *What is this tool assuming about learners?*
- *How might this image reinforce stereotypes?*
- *Could this response mislead students?*

Rather than correcting students directly, the instructor modeled critical inquiry and design thinking, aligning with the course's broader goal of fostering adaptive, ethically aware teaching mindsets.

4. Research Methodology

4.1 Research Design

This study adopted a qualitative research design grounded in a phenomenological approach to explore how pre-service teachers construct their TPACK competencies and develop AI self-efficacy through the integration of generative AI tools in authentic instructional design tasks. By focusing on participants' lived experiences, the study aimed to understand how AI use shapes their pedagogical reasoning, instructional strategies, and reflective practices.

4.2 Participants and Context

The participants were 18 pre-service teachers enrolled in a vocational teacher education course at a university in Taiwan. The course was structured around a task-based learning model that required students to design a complete instructional unit with the aid of generative AI tools (e.g., ChatGPT, Bing Image Creator, AI quiz generators).

4.3 Data Collection

Multiple data sources were used to ensure credibility and triangulation:

- Reflective journals: Participants documented their experiences, challenges, and learning insights throughout the course.
- Teaching artifacts: Lesson plans, instructional materials, and AI-generated content served as evidence of instructional decision-making.
- Semi-structured interviews: Conducted with 12 representative participants to explore deeper perspectives on AI integration, instructional reasoning, and perceived growth.

4.4 Data Analysis

Thematic analysis was conducted following Braun and Clarke's (2006) six-phase process:

- (1). Familiarization with the data;
- (2). Generation of initial codes;
- (3). Searching for themes;
- (4). Reviewing themes;
- (5). Defining and naming themes;
- (6). Producing the report.

Coding was performed manually and iteratively. Three overarching themes and eight subthemes were identified to represent the trajectory of TPACK development and AI self-efficacy transformation.

5. Research Findings

Thematic analysis of reflective journals, interview transcripts, and teaching artifacts revealed three overarching themes that capture how pre-service teachers engaged with generative AI tools during instructional design. These themes illustrate a developmental trajectory from initial uncertainty toward empowered use, while also uncovering emergent tensions around ethics, content credibility, and professional identity.

5.1 Theme 1: From Tool Confusion to Pedagogical Confidence

5.1.1 Initial Uncertainty and Functional Struggles

Many students began the course with limited experience using generative AI. Early reflections expressed confusion, hesitance, and even frustration:

"I didn't know how to phrase my prompt. I asked it to make a quiz, but the questions didn't make sense for my topic."

(Participant C, Journal)

This unfamiliarity often led to reliance on default prompts or superficial applications of AI-generated outputs.

5.1.2 Confidence Through Iterative Design

As students engaged in repeated cycles of trial, critique, and refinement, they gradually developed confidence—not only in operating AI tools, but in deciding when and how to use them effectively:

"At first I used everything it gave me. But later, I started thinking like a teacher: 'Is this really what I want my students to learn?'"

(Participant L, Interview)

This transformation reflects a shift from passive tool usage to active instructional reasoning, marking an important phase in pedagogical growth.

5.2 Theme 2: Constructing Situated TPACK Through AI-Enhanced Tasks

5.2.1 Aligning Technology with Pedagogical Purpose

Students began recognizing that AI-generated content needed to be filtered through pedagogical intent:

“ChatGPT gave me a nice explanation, but I had to simplify it and add a visual so vocational students could understand.”

(Participant A, Journal)

This illustrates the development of Technological Pedagogical Knowledge (TPK) in context—where teachers mediate between content, tools, and learners’ needs.

5.2.2 Deepening Content Representations (TCK)

In designing materials for vocational subjects, students used AI to generate illustrations or analogies that clarified abstract or mechanical concepts. However, they often felt the need to correct or contextualize the outputs:

“The diagram looked polished, but the labeling was wrong. I had to edit it to match the actual machine structure.”

(Participant F, Interview)

These moments reveal emerging Technological Content Knowledge (TCK), where students combine disciplinary accuracy with multimodal presentation.

5.3 Theme 3: Emerging Critical AI Literacy and Ethical Reflection

5.3.1 Questioning the Reliability of AI Outputs

While students appreciated the efficiency of AI tools, many expressed growing skepticism regarding accuracy and content validity:

“Sometimes it sounds confident but is actually wrong. I learned to double-check everything before using it in class.”

(Participant D, Interview)

This cautious stance signified the beginnings of critical AI literacy, as students became more discerning evaluators rather than passive adopters.

5.3.2 Ethical Tensions and Representational Concerns

Several students raised ethical concerns about authorship and bias:

“The AI created a teaching story, but I felt uncomfortable—who owns it? Can I really say it’s mine?”

(Participant K, Journal)

Others noticed stereotypical representations in AI-generated visuals:

“Most images showed men as engineers and women as assistants. I had to modify them to avoid reinforcing bias.”

(Participant G, Interview)

These reflections indicate an evolving ethical awareness and a sense of responsibility toward inclusive and authentic educational representation.

5.4 Cross-Theme Synthesis: Becoming Reflective Instructional Designers

Across all themes, a consistent pattern emerged: students became more reflective, adaptive, and pedagogically intentional over time. They learned not just to use AI tools, but to interrogate them—to understand their affordances and limitations within specific teaching contexts:

“It’s not about whether AI is good or bad. It’s about how I, as a teacher, choose to use it—and why.”

(Participant M, Final Reflection)

This evolving mindset aligns with the goals of teacher education in the digital age: to cultivate educators who are not only technologically capable, but critically aware, ethically grounded, and professionally self-directed.

6. Conclusion and Recommendations

6.1 Summary of Findings

This study explored how pre-service vocational teachers engaged with generative AI tools during a task-based instructional design course. Drawing on thematic analysis of reflective journals, interviews, and instructional artifacts, the findings reveal three key trajectories of learning and professional growth:

- (1). From Tool Confusion to Pedagogical Confidence: Students initially struggled with prompt formulation and AI tool usage. However, through iterative experimentation and peer-supported reflection, they gradually developed confidence in using AI as a purposeful aid in teaching design.
- (2). Situated Construction of TPACK: As students worked on authentic instructional tasks, they deepened their understanding of how technology intersects with pedagogy and content. Generative AI facilitated practical engagement with TPK and TCK, helping students internalize TPACK as a responsive framework rather than a static model.
- (3). Emerging Critical AI Literacy and Ethical Awareness: Students became increasingly aware of issues related to content accuracy, algorithmic bias, and authorship. They expressed concern over stereotypical representations, questionable content credibility, and the ethical implications of using AI-generated materials in education.

6.2 Implications for Teacher Education

The findings underscore the need for a more reflective and ethically grounded approach to integrating AI in teacher education:

- Embed AI Use Within Authentic, Task-Based Contexts: Rather than teaching AI tools in isolation, they should be embedded in meaningful instructional design scenarios that require pedagogical reasoning and contextual decision-making.
- Emphasize Reflective Practice: Structured opportunities for self-reflection, peer feedback, and lesson redesign enable students to connect AI use with deeper insights into their teaching beliefs and design intentions.
- Integrate AI Ethics and Prompt Literacy into Core Curricula: Teacher preparation programs should systematically address AI-related issues such as bias detection, source transparency, and intellectual authorship, alongside developing skills in prompt design and content evaluation.

6.3 Recommendations for Future Research and Curriculum Design

- (1). Broaden the Research Scope Across Contexts: Future studies can explore how AI-supported instructional design is experienced across general education disciplines and different stages of teacher development.
- (2). Develop Scaffolded AI-TPACK Design Modules: Create progressive design templates and instructional materials that guide novice teachers from basic AI tool usage toward sophisticated, context-aware integration.
- (3). Foster AI-Pedagogy Co-Design Communities: Establish communities of practice where pre-service teachers collaboratively explore, critique, and share AI-enhanced instructional strategies, fostering innovation through shared reflection.

6.4 Concluding Remarks

Generative AI offers powerful opportunities for teacher growth, but only when its use is embedded within pedagogically meaningful, ethically conscious, and reflective practices. This study demonstrates that pre-service teachers can evolve from tentative users to critically engaged designers through situated, AI-supported experiences. As the role of AI in education continues to expand, teacher education must prepare future educators not only to use these tools, but to do so with discernment, creativity, and professional responsibility.

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The Effects of Augmented Reality Technology on Learning Achievement of First-Year University Students in China

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ABSTRACT

This study examined the impact of Augmented Reality (AR) technology on learning achievement among first-year university students in safety education contexts within a Chinese higher education setting. The research employed a one-group pretest-posttest pre-experimental design involving 30 first-year university students during the first semester of the 2025 academic year. Participants were systematically selected through cluster sampling methodology from a public university in China. Research instruments comprised specially designed AR technology-enhanced lesson plans focused on safety education content and a validated learning achievement assessment instrument with established psychometric properties, including demonstrated reliability and validity measures. Data analysis procedures employed both descriptive statistical analyses (means and standard deviations) and inferential statistical methods (paired samples t-test) to examine differences between pre-intervention and post-intervention learning achievement outcomes. Results demonstrated that students' learning achievement following AR-enhanced instructional delivery was statistically significantly higher compared to pre-intervention baseline levels ($p < .001$). The findings indicate that learning activities systematically incorporating Augmented Reality technology demonstrated substantial educational efficacy in enhancing students' learning achievement in safety education, suggesting practically meaningful and educationally significant improvements in learning outcomes. These empirical results contribute meaningfully to the expanding body of research evidence supporting the strategic integration of AR technology within higher education pedagogical frameworks and provide valuable implications for curriculum designers and educational practitioners seeking to enhance student learning outcomes through innovative technological interventions in safety education contexts.

Keywords: augmented reality technology, educational technology, learning achievement, safety education, higher education

INTRODUCTION

In the rapidly evolving landscape of higher education, the critical importance of campus safety and effective safety management has become increasingly apparent. A secure campus environment that facilitates normal educational activities and harmonious interpersonal interactions serves as the foundation for all forms of quality education and institutional administration. This imperative is particularly pronounced in the context of contemporary universities, where the rapid expansion of educational institutions has introduced multifaceted challenges in campus safety management. The increasing enrollment of students, coupled with the complexities inherent in modern societal issues, has contributed to a notable rise in safety-related incidents on university campuses, thereby underscoring the urgent need for more effective safety education and comprehensive management strategies (Xiong et al., 2024).

Contemporary campus safety incidents, including fires, violence, and online fraud, have occurred with increasing frequency, posing serious threats to students' physical safety and psychological well-being while generating significant reputational consequences for educational institutions (Jiang & Xiao, 2024). These developments underscore the urgent need to address fundamental pedagogical challenges in campus safety education, which include persistently low student engagement, limited opportunities for practical skill application, and inadequate simulation of realistic risk scenarios (Xiong et al., 2024). Traditional lecture-based instructional approaches have demonstrated substantial limitations, with empirical evidence indicating that 68% of university students fail to demonstrate proper fire extinguisher operation following conventional safety training programs (Li et al., 2024).

The contemporary information age has intensified these challenges by introducing complex safety risks that extend beyond traditional campus boundaries to encompass digital environments. Traditional safety education methodologies have proven inadequate in preventing and mitigating these evolving safety risks effectively, necessitating comprehensive reform in educational approaches. Effective campus safety requires integrated strategies that combine systematic educational initiatives with administrative reforms, encompassing personal responsibility frameworks, enhanced regulatory guidelines, and optimized technological infrastructure (Dong, 2023).

Comprehensive safety education serves multiple critical functions through both individual and institutional dimensions. Well-designed programs enable students to develop enhanced self-protection capabilities, recognize dangerous situations, and contribute to measurable reductions in campus criminal activities while fostering legal awareness and ethical reasoning capabilities (Li et al., 2024). This integrated model extends beyond immediate security outcomes to encompass broader educational and developmental objectives, facilitating the establishment of sound value systems that contribute to cultivating civilized campus communities and ensuring that university students achieve comprehensive development within safe environments supporting their overall well-being and educational success.

Augmented Reality (AR) technology has fundamentally transformed pedagogical approaches by providing intuitive, real-time interactive learning experiences that transcend the limitations of traditional instructional methodologies. AR technology enhances practical skill development by enabling students to engage in immersive virtual environments that simulate real-world scenarios, particularly benefiting fire safety education contexts. This technological innovation allows students to practice evacuation procedures and emergency response protocols without exposure to actual hazards or risks that might occur during conventional hands-on training exercises. The implementation of AR technology in safety education offers significant pedagogical advantages through its user-friendly interface and versatile application in learning management systems. This innovative approach effectively stimulates student engagement and facilitates enhanced comprehension of essential safety concepts, thereby contributing to improved learning outcomes and knowledge retention. The interactive nature of AR-based instruction promotes active participation and deeper understanding of complex safety procedures, making it particularly valuable for developing critical emergency response competencies among students (Md Shamsudin et al., 2023).

Despite the promising potential of Augmented Reality (AR) technology in educational contexts, several significant barriers impede its widespread implementation in higher education settings. The primary challenges include the substantial financial investment required for AR equipment procurement and the insufficient digital competencies among educators regarding AR technology utilization (Barroso Osuna et al., 2019; Perifanou et al., 2022). These technological and human resource constraints represent fundamental obstacles to effective AR integration in academic environments.

Furthermore, educational institutions face considerable difficulties in developing appropriate content frameworks and establishing comprehensive guidelines for implementing AR technology within complex curricular structures. Current approaches to AR integration often prioritize learner-centered pedagogical methodologies over systematic technological implementation strategies, creating a disconnect between educational objectives and technological capabilities (De Lima et al., 2022). This emphasis on learner-centered approaches, while pedagogically sound, may inadvertently overlook the technical infrastructure and instructional design considerations essential for successful AR deployment in educational settings.

This study investigates the impact of Augmented Reality (AR) technology on the learning achievement of first-year university students in safety education contexts, contributing to the ongoing scholarly discourse on enhancing educational outcomes through innovative pedagogical technologies. By integrating virtual content with real-world environments, AR technology enables realistic emergency scenario simulations, including fire safety protocols, hazard recognition, and emergency response procedures, allowing students to practice critical safety competencies within controlled learning environments while improving situational awareness and emergency preparedness skills.

AR technology enhances learning achievement by fostering student engagement, promoting knowledge retention, and developing critical thinking capabilities essential for effective safety decision-making. The study's findings will provide valuable empirical insights into the utilization of AR technology for creating academically enriching and pedagogically effective learning environments in higher education safety education programs.

LITERATURE REVIEW

This section presents a comprehensive examination of scholarly literature pertaining to the implementation of Augmented Reality (AR) technology in educational contexts and its effects on student learning achievement. The review encompasses theoretical foundations of AR-enhanced learning, empirical evidence of educational efficacy, current applications in safety education, and implementation challenges within higher education settings. The literature synthesis provides the conceptual framework for investigating AR technology's impact on learning outcomes among university students in safety education contexts.

Importance of Safety Curriculum

University students occupy a critical developmental position as they transition from academic environments to broader societal roles, making comprehensive safety education particularly vital for their successful integration into society. Safety education serves as a fundamental requirement for adapting to social development, ensuring personal security, and promoting holistic growth while establishing appropriate safety consciousness and enhancing self-protection competencies (Li et al., 2024). This educational foundation enables students to effectively prevent and respond to diverse safety risks, contribute to institutional stability, and develop the crisis response capabilities essential for academic achievement and personal development.

Contemporary safety education encompasses both traditional safety concerns and emerging digital-age challenges, including cyber threats and psychological vulnerabilities that students encounter in the information era. Beyond safeguarding physical health, comprehensive safety programs cultivate students' civic responsibility, legal awareness, and ethical values, preparing them to function as conscientious and resilient members of society (Jiang & Xiao, 2024). Network security education has become an indispensable component of this comprehensive approach, helping students recognize digital environment risks, enhance cybersecurity awareness, and develop necessary skills to prevent and respond to online threats while fostering responsible internet use and critical thinking abilities (Wang, 2019).

Current Safety Courses and Programs in Universities

Contemporary safety education programs in universities have evolved into comprehensive educational systems that strategically integrate multiple disciplinary areas, including legal education, fire safety protocols, and cybersecurity training. These interdisciplinary programs are designed to ensure students acquire both theoretical foundations and practical competencies, enabling effective application of safety principles in real-world contexts. The emphasis on content relevance to students' daily experiences, as highlighted in "University Students Safety Education and Self-Protection," demonstrates that selecting safety education materials that resonate with students' immediate concerns significantly enhances learning engagement and interest (Guo et al., 2021).

Higher education institutions emphasize the integration of theoretical knowledge with experiential learning through organized activities such as emergency drills and crisis simulations, which enhance students' capacity for effective emergency response. The incorporation of expertise from legal professionals, public security personnel, and fire safety specialists adds specialized knowledge to training programs, making complex safety concepts more accessible and comprehensible to students. Continuous evaluation and iterative improvement of these programs remain essential, enabling institutions to assess program effectiveness and implement necessary modifications to maintain educational relevance and impact while creating safer and more stable campus environments that prepare students to navigate potential risks in both academic and personal contexts.

Learning Achievement

Learning achievement represents a complex and multifaceted construct that encompasses the degree to which students have acquired knowledge, skills, habits, and attitudes through systematic educational processes. This comprehensive concept refers to performance outcomes that indicate the extent to which specific educational goals have been accomplished, serving as a valuable measure of student quality and educational effectiveness (Tauhid, 2021). Learning achievement is characterized as the extent to which individual learners have successfully attained knowledge and competencies within specific domains of study, frequently indicated by evaluative metrics such as grades or scores that encapsulate academic effectiveness (Amin, 2020).

As a multifaceted construct, learning achievement includes cognitive goals across various subject areas, encompassing critical thinking abilities and domain-specific knowledge that reflect students' capabilities after receiving educational experiences (Steinmayr et al., n.d.). This achievement integrates numerous components that significantly impact academic success, including socio-economic status, emotional intelligence, intrinsic motivation, learning methodologies, and cognitive competencies, each of which plays an instrumental role in determining educational outcomes as substantiated by empirical research findings.

Cognitive abilities constitute fundamental prerequisites for attaining learning achievement in educational settings, encompassing a wide range of mental processes including memory integration and verbal comprehension. These cognitive faculties facilitate systematic knowledge accumulation over time and enable effective integration of various learning episodes, both of which are indispensable components for achieving academic success (Esposito & Bauer, 2022).

Measuring learning achievement constitutes a complex endeavour that requires comprehensive assessment frameworks integrating multiple methodologies to ensure accurate evaluation of student learning and educational effectiveness. This measurement process is pivotal for developing instructional strategies, assessing pedagogical effectiveness, and maintaining accountability within educational systems. A strategic approach to assessment encompasses three complementary methodologies, each serving distinct but interconnected functions in the evaluation process. Formative assessment occurs throughout the instructional process, providing continuous feedback that proves invaluable to both students and instructors. These assessments play crucial roles in monitoring student progress toward established learning objectives while facilitating necessary instructional adjustments that optimize learning outcomes. The implementation of effective formative assessment methodologies significantly influences student motivation and engagement, with constructive feedback substantially enhancing students' intrinsic motivation for improved academic performance (Harris & Jones, 2021; Wu, 2024). Summative assessment serves as the definitive mechanism for gauging the degree to which learners have successfully met educational objectives and learning outcomes established at the beginning of courses or instructional units. This assessment form provides comprehensive perspectives on student performance and frequently serves as the foundation for decisions regarding student advancement and graduation eligibility (Alemann, 2022).

The strategic implementation of these integrated assessment approaches enables educators to make informed decisions about instructional strategies, student advancement, and program effectiveness. Effective measurement ultimately depends on careful consideration of methodological factors that ensure reliable, valid, and meaningful evaluation practices supporting educational success and continuous improvement in learning outcomes.

Augmented Reality and Learning Achievement Enhancement

Augmented Reality (AR) has emerged as a transformative educational innovation that facilitates immersive and interactive learning experiences, demonstrating measurable improvements in students' academic performance across diverse educational contexts and institutional levels. The pedagogical effectiveness of AR technology is fundamentally grounded in constructivist learning theory, which emphasizes knowledge construction through authentic, experiential learning opportunities. By enabling learners to acquire knowledge through multimodal content delivery systems, AR creates sophisticated learning environments that seamlessly integrate physical and virtual components, thereby facilitating enhanced understanding and superior knowledge retention compared to traditional instructional approaches (Garzón, 2021).

Contemporary technological advancements in AR, encompassing significant developments in both hardware capabilities and software applications, have substantially enhanced the seamless integration of real and virtual learning environments. These innovations effectively reduce extraneous cognitive load while facilitating deeper comprehension of complex academic concepts and materials (Arena et al., 2022). This technological sophistication enables AR to establish educational contexts in which learners can engage with academic content through modalities and interactions that conventional pedagogical methodologies cannot replicate, thereby supporting both theoretical knowledge acquisition and practical skill development in ways that align with contemporary learning science principles.

Comprehensive meta-analytic research published in prestigious academic journals provides substantial empirical support demonstrating that AR technology significantly enhances learners' knowledge acquisition, conceptual comprehension, and practical competency development across diverse educational contexts and disciplinary domains. Garzón's (2021) seminal comprehensive review, encompassing over 25 years of AR research in educational settings, demonstrates that AR implementation consistently enhances student motivation and academic engagement while producing measurably favorable learning outcomes across multiple educational levels and subject areas.

Convergent evidence from multiple large-scale meta-analyses provides robust quantitative support for AR's educational efficacy, with studies published in premier educational technology journals, including *Computers & Education* and *Educational Research Review*, consistently reporting medium-to-high overall effect sizes on

learning achievement outcomes ($d = 0.68-0.90$). These findings indicate that AR interventions produce educationally meaningful improvements that substantially exceed those typically observed with conventional instructional approaches (Chang et al., 2022; Garzón & Acevedo, 2019; Zhang et al., 2022).

Domain-specific research investigations have demonstrated particularly pronounced effectiveness within specialized professional fields, with Li et al. (2020) establishing that AR implementation substantially enhances learning outcomes in medical education contexts within health sciences curricula. Students engaged in AR-enhanced instruction demonstrated statistically significant superior performance in both accuracy measures and conceptual comprehension compared to counterparts receiving conventional pedagogical approaches, with particularly notable improvements observed in complex domains such as surgical training protocols and anatomical visualization studies. Furthermore, rigorous empirical data derived from randomized controlled trials provide additional substantiation that AR interventions enhance both theoretical knowledge acquisition and practical skill competencies, as demonstrated through nursing students' performance improvements in advanced cardiac life support instruction and assessment (Sun et al., 2024).

Critical Success Factors and Implementation Considerations

Empirical research has identified essential factors that significantly contribute to AR's educational efficacy, encompassing the pedagogical function of AR implementation, intervention duration, and subject matter characteristics that influence learning outcomes. These research findings consistently indicate that AR technology achieves maximum educational effectiveness when strategically designed for systematic content delivery and comprehensive skill enhancement rather than being employed merely for superficial attention capture or novelty effects (Chang et al., 2022; Garzón & Acevedo, 2019). Optimal implementation requires sophisticated instructional design frameworks that systematically align AR-enhanced activities with clearly defined learning objectives, ensure appropriate subject matter selection, and incorporate thorough consideration of learners' cognitive complexity levels and developmental readiness.

The comprehensive body of research evidence conclusively demonstrates that AR represents a highly promising educational technology for enhancing learning outcomes across both theoretical knowledge domains and practical skill applications. Its primary pedagogical strength resides in creating seamlessly integrated learning experiences that effectively combine physical and virtual educational environments, thereby enabling students to construct understanding and retain knowledge more effectively and efficiently than conventional instructional approaches can achieve. However, successful AR implementation depends critically on thoughtful and systematic instructional design processes that ensure AR-enhanced activities are meaningfully connected to specific educational goals while being appropriately matched to individual learner characteristics, cognitive capabilities, and specific content requirements within the educational context.

METHODOLOGY

Research Objective

To examine and compare the learning achievement outcomes of first-year university students in safety education before and after receiving instruction through Augmented Reality (AR) technology-enhanced learning management systems.

Research Hypothesis

First-year university students' learning achievement in safety education following instruction delivered through Augmented Reality (AR) technology-enhanced learning management will be significantly higher than their learning achievement before receiving the AR-enhanced instructional intervention.

Conceptual Framework

This research employs a one-group pretest-posttest pre-experimental design to examine the effects of Augmented Reality (AR) technology on learning achievement in safety education. The conceptual framework presented below serves as the theoretical foundation and methodological guide for conducting this investigation, illustrating the causal relationship between the independent variable (learning management using Augmented Reality technology) and the dependent variable (learning achievement) within the context of safety education for first-year university students.

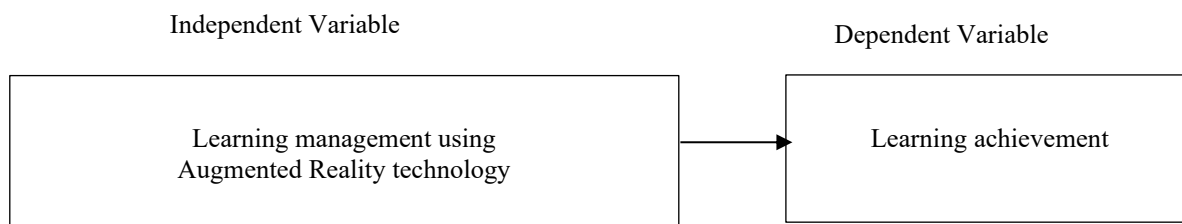


Figure 1 Conceptual framework illustrating the relationship between learning management using Augmented Reality technology and learning achievement enhancement among first-year university students in China

Research Methodology

Research Design

This study employed a pre-experimental research design utilizing a one-group pretest-posttest methodology to examine the effects of Augmented Reality technology on learning achievement among first-year university students in safety education (Best & Kahn, 2003). The pre-experimental design was selected as an appropriate methodological approach for investigating the preliminary effects of AR-enhanced instruction on student learning outcomes within the specified educational context.

Table 1: One-Group Pretest-Posttest Design

Pretest	Intervention	Posttest
O1	X	O2

Symbols used in experimental design.

O1 = Pretest measurement of learning achievement

O2 = Posttest measurement of learning achievement

X = Learning management using Augmented Reality technology intervention

Population and Sample

The target population for this study comprised first-year undergraduate students enrolled at a public university in China. This population was selected based on their developmental stage as beginning university students. The study employed cluster sampling methodology to select 30 first-year undergraduate students from the Faculty of Arts at a public university in China. This non-probability sampling approach was chosen due to practical considerations related to classroom organization and the availability of intact academic groups within the faculty structure.

The selected participants were enrolled in safety-related courses during the first semester of the 2025 academic year, ensuring homogeneity in terms of educational level, subject matter exposure, and temporal context. All participants formed a single experimental group that received AR-enhanced instructional intervention, consistent with the one-group pretest-posttest research design employed in this investigation. The sample size of 30 students was determined based on practical constraints and represents a sufficient number for preliminary investigation of AR technology effects on learning achievement, while acknowledging that larger sample sizes would enhance the generalizability of findings in future research endeavours.

Research Instrument

This research utilized various instruments to measure the effectiveness of Augmented Reality technology learning management on students' learning achievement. The instruments are categorized into two main types: tools for learning management are Augmented Reality technology lesson plans, and instruments for data collection is Learning Achievement Test.

Instrument Development

Augmented Reality technology lesson plans

The development of AR-enhanced learning management materials followed a systematic six-step process designed to ensure both theoretical rigour and practical applicability:

1) Literature Review and Curriculum Analysis, The researcher analyzed curriculum objectives, safety-related learning outcomes, AR-based learning management literature, and safety education principles to develop four 2-hour lesson plans incorporating AR technology.

2) Instructional Design and Material Creation, Detailed lesson plans were developed, including teaching materials, interactive AR content, and assessment tools for each lesson, ensuring alignment with research objectives.

3) Expert Content Validation, Completed instruments were submitted to three experts: (a) an educational technology and AR applications specialist, (b) a safety education and risk management expert, and (c) a curriculum and instruction specialist.

4) Index of Item-Objective Congruence (IOC) Assessment, Experts evaluated the materials using IOC methodology, examining content accuracy, learning objective alignment, AR technology integration, activity design, and assessment methods.

5) Statistical Analysis and Pilot Testing, IOC values were calculated with acceptable thresholds of 0.67-1.0. Content was modified based on expert recommendations, followed by pilot testing with a representative sample to assess feasibility.

6) Final Refinement and Optimization, learning activities were revised based on expert feedback, time allocations adjusted, AR content integration enhanced, and assessment tools improved according to pilot study results.

Learning Achievement Test

The development of the learning achievement test followed a systematic eight-step process designed to ensure psychometric rigor and content validity:

1) The researcher analyzed learning objectives, content domains, and expected outcomes within safety education curricula. A comprehensive test specification table was constructed to ensure systematic content coverage, resulting in an initial instrument comprising 45 multiple-choice items addressing risk identification, safety protocols, and emergency response procedures.

2) Preliminary test items were developed according to the established test specification framework. Items were systematically designed to assess multiple cognitive levels consistent with Bloom's Taxonomy, with each question carefully aligned to specific learning objectives and knowledge domains within the safety education curriculum.

3) The preliminary instruments underwent comprehensive review and refinement under supervisory guidance to ensure adequate content coverage and technical accuracy. Following these revisions, the test items were submitted to a panel of three subject matter experts for content validation.

4) Three subject matter experts evaluated each test item using established criteria, including content accuracy, linguistic clarity, cognitive level appropriateness, and construct validity. Index of Item-Objective Congruence (IOC) values were calculated, with items achieving IOC scores between 0.8 and 1.0 retained for subsequent pilot testing.

5) A pilot study was conducted with 30 participants possessing characteristics similar to the target population but excluded from the primary study sample. This pilot phase was essential for establishing the instrument's psychometric properties and identifying necessary refinements.

6) Pilot test data underwent comprehensive statistical analysis examining item difficulty indices ($p = 0.20-0.80$), item discrimination indices ($r \geq 0.20$), and internal consistency reliability using Cronbach's alpha coefficient. This analysis ensured selection of items with appropriate difficulty levels and satisfactory discriminating power.

7) Based on psychometric analysis results, 20 multiple-choice questions and 4 short-answer questions meeting specified criteria were selected. The retained multiple-choice items demonstrated p -values between 0.32 and 0.55 and r -values ranging from 0.20 to 0.73. The final instrument achieved an overall reliability coefficient (Cronbach's alpha) of 0.80.

8) The final instrument version was refined based on statistical analysis findings and expert recommendations, ensuring the assessment tool possessed both adequate validity and reliability for measuring student learning achievement in safety education contexts within the primary investigation.

Data Collection

The data collection process involved three systematic steps designed to ensure accuracy and reliability in measuring the effects of Augmented Reality technology-enhanced learning management on students' learning achievement in safety education.

1) Pre-experimental Step: Institutional permission was obtained from the academic administration of the participating university, with relevant faculty members informed about the study objectives and procedures. Coordination meetings were conducted with instructors responsible for the experimental group to align lesson plans and establish standardized data collection procedures. The pretest was administered using the validated learning achievement test to establish baseline measurements for the experimental group. All pretest scores were systematically verified and documented to ensure data integrity and accuracy before proceeding to the intervention phase.

2) Experimental Step: The AR technology-enhanced learning management intervention was implemented with the experimental group across four 2-hour instructional sessions, following the systematically developed lesson plans. Student participation and responses were continuously documented throughout the implementation period to maintain comprehensive records of the educational process. Adherence to planned activities and time

allocations was monitored to ensure fidelity of implementation, while technical issues and implementation challenges were systematically recorded for subsequent analysis and methodology refinement.

3) Post-experimental Step: The posttest was administered using the identical learning achievement test to measure post-intervention learning outcomes under consistent assessment conditions maintained for the experimental group to ensure reliability measurement. All assessment data were systematically collected and verified for completeness and accuracy, with particular attention paid to maintaining the integrity of the measurement process. The collected data was then organized and prepared for subsequent statistical analysis, ensuring proper documentation and secure data storage protocols were followed throughout the process.

Data analysis

The data collected was analyzed using both descriptive and inferential statistical methods. Descriptive statistics, including means and standard deviations, were calculated to summarize the central tendencies and variability of the learning achievement scores. Inferential statistics employing paired samples t-tests were conducted to examine significant differences between pre- and post-intervention performance. All statistical analyses were performed using statistical analysis software to ensure computational accuracy and reliability of results. The significance level was set at $\alpha = .05$ for all statistical tests

The data were analyzed to compare the learning achievement of first-year university students in safety education before and after receiving AR technology-enhanced instruction, employing paired samples t-test analysis. The results of the statistical analysis are presented in Table 2.

Table 2: Comparative Analysis of Learning Achievement Among First-Year University Students in AR Technology-Enhanced Safety Education: Pre- and Post-Instruction Comparison

Learning Achievement	n	M	SD	$\bar{D}$	Sd	t	p	Effect Size
Before instruction	30	9.20	0.73	10.37	5.34	10.63*	.000	1.94
After instruction	30	19.57	5.58					

* $p < .05$

Analysis of the data presented in Table 2 revealed statistically significant differences in learning achievement outcomes ($t = 10.63$, $p < .001$). Examination of mean learning achievement scores in safety education among first-year university students who received AR technology-enhanced instruction demonstrated significantly higher post-instruction performance ($M = 19.57$, $SD = 5.58$) compared to pre-instruction baseline measurements ($M = 9.20$, $SD = 0.73$) at the $\alpha = .05$ significance level.

Effect size analysis using Cohen's d calculated with the change score standard deviation yielded a very large effect ($d = 1.94$), indicating that the AR technology intervention demonstrated substantial practical significance in enhancing students' learning achievement in safety education. According to Cohen's conventions, this effect size substantially exceeds the threshold for large effects ($d \geq 0.8$), suggesting that the observed improvements represent educationally meaningful gains attributable to the AR-enhanced instructional intervention.

CONCLUSIONS AND DISCUSSION

Conclusions

This study successfully demonstrated the educational efficacy of Augmented Reality technology in enhancing learning achievement within safety education contexts. The research findings confirm that systematic integration of AR-enhanced instructional methods produces measurable improvements in student learning outcomes. The intervention's success can be attributed to AR technology's unique capacity to create experiential learning environments that bridge the gap between theoretical knowledge and practical application. By enabling students to engage with safety scenarios through interactive simulations, the technology addressed fundamental limitations of conventional instructional methods while providing safe, controlled environments for skill development and knowledge acquisition. These empirical findings provide robust support for the research hypothesis and contribute valuable evidence to the growing literature on technology-enhanced learning in higher education. The results demonstrate that AR technology represents a viable and effective pedagogical tool for institutions seeking to improve safety education outcomes and enhance student preparedness for real-world emergencies.

Discussion

The implementation of Augmented Reality (AR) technology in safety education pedagogy significantly enhanced post-intervention learning achievement by fundamentally transforming abstract safety concepts into experiential

learning opportunities. Learning management using AR technology was systematically integrated throughout various stages of the instructional process, including content presentation, scenario simulation, and facilitating interactions between learners and educational materials. In this research, AR technology was utilized across three key instructional phases: Step 1 (Introduction), Step 2 (AR-Enhanced Teaching), and Step 3 (Summary and Assessment). The second step comprised three critical components: 1) presenting safety-related content through interactive AR visualizations, 2) simulating real-world environments for hands-on practice, and 3) engaging students in active problem-solving tasks.

By integrating AR-enabled applications and devices throughout these instructional phases, this pedagogical approach enhanced university students' acquisition and application of safety competencies through multiple cognitive and behavioral mechanisms. AR technology enabled cognitive embodiment by visualizing complex safety procedures, such as fire extinguisher operation and hazard identification, through interactive three-dimensional simulations, thereby increasing knowledge retention through multisensory engagement. Concurrently, behavioral reinforcement created high-frequency skill refinement cycles where real-time feedback during AR training exercises provided corrective prompts for incorrect techniques, reducing operational errors through systematic protocol automation.

Contextual stress adaptation integrated time-pressured scenarios, notably three-minute multi-hazard decision-making exercises, which accelerated crisis response capabilities through simulated high-stress challenges. Finally, responsibility internalization through structured reflection activities and safety commitment documentation fostered personal accountability, evidenced by increased student expressions of safety ownership and engagement. This integrated framework of embodied learning, iterative practice, adaptive stress exposure, and ethical internalization collectively addressed the knowledge-application gap inherent in traditional safety instruction, shifting educational outcomes from theoretical recall to demonstrable competence in real-world safety management contexts.

The significant improvement in learning achievement following AR-enhanced instruction aligns with previous research demonstrating AR's educational efficacy across multiple domains. Li et al. (2020) demonstrated that AR-enhanced medical training improved anatomical understanding by 40% through three-dimensional visualizations, while Radu and Schneider (2019) documented AR's advantages in conveying abstract concepts such as electromagnetic field dynamics. The current findings extend these results to safety education, confirming AR technology's capacity to: (1) reduce cognitive load by transforming theoretical safety protocols into interactive simulations (Gong et al., 2024), and (2) enhance student engagement through immersive hazard-response scenarios, addressing traditional safety education's documented limitations in student participation and retention (Xiong et al., 2024).

The observed large effect size ($d = 1.94$) substantially exceeds meta-analytic benchmarks for educational interventions, which typically range from $d = 0.4$ to 0.8 , suggesting AR technology's exceptional utility for high-risk skill acquisition in educational settings. This finding aligns with Yang et al.'s (2024) research on fire drill simulations, where AR implementation increased correct emergency responses by 63%. These convergent findings suggest that AR technology represents a particularly promising pedagogical tool for safety education contexts where traditional instructional methods have demonstrated limited effectiveness in translating theoretical knowledge into practical competencies.

The Study Reached the Following Findings

This study yielded the following key findings regarding the implementation of Augmented Reality technology in safety education. 1) The AR-enhanced intervention produced statistically significant improvements in students' safety education learning achievement, with post-intervention performance substantially exceeding pre-intervention baseline levels. This advancement was accompanied by reduced variability in learning outcomes across the participant cohort, indicating more consistent educational benefits. 2) The magnitude of improvement achieved a very large practical effect size, substantially surpassing conventional benchmarks for educational interventions. This scale of efficacy suggests that AR technology fundamentally enhanced both cognitive processing during hazard assessment tasks and procedural execution during emergency response scenarios. 3) Participants demonstrated consistent application of AR-acquired safety protocols in subsequent practical exercises, with reflective assessments revealing substantial shifts toward safety ownership and responsibility internalization. This transfer of learning indicates the intervention's effectiveness in bridging the gap between theoretical knowledge and practical implementation.

RECOMMENDATIONS

Recommendations for Implementation

Based on the findings and limitations of this study, the following integrated recommendations are proposed to advance the implementation of augmented reality technology in safety education contexts. 1) Educational practitioners should adopt a phased integration approach, beginning with pilot AR modules targeting high-risk scenarios such as laboratory chemical spills and emergency evacuation procedures. Initial implementation should utilize cost-effective mobile AR solutions before scaling advanced hardware systems to ensure financial sustainability and institutional feasibility. This approach should be coupled with a hybrid training model that strategically combines AR simulations for cognitive decision-making processes with traditional physical drills for psychomotor skill development, particularly for high-stakes procedures such as fire extinguisher operations. 2) Educators implementing this AR-enhanced learning management approach must develop comprehensive understanding of the instructional design process and acquire clear knowledge of teaching and learning management procedures. They should also develop competencies in learning environmental design and facilitation. Professional development is critical, and mandatory workshops should address scenario design for safety contexts, troubleshooting common AR tracking errors, and calibrating standardized assessment rubrics to ensure consistent evaluation of safety competencies across different educational settings.

Recommendations for Future Research

Based on the conclusions and discussion of the study, the researcher has several suggestions as follows: 1) Future research should conduct randomized controlled trials comparing AR-enhanced instruction with traditional safety education methods using validated assessment instruments, such as the National Safety Council's Safety Skills Inventory. Critical control variables should include prior safety training experience, spatial ability, and technology familiarity to ensure accurate attribution of observed effects to the AR intervention. 2) Longitudinal studies should track participants for 6-12 months post-training to measure: (a) retention of AR-acquired knowledge through assessments at three-month intervals, (b) real-world application rates through analysis of incident reports and safety performance metrics, and (c) correlations between AR training completion and reduced campus accident frequencies. 3) Research should investigate AR framework effectiveness across high-risk academic disciplines, including: (a) engineering laboratories for chemical exposure simulations, (b) medical campuses for biohazard response training, and (c) fieldwork-intensive programs for geological hazard identification. These studies would establish the generalizability of AR-enhanced safety education across diverse educational contexts and risk environments. 4) Economic evaluation studies should assess the financial feasibility and return on investment of AR implementation compared to traditional safety education methods, considering factors such as equipment costs, training expenses, and potential reduction in safety-related incidents and associated costs.

Declaration of Generative AI and AI-Assisted Technologies

During the preparation of this work, the authors used Claude AI to correct grammatical errors and improve readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Credit Authorship Contribution Statement

All authors have read and agreed to the published version of the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

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The Effects of the Administrators' Teacher Influencing Behaviors on School Mindfulness and on Teachers' Organizational Commitment

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ABSTRACT

This article provides insight into administrators' teacher influencing tactics. The data are collected from the teachers at secondary level schools in Turkey and in the Turkish Republic of Northern Cyprus. We employed a quantitative survey by means of three different scales and utilized SEM modeling to test the model fit indexes of the scales aiming to examine administrators' teacher influencing tactics and to examine teachers' organizational commitment and perceptions of school mindfulness. The results signified a meaningful relationship between teachers' organizational commitment, school mindfulness and administrators' teacher influencing tactics. The administrators' influencing tactics increase the teachers' organizational commitment, whereas these tactics decrease the teachers' organizational commitment. Moreover, Administrators' teacher influencing tactics reduce school mindfulness but increase teachers' organizational commitment.

Keywords: Administrators' teacher influencing tactics, School mindfulness, Teacher mindfulness, Administrator mindfulness, Organizational commitment.

INTRODUCTION

Since the start of the social interactions and the group formations amongst the mankind, the subject of influencing others had been an interest of the administrators of the organizations, tribes and sects. Within this consideration, influencing is in the essence of leadership. An administrator, who would be regarded as a leader must have the ability to influence and integrate their surroundings. In today's World, leadership is regarded as a proactive social influencing process which aims to change the followers' attitudes towards a vision or a target to reach, their values and beliefs (Faeth, 2004; Robbins & Judge, 2012; Owens, 2004).

The ability to influence the employees is an important determinant of the effectiveness of the administrator (Sheer, 2012). In other words, the fundamental factor in a successful leadership is the effective management of the influencing process (Agezo, 2008; Yukl & Fable, 1990; Yukl et al., 2008). Depending on this reason, leaders must understand the influencing process between their followers (Deluga, 1988). The research findings state that an effective leadership is a must for organizational success and has direct effects on individual and

organizational effectiveness (Dagli & Calik, 2016; Furst & Cable, 2008; Kipnis et al., 1984; Klocke, 2009; Kuru, 2013; Luecke, 2007; Yukl, 2013;).

In the field of literature, there are studies focusing on administrators' and teachers' influencing behaviors in educational institutions (Culver, 1994; Dohlen, 2012; Jones, 1992; Kuru, 2013; Maher, 1999; Porter et al., 1989; Rogers-Backus, 2010; Wickstrom, 1981). The attempt of influencing is regarded as necessary in leadership issues (Kipnis et al., 1980) and positive organizational behavior theory emphasizes that employees' performances are likely to increase when leaders use positive and supportive influencing tactics (Dagli & Calik, 2016; Moideenkutty & Schmidt, 2011).

Teachers' Organizational Commitment: Teachers' commitment core can be different regarding their instructional activities, schools, families, colleagues and other external values, and their behavioral patterns can change according to the commitments that they prioritize.

One of the elements that form the teachers' basis of their feelings related to the workplace is the interest and the attitude towards the objects (the occupation, the work, the study group, and the students) in that surrounding. In this sense, teachers' performances depend on the values that they appraise to these objects and the quality of the relation with them. Educational institutions' degree of effectiveness depend on a variety of factors and one of the leading one is the interaction between administrator, teacher and student that take part in the teaching and learning process. In this context, teachers' commitment to the school, to the students, to instructional activities, to the profession and to the colleagues can make a positive contribution to the school effectiveness by supplying informal behaviors beyond the normative expectations of the groups and the objects (Celep, 1996: 2-3).

Pre-service teachers' attitudes towards teaching profession that involves political ideas instead of professional and scientific values is possibly because the university lecturers' undemocratic behaviors (Celep, 1999). There are external stakeholders that have an effect on the organization. An educational institution's external stakeholders which are regarded as external pressure groups are economy, religion, politics, political structure, societal values and the family.

Influencing Tactics of Administrators: An influencing tactic is determined as the type of behavior which is used on purpose in order to affect an individual's attitudes and behaviors (Yukl, 2013:190). Influencing is a necessary process to coordinate people's activities and their efforts in order to reach the organizational objectives. It is the key point of leadership definitions (McShane & Von Glinow, 2008). The influencing attempt is used to change an individual's or a group's beliefs or values (Faeth, 2004). During the influencing process, 'the actor' is the person who initiates the influencing attempt. 'The target' is the person who is the subject of the influencing attempt (Faeth, 2004; McShane & Von Glinow, 2008).

The first phase of the studies (Berson & Sosik, 2007; Peter, 1998; Jensen, 2007; Kipnis et al., 1980; Yukl & Falbe, 1990) related to the frequency and the direction of the influencing tactics had the aim to classify the most used organizational influencing tactics by the administrators' and employees' to influence the others (Yukl & Falbe, 1992; Kipnis et al., 1980; Hinkin & Schriesheim, 1989). The second phase is the studies that examined the relation between administrators' and employees' outputs of influencing attempts and organizational influencing tactics (Culves, 1994; Falbe & Yukl, 1992; Gozu, 2012; Su, 2010; Yukl, 2010).

Some scholars (ie. Falbe & Yukl, 1992; Yukl & Tracey, 1992) conducted research to examine how administrators and employees are effected due to the use of the influencing tactics. The third phase of the studies is the one which examined the influencing tactics used according to the leadership types of the administrators (Friedrich, 2010; Vecchio & Sussman, 1993; Yukl et al., 1990).

The moderate tactics refers to creating positive social relations and positive influencing that involves judgement. A leader who uses moderate tactics believes that the followers will adapt by using their logic instead of being under control of the leader (Moideenkutty & Schmidt, 2011).

Administrators must use their powers in an effective way in order to to impress the followers and direct them within the organizational objectives. In this sense, administrators apply some sources of powers in order to achieve organizational objectives. The power can be identified as; the ability to get the others to do a work in a desired way (Salancik & Pfeffer, 1977); to supply the desired work in order to effect the outcomes, start up an action and sustain it.

Pfeffer (1992a, 1992b) defined the power simply as a potential force; and as a broad definition effecting the behaviors, changing the flow of events, dealing with resistance, and a potential ability to enable people to act in

that way helping to win them. The power can be determined as the source of an individual to affect others to behave the way that he or she desires. Consequently, organizational power is determined as the administrator's acts to direct the employees for the organizational objectives (Altinkurt & Yilmaz, 2013; Hoy & Miskel, 2010).

The moderate tactics are; appreciation, consultation, making an incentive request, using personal intimacy, cooperation and information and persuasion by reason (Fable & Yukl, 1992; Kreitner & Kinicki, 2013; Yukl 2013). The influencing tactics that are extensively considered by Yukl (2013) are; Persuasion by reason, Reciprocation tactic, Making an incentive request, Compliance with the rules, Information tactic, Cooperation tactic, Consultation, Using personal intimacy and Building coalitions with others (Dagli & Calik, 2016).

The basis of the power that administrators have is under examination within a variety of ways. The classification related to the basis of the power is generally similar. One of the leading researches on this issue is French and Raven's (1959), which classified the basis of the power as; Rewarding power, Legitimate power, Expert power, and Referent power.

School Mindfulness: The concept of mindfulness is first examined on an individual basis later then examined on the organizational basis. The individual mindfulness is identified as 'individual's constant action to open new categories in the brain and developing more than one perspective for each event'. The organizations which have high level of mindfulness are identified as organizations which also have high level of organizational trust (Buyukgoze & Ozdemir, 2019; Weick et al., 1999).

The features of the organizations that have high level of mindfulness is evaluated as a component and these components are identified as; 'coping with failure, reluctance to simplify, sensitivity to applications, commitment to the strength to overcome difficulties and considering expertise' (Weick & Sutcliffe, 2001).

Public schools are organizations that are bounded by rules and regulations. The policies and regulations can create a sense of stability in the work environment that causes unconsciousness (Smith & Scarbrough, 2011). From this view, within a cooperative approach, an organization can encourage its employees in terms of flexibility, being open to new information, feeling trust, and taking risks in order to create an environment with a high level of mindfulness (Kearney et al., 2013).

The mindfulness at schools is closely related to teachers' and administrators' attitudes towards investigating problems systematically and carefully, preventing small problems in order to prevent the bigger ones, caring about the events, focusing on teaching and learning, being flexible in problems and showing respect to expertise. Administrators can approach teacher oriented challenges with tolerance in the schools which have a high level of mindfulness. When things went wrong in this kind of schools, mistakes serve as feedback for the lessons learned. Besides, rules and regulations provide new solutions rather than immutable operations. Teachers and administrators of these schools can debate the intellectual differences. Moreover, open communication between teachers and administrators creates a perception of trust and support to each other (Dagli & Calik, 2016; Hoy, 2002).

METHODOLOGY

The purpose of this research is to examine school administrators' tactics to influence the teachers, and to examine teachers' organizational commitment and perceptions of school mindfulness. Furthermore, it is to identify the correlation in the administrators' influencing tactics, school mindfulness and teachers' organizational commitment levels. In compliance of this purpose, the effects of the school administrators' behaviors to influence the teachers, as the intermediate variable, on teachers' organizational commitment behavior over school mindfulness was examined.

The population of the research is the secondary level teachers that teach in Turkey and in the Turkish Republic of North Cyprus (TRNC). So that the population consisted of two countries and being big enough for the researchers to reach, random sampling technique was utilized.

Data Collection Procedure: Three different tools were used to examine the teacher organizational influencing tactics, school mindfulness and multi-dimensioned organizational commitment.

1. Structural Validity of Administrators' Teacher Influencing Tactics Scale:

In this research, "Administrators' Teacher Influencing Tactics Scale" developed by Celep and Kaya (2020) is used. The sub-dimensions of the scale were identified as "Rules, Authority Power, Mutual Benefit, Reward, and Relationship and consisted of 44 items.

2. The Structural Validity of the School Mindfulness Scale: One of the data collection tools in this research is the “School Mindfulness Scale”, which have two sub-dimensions with 14 items. The first sub-dimension is consisted of seven items named as “Teacher Mindfulness” and the second sub-dimension is consisted of seven items named as “Administrator Mindfulness”. This scale is originated with Hoy et al. (2014) The School Mindfulness Scale (M-Scale) and the adaptation of this scale to Turkish was done by Dagli and Calik (2016), and Buyukgoze and Ozdemir (2019).

In order to examine whether the latent structure that lies beneath the “School Mindfulness Scale” was confirmed by the scale items, CFA was utilized. The model fit index analysis results conducted with 14 items are presented in Table 4.

Table 4. Model Fit Index and Related Estimations

Model Fit Index	Estimation Value
Root Mean Square Error of Approximation (RMSEA)	0,038 (90% GA with 0,026-0,049)
χ^2/sd	126,180/ 76
Comparative Fit Index (CFI)	0.99
Tucker- Lewis Index (TLI)	0.99
Standardized Root Mean Square (SRMR)	0,06

The RMSEA estimation value was found 0.065 with 90% possibility between 0.026 and 0.049 identifying that model fit index is reasonable. When the Chi-square value divided by the degree of freedom $126.180/76=1.66$ score was obtained. This score can be considered as reasonable so that this value is close to 1.7. CFI and TLI fit indexes were found as 0.99 and 0.99 respectively. When the fit index of SRMR was examined the obtained estimation value was found 0.06. The model fit index is examined in general; it is possible to state that the research data comply with the model-data fit.

Table 5 presents the standardized path coefficients, the standard errors of these coefficients and the significance of the “School Mindfulness Scale”, and all p values were found to be significant. This possibly means that the items in the scale predict the related latent factor. The factor loads in the sub-dimensions are; in the first sub-dimension between 0.74 and 0.92, in the second sub-dimension between 0.52 and 0.93. So that these standardized values were found to be below 0.3, it is possible to state that these items measure the targeted aspect. Moreover, the Cronbach Alpha value was measured for each sub-dimension of the scale and the reliability coefficient differs between 0.87 and 0.90.

Table 5. Standardized Factor Load Values of School Mindfulness Scale

Dimensions	Items	Standard Estimate Value	Standard error	z value	p	Cronbach Alfa
Administrator Mindfulness	SM1	0.774	0.028	27.528	< .001	.90
	SM2	0.840	0.029	28.889	< .001	
	SM3	0.837	0.029	29.004	< .001	
	SM4	0.737	0.028	25.968	< .001	
	SM5	0.911	0.029	31.265	< .001	
	SM6	0.861	0.029	29.576	< .001	
	SM7	0.915	0.031	29.858	< .001	
Teacher Mindfulness	SM8	0.523	0.024	21.543	< .001	.87
	SM9	0.562	0.026	21.817	< .001	
	SM10	0.934	0.030	31.313	< .001	
	SM11	0.558	0.026	21.518	< .001	
	SM12	0.681	0.026	26.247	< .001	
	SM13	0.606	0.024	25.132	< .001	
	SM14	0.768	0.030	25.657	< .001	

3. The Structural Validity of the Organizational Commitment Scale: The third data collection tool in this research was the “Commitment to School Scale” developed by Celep (1996), with 58 items and five sub-

dimensions. The first sub-dimension is consisted of 15 items named as “Commitment to School”, the second sub-dimension is consisted of 10 items named as “Commitment to Politics”, the third sub-dimension is consisted of 12 items named as “Commitment to Colleagues”, the fourth sub-dimension is consisted of 14 items named as “Commitment to Teaching Profession” and the fifth sub-dimension is consisted of seven items named as “Commitment to Teaching”. In order to examine whether the latent structure that lies beneath the Commitment to School Scale was confirmed by the scale items, CFA was utilized. So that item 18 and item 51 were found to be insignificant, they were excluded from the scale and the model fit index analysis results obtained from the CFA conducted with 56 items are presented in Table 6.

Table 6. Model Fit Index and Related Estimations

Model Fit Index	Estimation Value
Root Mean Square Error of Approximation (RMSEA)	0,027 (90% GA with 0,024-0,030)
X ² /sd	1963,423/ 1474
Comparative Fit Index (CFI)	0.99
Tucker- Lewis Index (TLI)	0.99
Standardized Root Mean Square (SRMR)	0,06

The RMSEA estimation value was found 0.027 with 90% possibility between 0.024 and 0.030 identifying that model fit index is reasonable. Chi-square value divided by the degree of freedom 1963.423/1474=1.33 score was obtained. This score can be considered as good fit so that this value is below 2.0. CFI and TLI fit indexes were found as 0.99, indicating good fit for the model index. When the fit index of SRMR was examined, the obtained estimation value was found 0.06. Depending on these scores, it is possible to state that the research data comply with the model-data fit.

Table 7 presents the standardized path coefficients, the standard errors of these coefficients and the significance of the Organizational Commitment Scale, and all *p* values were found to be significant. This possible means that the items in the scale predict the related latent factor. The factor loads in the sub-dimensions are; (f1) 0.32-0.96, (f2) 0.28-.0.85, (f3) 0.41-0.84, (f4) 0.34-0.82, (f5) 0.32-0.62.

Table 7. Standardized Factor Load Values of Organizational Commitment Scale

Dimensions	Items	St. Est. Value	Standard Error	z value	p	Cronbach Alfa
Commitment to School	SM1	0.841	0.018	46.198	< .001	.93
	SM2	0.478	0.019	24.611	< .001	
	SM3	0.935	0.019	48.016	< .001	
	SM4	0.908	0.020	45.256	< .001	
	SM5	0.507	0.017	30.071	< .001	
	SM6	0.845	0.020	42.732	< .001	
	SM7	0.947	0.020	47.131	< .001	
	SM8	0.864	0.019	45.257	< .001	
	SM9	0.962	0.020	49.109	< .001	
	SM10	0.916	0.020	46.443	< .001	
	SM11	0.546	0.017	31.828	< .001	
	SM12	0.881	0.021	42.550	< .001	
	SM13	0.766	0.019	41.197	< .001	
	SM14	0.322	0.013	24.406	< .001	
	SM15	0.739	0.019	39.552	< .001	
Commitment to Politics	SM16	0.441	0.025	17.543	< .001	.79
	SM17	0.284	0.014	19.642	< .001	
	SM19	0.553	0.033	16.777	< .001	
	SM20	0.593	0.029	20.535	< .001	
	SM21	0.854	0.032	26.905	< .001	
	SM22	0.689	0.027	25.456	< .001	
	SM23	0.484	0.020	24.652	< .001	
	SM24	0.402	0.027	14.700	< .001	
	SM25	0.736	0.032	23.197	< .001	

Commitment to Colleagues	SM26	0.409	0.014	30.221	OA26	
	SM27	0.728	0.018	40.387	OA27	
	SM28	0.631	0.017	36.789	OA28	
	SM29	0.536	0.018	30.037	< .001	
	SM30	0.659	0.019	35.115	< .001	.91
	SM31	0.553	0.019	28.392	< .001	
	SM32	0.835	0.020	41.079	< .001	
	SM33	0.589	0.018	33.621	< .001	
	SM34	0.726	0.020	36.212	< .001	
	SM35	0.597	0.018	33.112	< .001	
	SM36	0.501	0.015	32.423	< .001	
	SM37	0.826	0.021	39.252	< .001	
Commitment to the Teaching Profession	SM38	0.629	0.017	36.167	< .001	
	SM39	0.464	0.018	25.724	< .001	
	SM40	0.444	0.016	28.419	< .001	
	SM41	0.692	0.019	35.776	< .001	
	SM42	0.344	0.013	27.394	< .001	
	SM43	0.759	0.022	35.153	< .001	.92
	SM44	0.745	0.019	39.442	< .001	
	SM45	0.818	0.022	37.393	< .001	
	SM46	0.587	0.016	35.851	< .001	
	SM47	0.679	0.018	36.910	< .001	
	SM48	0.677	0.020	33.681	< .001	
	SM49	0.754	0.020	37.467	< .001	
	SM50	0.803	0.021	38.188	< .001	
Commitment to Teaching	SM52	0.401	0.015	26.859	< .001	
	SM53	0.471	0.017	27.171	< .001	
	SM54	0.322	0.013	24.915	< .001	
	SM55	0.491	0.016	30.762	< .001	.86
	SM56	0.420	0.016	26.967	< .001	
	SM57	0.485	0.015	32.109	< .001	
	SM58	0.617	0.017	35.617	< .001	

FINDINGS

Regression analysis was conducted in order to find out the effects of the teacher influencing tactics on organizational commitment, the effects of teachers' mindfulness on organizational commitment and the effects of teacher influencing tactics on school mindfulness. Before the regression analysis conducted, in order to measure the data set's convenience, the missing values, single and multiple extreme values and the normality of the data set was checked. It was found that, there were no missing values, the data was not normally distributed, and both single and multiple extreme values were existed.

In order to fix the non-normally distributed data, the bootstrapping sampling method was utilized, which forms a new sample by estimating characteristics of the sample distributions from the current data when the sample of the research is less or non-normally distributed (Field, 2018). In this analysis, the bootstrapping sample was set as 1.000. The descriptive statistics of the data set is presented in Table 8.

Table 8. Descriptive Statistics of the Variable

Variable	N	$\bar{X}$	sd	Min.	Max.
Commitment to School	464	3.63	.786	1.07	5.00
Commitment to Politics	464	2.14	.633	1.00	4.22
Commitment to Colleagues	464	3.53	.666	1.33	5.00
Commitment to the Teaching Profession	464	4.13	.674	1.46	5.00
Commitment to Relationship	464	4.37	.509	2.00	5.00
Administrator Mindfulness	464	3.54	.883	1.00	5.00
Teacher Mindfulness	464	3.47	.721	1.14	5.00

Teacher Influencing Tactics-Rules	464	3.14	.583	1.00	4.00
Teacher Influencing Tactics –Authority Power	464	1.76	.711	1.00	3.93
Teacher Influencing Tactics -Expertise	464	3.09	.632	1.00	4.00
Teacher Influencing Tactics –Mutual Benefit	464	2.05	.838	1.00	4.00
Teacher Influencing Tactics -Reward	464	2.30	.678	1.00	4.00
Teacher Influencing Tactics -Relationship	464	2.27	.756	1.00	4.00

Before the regression analysis, in order to examine the relationship between the variables the Spearman correlation test was conducted and the results are presented in Table 9.

Table 9. The Spearman Correlation Analysis of the Teachers' Organizational Commitment Scale, the School Mindfulness Scale, and the Administrators' Teacher Influencing Tactics Scale and the Sub-dimensions of the Related Scales

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Commitment to School	1												
2 Commitment to Politics	.171**	1											
3 Commitment to Colleagues	.424**	-.106*	1										
4 Commitment to the Teaching Profession	.321**	.186**	.309**	1									
5 Commitment to Teaching	.319**	.267**	.233**	.580**	1								
6 Administrator Mindfulness	.679**	.265**	.398**	.244**	.198**	1							
7 Teacher Mindfulness	.531**	.267**	.529**	.225**	.242**	.606**	1						
8 Influencing Tactics-Rules	.129*	-0.024	-0.021	-0.02	-0.046	0.104	0.075	1					
9 Influencing Tactics-Authority Power	.437**	.334**	.255**	.171**	-.134*	.618**	.455**	0.036	1				
10 Influencing Tactics-Expertise	.259**	-0.063	0.086	-0.019	-0.029	.276**	.227**	.481**	.156**	1			
11 Influencing Tactics-Mutual Benefit	.218**	.285**	.181**	.164**	.101**	.354**	.291**	0.091	.582**	0.016	1		
12 Influencing Tactics-Reward	0.031	.176**	-0.003	-0.036	-0.035	0.03	-0.069	.146*	.248**	.249**	.484**	1	
13 Influencing Tactics-Relationship	0.007	.183**	-0.037	-0.026	0	-0.075	-0.016	.183**	.325**	.200**	.539**	.579**	1

The results signified that there are meaningful relationship between teachers’ organizational commitment, school mindfulness and administrators’ teacher influencing tactics.

The Ordinary Least Square (OLS) technique was utilized in order to examine the direct and indirect relationship between the variables to find out the “administrator’s teacher influencing behavior’s effect on organizational commitment within the school mindfulness intermediate variable” as one of the research questions. The scales used in the research and their sub-dimensions are presented below.

Administrators’ Teacher Influencing Tactics Scale (The predictive variable);

- Rules
- Authority Power
- Expertise
- Mutual Benefit
- Reward
- Relationship

School Mindfulness (Intermediate Variable)

- Teacher Mindfulness

Organizational Commitment (Dependent Variable)

- Commitment to School
- Commitment to Politics
- Commitment to Colleagues
- Commitment to the Teaching Profession
- Commitment to Teaching

In the data analysis process as the first step, the direct effects of the sub-dimensions of the “Administrators’ Teacher Influencing Behavior” on the sub-dimensions of “School Mindfulness” and on the sub-dimensions of Organizational Commitment” were examined. Additionally, the direct effects of the “School Mindfulness Scale” as the intermediate variable on the sub-dimensions of the “Organizational Commitment Scale” was examined and presented in Table 10. In the analysis of the relation between the variables for $\alpha=0.95$ and by means of the Bootstrap technique (5000), the obtained coefficients’ ranges within %95 possibility the significance values were examined. If these ranges included zero value, it was concluded that the variables’ effect on the other variables were not significant. The direct effects and the significance levels are presented in Table 10.

Table 10. The Direct Effects of Administrators’ Teacher Influencing Behavior, School Mindfulness and Organizational Commitment

Depend. Variable	Predictive Variable	β Coeff.	Stand. Error	t	p	Lower b. G.A.	Upper b. G.A.
Commit. to School	Rules	0.007	0.0497	0.1411	0.8878	-0.0907	0.1048
	Teacher Mindfulness	0.2036	0.0449	4.5327	0.000*	0.1153	0.2919
	Administrator Mindfulness	0.5017	0.0439	11.4295	0.000*	0.4154	0.588
	Authority Power	-0.0482	0.0552	-0.874	0.3826	-0.1566	0.0602
	Expertise	0.0679	0.0506	1.3411	0.1806	-0.0316	0.1673
	Mutual Benefit	0.0392	0.0445	0.8821	0.3782	-0.0482	0.1267
	Reward	-0.0443	0.0504	-0.8802	0.3792	-0.1433	0.0547
	Relationship	0.0561	0.0455	1.235	0.2175	-0.0332	0.1455
Commit. to Politics	Rules	-0.0055	0.0533	-0.1041	0.9171	-0.1103	0.0992
	Teacher Mindfulness	-0.1309	0.0481	-2.7181	0.0068*	-0.2255	-0.0362
	Administrator Mindfulness	-0.0597	0.047	-1.2696	0.2049	-0.1522	0.0327
	Authority Power	0.1004	0.0591	1.699	0.0900	-0.0157	0.2166
	Expertise	-0.0071	0.0542	-0.1314	0.8955	-0.1137	0.0994
	Mutual Benefit	0.0521	0.0477	1.0932	0.2749	-0.0416	0.1458
	Reward	0.0963	0.054	1.7842	0.0751	-0.0098	0.2024
	Relationship	0.0509	0.0487	1.0443	0.2969	-0.0449	0.1466
Commit. to Colleagues	Rules	-0.0361	0.0502	-0.7184	0.4729	-0.1348	0.0627
	Teacher Mindfulness	0.4572	0.0454	10.0746	0.000*	0.368	0.5464
	Administrator Mindfulness	0.1341	0.0443	3.0226	0.0026*	0.0469	0.2212
	Authority Power	0.0926	0.0557	1.6614	0.0973	-0.0169	0.2021

	Expertise	-0.0376	0.0511	-0.7348	0.4629	-0.138	0.0629
	Mutual Benefit	-0.017	0.0449	-0.3774	0.706	-0.1053	0.0714
	Reward	0.0666	0.0509	1.3084	0.1914	-0.0334	0.1666
	Relationship	-0.0455	0.0459	-0.9896	0.3229	-0.1357	0.0448
Commit. to the Teaching Profession	Rules	0.0399	0.0585	0.682	0.4956	-0.0751	0.1549
	Teacher Mindfulness	0.1359	0.0528	2.5726	0.0104*	0.0321	0.2398
	Administrator Mindfulness	0.1501	0.0516	2.9061	0.0038*	0.0486	0.2515
	Authority Power	0.0385	0.0649	0.5936	0.5531	-0.089	0.166
	Expertise	-0.047	0.0595	-0.7904	0.4297	-0.164	0.0699
	Mutual Benefit	-0.0863	0.0523	-1.6497	0.0997	-0.1892	0.0165
	Reward	0.0156	0.0593	0.264	0.7919	-0.1008	0.1321
	Relationship	0.0492	0.0535	0.9199	0.3581	-0.0559	0.1543
Commit. to Teaching	Rules	-0.0072	0.0448	-0.1599	0.873	-0.0953	0.0809
	Teacher Mindfulness	0.1162	0.0405	2.8687	0.0043*	0.0366	0.1957
	Administrator Mindfulness	0.0498	0.0396	1.2594	0.2085	-0.0279	0.1276
	Authority Power	-0.057	0.0497	-1.1463	0.2523	-0.1547	0.0407
	Expertise	-0.0627	0.0456	-1.3746	0.1699	-0.1523	0.0269
	Mutual Benefit	-0.0172	0.0401	-0.4294	0.6678	-0.096	0.0616
	Reward	-0.0071	0.0454	-0.1573	0.8750	-0.0964	0.0821
	Relationship	0.049	0.041	1.1949	0.2328	-0.0316	0.1295
Teacher Mind.	Rules	-0.0749	0.0571	-1.3129	0.1899	-0.187	0.0372
	Authority Power	-0.3478	0.0536	-6.4878	0.000*	-0.4532	-0.2425
	Expertise	0.2191	0.0572	3.8312	0.0001*	0.1067	0.3315
	Mutual Benefit	-0.1336	0.0509	-2.6255	0.0089*	-0.2336	-0.0336
	Reward	-0.0655	0.0571	-1.147	0.252	-0.1776	0.0467
	Relationship	0.1409	0.052	2.7103	0.007*	0.0387	0.2431
Admin. Mind.	Rules	0.0562	0.0584	0.9627	0.3362	-0.0585	0.171
	Authority Power	-0.7476	0.0549	-13.6264	0.000*	-0.8554	-0.6398
	Expertise	0.2001	0.0585	3.4191	0.0007*	0.0851	0.3151
	Mutual Benefit	-0.0926	0.0521	-1.778	0.0761	-0.1949	0.0097
	Reward	0.1753	0.0584	3.0018	0.0028*	0.0605	0.2901
	Relationship	0.0536	0.0532	1.0067	0.3146	-0.051	0.1581

*p<0.05

The results signified that none of the sub-dimensions of the “Administrators’ Teacher Influencing Tactics Scale” as “Rules, Expertise, Mutual Benefit, Reward, Relationship and Authority Power” have a significant effect on the sub-dimensions of the “Organizational Commitment Scale”. While the Teacher Mindfulness intermediate variable have a significant effect on all sub-dimensions of the Organizational Commitment Scale, the School Mindfulness Scale have a significant effect on the Commitment to School, Commitment to Colleagues, and Commitment to Teaching Profession sub-dimensions of the Organizational Commitment Scale.

The Effect of Administrators’ Influencing Tactics on School Mindfulness

As stated in Table 10, the variable which have an effect on intermediate variables are as follows; while Authority Power, Expertise, Mutual Benefit, and Relationship sub-dimensions have a significant effect on Teacher Mindfulness; the Authority Power, Expertise, and Reward sub-dimensions have a significant effect on Administrator mindfulness.

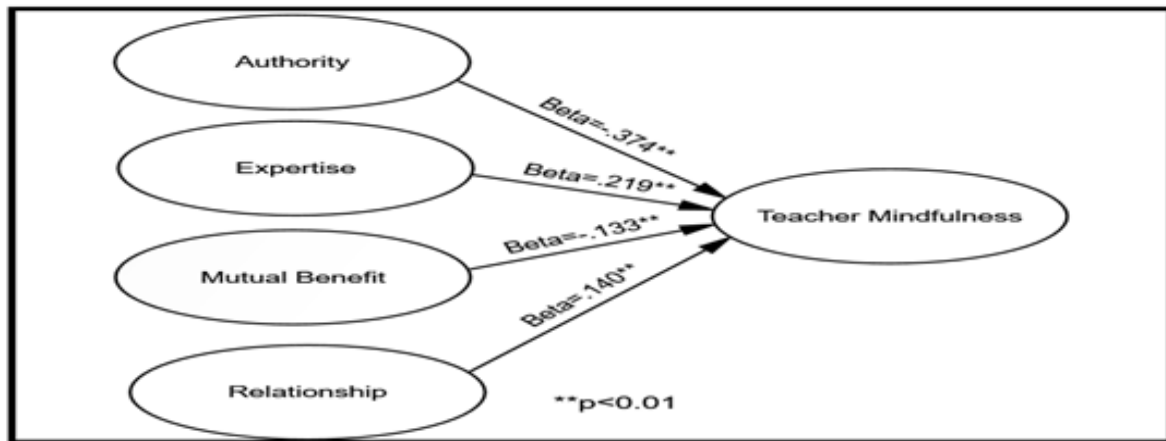


Figure 1. The Effects of Administrators' Teacher Influencing Tactics on Teacher Mindfulness

The authority power and expertise have a predictive effect on both Teacher Mindfulness and Administrator Mindfulness. While Mutual Benefit and Relationship sub-dimensions have a predictive effect on Teacher Mindfulness, Reward has a predictive effect on the Administrator Mindfulness. This situation signifies that the use of authority power by the administrator reduces the teacher mindfulness while the use of expertise increases the teacher mindfulness.

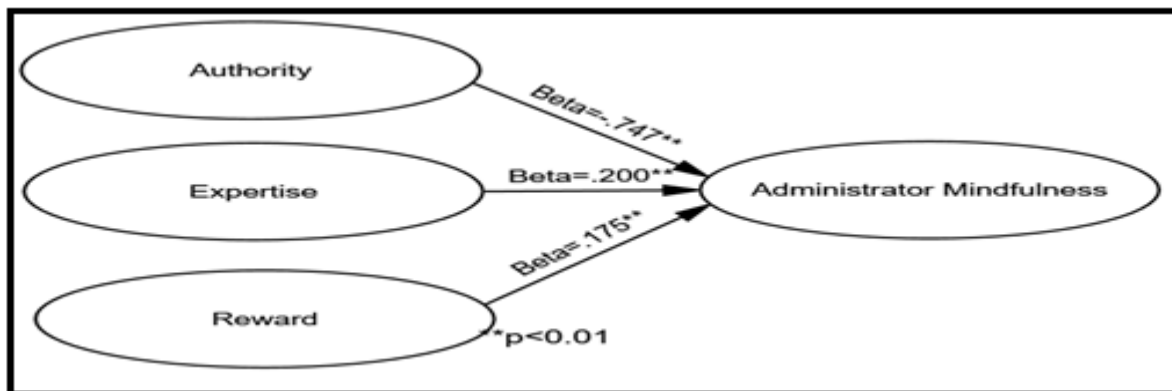


Figure 2. The Effects of Administrators' Teacher Influencing Tactics on Administrator Mindfulness

Moreover, it was found that the use of reward by the administrator to influence the teachers' increases the administrator mindfulness, whereas the use of relationship increases the teacher mindfulness. On the other hand, it was found that the use of mutual benefit by the administrators to influence the teachers reduces the teacher mindfulness.

The Effects of School Mindfulness on Teachers' Organizational Commitment

Table 10 represents the significant difference and the positive effect of the Teacher Mindfulness on Commitment to School, Commitment to Colleagues, Commitment to the Teaching Profession and Commitment to Teaching sub-dimensions. It is possible to state that when the Teacher Mindfulness increases, these commitment types are likely to increase. Additionally, the effect of Teacher Mindfulness on Commitment to Politics was found to be negative and statistically significant, meaning that an increase in the Teacher Mindfulness decreases the Commitment to Politics.

Teacher mindfulness increases the teachers' commitment to the school, commitment to the profession, commitment to the colleagues and commitment to teaching but decreases the commitment to politics.

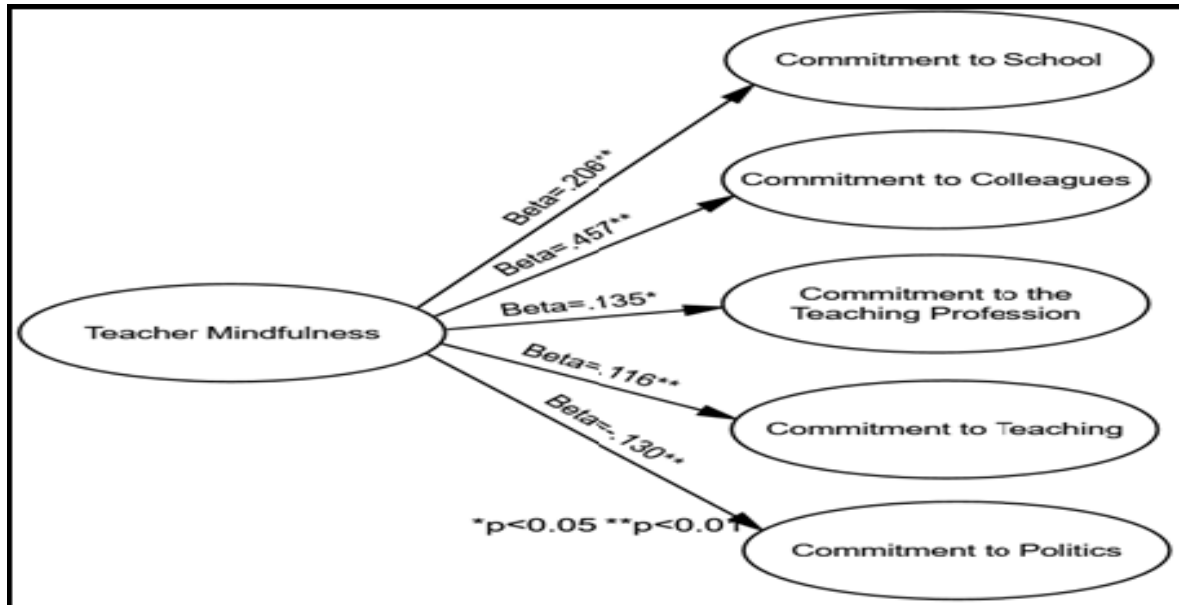


Figure3. The Effects of School Mindfulness on Teachers' Organizational Commitment

It is found that Administrator Mindfulness have a positive and significant effect on Commitment to School, Commitment to Colleagues, and Commitment to Teaching Profession sub-dimensions. According to this result, it is possible to state that an increase in administrators' mindfulness increases the teachers' commitment to school, commitment to colleagues and commitment to the teaching profession.

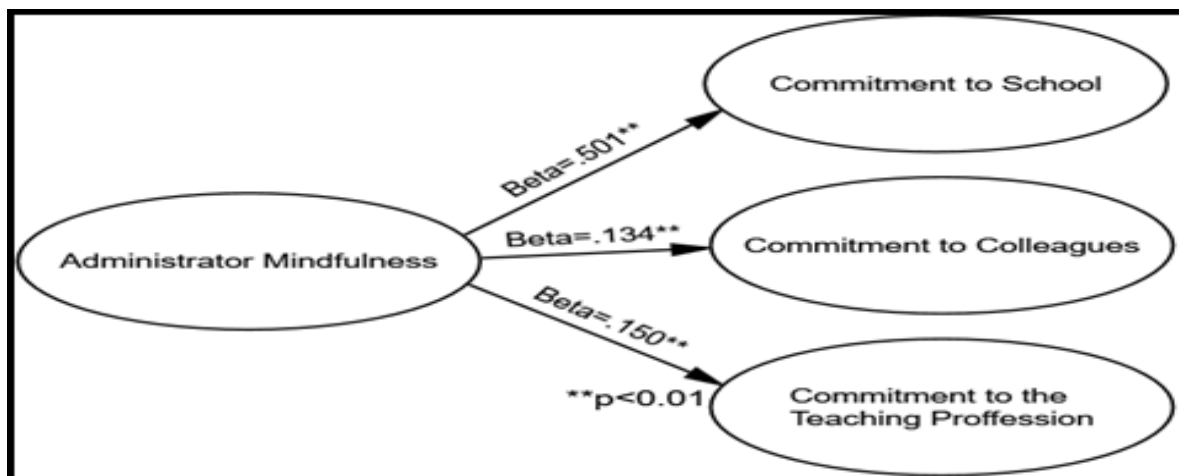


Figure 4. The Effects of School Mindfulness on Teachers' Organizational Commitment

When the results of the direct effects are assessed in general, it was found that the Administrators' Teacher Influencing Scale's sub-dimensions do not have an effect on Organizational Commitment.

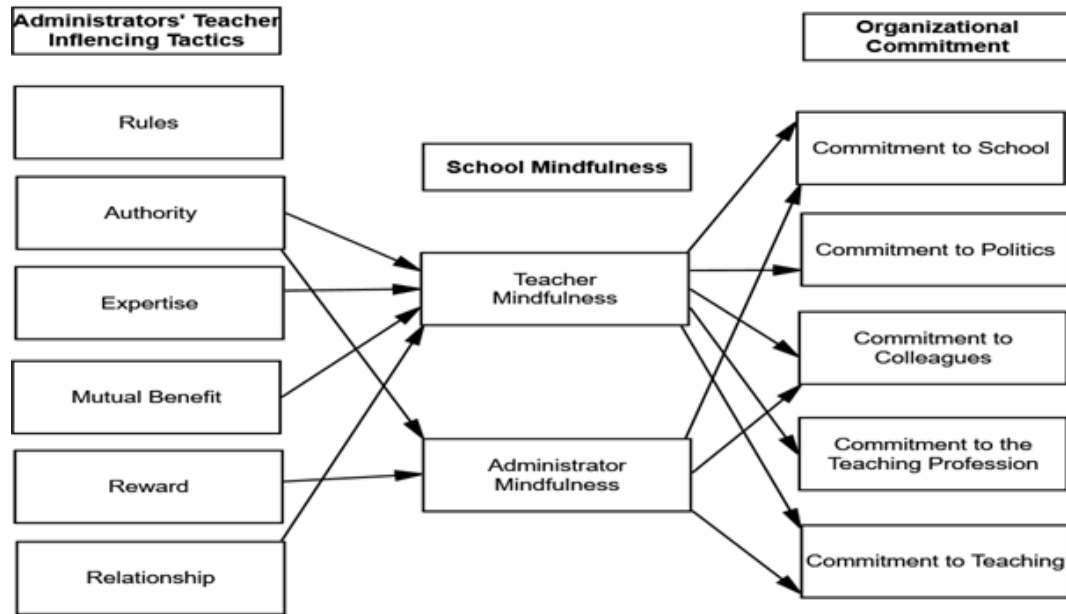


Figure5. The Model of Significant Direct Effects

However, some of the sub-dimensions have effects on Teacher Mindfulness and Administrator Mindfulness. Moreover, Teacher Mindfulness and Administrator Mindfulness intermediate variables have a significant effect on the Organizational Commitment.

Administrator's Teacher Influencing Behavior's Effects on Organizational Commitment within the School Mindfulness Intermediate Variable

Research findings revealed that there is an indirect effect between the administrators' influencing tactics, school mindfulness and organizational commitment. Within this scope, it can be mentioned that Administrators' Teacher Influencing Tactics are likely to have a significant effect on Organizational Commitment with the School Mindfulness intermediate variable.

In order to analyze this intermediary effect found out in the research, the indirect effects were examined and presented in Table 11. This table only reflects the significance values of the indirect effects.

Table11. The Administrator's Teacher Influencing Behavior's Effects on Organizational Commitment (according to sub-dimensions) within the School Mindfulness Intermediate Variable

Independent Variable	Intermediary Variable	Dependent Variable	Effect	Boot SE	Boot LLCI	Boot ULCI
Administrators' Influencing Behavior	School Mindfulness	Organizational Commitment				
Authority Power	Teacher Mindfulness	Commitment to School	-0.0708	0.0232	-0.1195	-0.0301
	Administrator Mindfulness		-0.3751	0.0456	-0.4685	-0.2878
Expertise	Teacher Mindfulness		0.0446	0.0155	0.0182	0.0784
	Administrator Mindfulness		0.1004	0.0314	0.0412	0.1658
Mutual Benefit	Teacher Mindfulness		-0.0272	0.0126	-0.0553	-0.0064
Reward	Administrator Mindfulness		0.088	0.0322	0.0227	0.1498
Relationship	Teacher Mindfulness		0.0287	0.0138	0.0073	0.0604
Authority Power	Teacher		0.0455	0.0202	0.0097	0.0898

	Mindfulness					
Expertise	Teacher Mindfulness	Commitment to Politics	-0.0287	0.0131	-0.0572	-0.0067
Mutual Benefit	Teacher Mindfulness		0.0175	0.0096	0.0025	0.0396
Relationship	Teacher Mindfulness		-.0184	.0102	-.0426	-0.0026
Authority Power	Teacher Mindfulness	Commitment to Colleagues	-0.159	0.0292	-0.2187	-0.1043
Authority Power	Administrator Mindfulness		-0.1002	0.0424	-0.1793	-0.0121
Expertise	Teacher Mindfulness		0.1002	0.0259	0.0506	0.1525
Expertise	Administrator Mindfulness		0.0268	0.0149	0.0023	0.0605
Mutual Benefit	Teacher Mindfulness		-0.0611	0.024	-0.112	-0.018
Reward	Administrator Mindfulness		0.0235	0.0128	0.0014	0.0511
Relationship	Teacher Mindfulness		0.0644	0.0224	0.0229	0.1104
Authority Power	Teacher Mindfulness		-0.0473	0.0224	-0.0937	-0.0056
Authority Power	Administrator Mindfulness	Commitment to the Teaching Profession	-0.1122	0.0465	-0.2066	-0.0222
Expertise	Teacher Mindfulness		0.0298	0.0151	0.0036	0.0618
Expertise	Administrator Mindfulness		0.03	0.0155	0.0052	0.066
Mutual Benefit	Teacher Mindfulness		-0.0182	0.0112	-0.0451	-0.001
Reward	Administrator Mindfulness		0.0263	0.0153	0.0029	0.0621
Relationship	Teacher Mindfulness		0.0192	0.0122	0.0013	0.0472
Authority Power	Teacher Mindfulness	Commitment to Teaching	-0.0404	0.0189	-0.0800	-0.0057
Expertise			0.0255	0.012	0.0036	0.0514
Mutual Benefit			-0.0155	0.0092	-0.0370	-0.0012
Relationship			0.0164	0.0096	0.0015	0.0380

As it can be seen in Table 11, within the intermediary effect of the Teacher Mindfulness; the Expertise, Mutual Benefit, and Relationship sub-dimensions of the Administrators' Teacher Influencing Tactics on Commitment to School was measured as positive and significant, whereas the Authority Power sub-dimension was measured to have a negative and significant effect on Commitment to School within the intermediate effect of Teacher Mindfulness. This mediating effect was measured to be a total effect, so that the effect of the predictive variables on the dependent variable was insignificant without the intermediate effect. When the regression coefficients of the variables are examined, the effects were found to be at a low level.

Within the intermediary effect of the Administrator Mindfulness; the Expertise, and the Reward sub-dimensions of the Administrators' Teacher Influencing Tactics on Commitment to School was measured as positive and significant, whereas the Authority Power sub-dimension was measured to have a negative and significant effect on Commitment to School within the intermediate effect of the Administrator Mindfulness. Likewise, the total effect was measured within the variables and the effect of Authority Power sub-dimension was found to be at a moderate level.

Commitment to School, Commitment to Colleagues, and Commitment to the Teaching Profession: All of the sub-dimensions of the Administrators' Teacher Influencing behaviors have an effect on teachers' Commitment to School, Commitment to Colleagues and Commitment to the Teaching Profession within the

intermediate effect of the School Mindfulness. This effect was measured to decrease the teachers' commitment to school, commitment to colleagues, and commitment to the teaching profession due to the administrators' authority power and mutual benefit behaviors over the school mindfulness, which also has a characteristic feature to increase these commitment levels of the teachers from the other sub-dimensions' effects.

Commitment to Teaching Profession: The findings revealed that the administrators' influencing behaviors that depend on authority power, mutual benefit, relationship and expertise have an effect on teachers' commitment to the teaching profession over teacher mindfulness' intermediate effect. It was found out that administrators' expertise and relationship behaviors increases teachers' commitment to school within the effect of the teacher mindfulness intermediate variable, whereas the administrators' authority power and mutual benefit behaviors decreases the teachers' commitment to the teaching profession.

Commitment to Politics: Administrators' informal influencing behaviors that depend on relationship, mutual benefit, expertise, and authority power were found to have an effect on teachers' commitment to politics over teacher mindfulness intermediate variable. While the administrators' authority power and mutual benefit behaviors increase the teachers' commitment to politics, the informal relationship with the teachers and the expertise decreases the teachers' commitment to politics.

According to Table 12, within the intermediate effect of the teacher mindfulness, the Authority Power and Mutual Benefit sub-dimensions were measured to have a negative and significant effect on the Commitment to Teaching Profession, whereas the Expertise and the Relationship sub-dimensions have a positive and significant effect on the Commitment to Teaching Profession within the intermediate effect of teacher mindfulness. The total effect was also found in this model in which the indirect effects were examined. When the regression coefficients are examined the effect was found to be at a low level.

Table 12. The Administrator's Teacher Influencing Behavior's (according to sub-dimensions) Effect on the Organizational Commitment within the School Mindfulness Intermediate Variable

Independent Variable	Intermediate Variable	Dependent Variable	Effect	Boot SE	Boot LLCI	Boot ULCI
Administrator's Influencing Behavior	School Mindfulness	Organizational Commitment				
Authority Power	Teacher Mindfulness	Political Commitment	0.0455	0.0202	0.0097	0.0898
	Teacher Mindfulness	Commitment to Colleagues	-0.159	0.0292	-0.2187	- 0.1043
	Administrator Mindfulness		-0.1002	0.0424	-0.1793	- 0.0121
	Teacher Mindfulness	Commitment to the Teaching Profession	-0.0473	0.0224	-0.0937	- 0.0056
	Administrator Mindfulness		-0.1122	0.0465	-0.2066	- 0.0222
	Teacher Mindfulness	Commitment to Teaching	-0.0404	0.0189	-0.0800	- 0.0057
	Teacher Mindfulness	Commitment to School	-0.0708	0.0232	-0.1195	- 0.0301
	Administrator Mindfulness		-0.3751	0.0456	-0.4685	- 0.2878
Expertise	Teacher Mindfulness	Political Commitment -	-0.0287	0.0131	-0.0572	- 0.0067
	Teacher Mindfulness	Commitment to School	0.0446	0.0155	0.0182	0.0784
	Administrator Mindfulness		0.1004	0.0314	0.0412	0.1658
	Teacher Mindfulness	Commitment to Colleagues	0.1002	0.0259	0.0506	0.1525
	Administrator Mindfulness		0.0268	0.0149	0.0023	0.0605

	Teacher Mindfulness	Commitment to the Teaching Profession	0.0298	0.0151	0.0036	0.0618
	Administrator Mindfulness		0.03	0.0155	0.0052	0.066
	Teacher Mindfulness	Commitment to Teaching	0.0255	0.012	0.0036	0.0514
Relationship	Teacher Mindfulness	Commitment to School	0.0287	0.0138	0.0073	0.0604
		Political Commitment -	-.0184	.0102	-.0426	-.0026
		Commitment to Colleagues	0.0644	0.0224	0.0229	0.1104
		Commitment to Teaching	0.0164	0.0096	0.0015	0.0380
		Commitment to the Teaching Profession	0.0192	0.0122	0.0013	0.0472
Mutual Benefit	Teacher Mindfulness	Political Commitment +	0.0175	0.0096	0.0025	0.0396
		Commitment to Colleagues	-0.0611	0.024	-0.112	-0.018
		Commitment to the Teaching Profession	-0.0182	0.0112	-0.0451	-0.001
		Commitment to Teaching	-0.0155	0.0092	-0.0370	- 0.0012
		Commitment to School	-0.0272	0.0126	-0.0553	- 0.0064
Reward	Administrator Mindfulness	Commitment to the Teaching Profession	0.0263	0.0153	0.0029	0.0621
		Commitment to Colleagues	0.0235	0.0128	0.0014	0.0511
		Commitment to School	0.088	0.0322	0.0227	0.1498

When each of the administrators' influencing tactics sub-dimensions' effects on teachers' organizational commitment were examined the results are as follows.

The Authority power: The use of Authority Power by the administrators to influence the teachers affects all of the sub-dimensions of the Teachers' Organizational Commitment over both of the two sub-dimensions. While this effect helps to increase the teachers' commitment to politics, it has a decreasing effect on the rest of the sub-dimensions of the Organizational Commitment.

Expertise: Administrators' use of expertise to influence the teachers has an effect on organizational commitment over school mindfulness. It was found that, this effect decreases the teachers' commitment to politics while increasing their commitment levels in other sub-dimensions.

Mutual Benefit: The administrators' use of mutual benefit affects all of the sub-dimensions of the Organizational Commitment over Teacher Mindfulness. While the mutual benefit behavior increases the teachers' commitment to politics, it decreases the commitment levels in the other sub-dimensions.

Relationship: The administrators' use of informal and sincere Relationship to influence the teachers affects all of the sub-dimensions of the Organizational Commitment over Teacher Mindfulness. While the informal relationship of the administrators' to influence the teachers decreases the teachers' commitment to politics, it increases the commitment levels in other sub-dimensions.

Reward: The administrators' use of Reward to influence increases the teachers' commitment to the teaching profession, relationship with other teachers, and commitment to school over Administrator Mindfulness.

The Effects of Demographic Variables

Teacher Demographics: In order to examine the significant difference between the teacher influencing tactics,

school mindfulness and organizational commitment levels, non-parametric Mann Whitney U and Kruskal Wallis tests were applied.

It was found that the teachers' Commitment to Politics ($U=20484,5$, $p\leq.05$), Commitment to the Teaching Profession ($U=20246$, $p\leq.05$), the administrators' use of Authority Power ($U=20568$, $p\leq.05$), Mutual Benefit ($U=20337$, $p\leq.05$), Reward ($U=19310$, $p\leq.05$), and Relationship ($U=17649$, $p\leq.05$) to influence the teachers signified a statistically meaningful difference ($U=17649$, $p\leq.05$) according to the gender variable. Findings revealed that, the teachers' level of commitment to politics, the level of the administrators' tactics to influence the teachers with the use of power, the level of the administrators' tactics to influence the teachers with mutual benefit, the level of the administrators' tactics to influence the teachers with the use of reward, and the level of the administrators' tactics to influence the teachers with relationship were higher in men rather than the women. The teachers' commitment to the teaching profession was found higher in women rather than the men.

Seniority: Kruskal Wallis test results revealed that teachers' Commitment to Politics differs according to the seniority level ($\chi^2=21.906$, $p\leq.05$). The multiple comparisons signified that there was a significant difference in terms of commitment to politics between the teachers with less than a year seniority and the teachers with 26 years and more seniority, and also the teachers with 1-5 years of seniority and the teachers with 26 years and more seniority, in favor of the ones with 26 years and more seniority level.

Kruskal Wallis test results revealed that teachers' Commitment to Politics differs according to the seniority level ($\chi^2=21.906$, $p\leq.05$). The multiple comparisons signified that the level of the commitment to politics of the teachers with 26 years and more seniority was higher than the ones with 1-5 years seniority and also with the ones with less than a year of seniority.

Age: The teachers' level of Commitment to Politics was found to be significant ($\chi^2=19,288$, $p\leq.05$), according to the Kruskal Wallis test conducted for the age variable. The multiple comparison test results revealed that teachers with 51 years and more age have higher scores rather than the ones with 20-30 years and the ones with 31-40 years of age.

The School Type: According to the Kruskal Wallis test results, the Teacher Mindfulness ($\chi^2=14,904$, $p\leq.05$) and Teacher Influencing Tactics based on the use of the Rules ($\chi^2=13,797$, $p\leq.05$) differs according to the school type of the participants. The multiple comparison test results revealed that teachers who teach in vocational schools have lower scores of Teacher Mindfulness rather than the ones who teach at the primary level. The teachers who teach at the primary level have lower scores in the administrators' use of the Rules in teacher influencing rather than the ones who teach at the secondary level.

The Service time: According to the Kruskal Wallis test conducted for the service time of the teachers, it was found that teachers' Commitment to Politics ($\chi^2=13,444$, $p\leq.05$), Commitment to Teaching Profession ($\chi^2=19,457$, $p\leq.05$), and Administrator Mindfulness ($\chi^2=11,481$, $p\leq.05$) have significant differences. When the service time of the teachers increases the administrator mindfulness decreases. On the other hand, the increase in the teachers' service time also increases their commitment to the teaching profession.

The Examination of the Teacher Influencing Tactics' Effects on Organizational Commitment

The Effect of Administrators' Teacher Influencing Behavior on Commitment to School: The model that was developed to predict teachers' Commitment to School sub-dimension over teachers' Organizational Commitment level was found significant ($F(457,6)=28.358$, $p\leq.05$, $R^2=.27$). Amongst the administrators' teacher influencing tactics; Authority Power, Expertise, Relationship were found to be the significant (respectively; $t=-8.618$, $t=3.480$, $t=2.009$, $p\leq.05$; within 95 % reliability intervals no zero degree was detected) predictors of the Commitment to School sub-dimension of the Organizational Commitment Level.

The Effect of Administrators' Teacher Influencing Tactics on the School Sub-dimension of Organizational Commitment: When the standardized beta coefficients were examined, it was found that one unit of increase in the standard deviation in the power based teacher influencing level, .447 points decrease happens in the teachers' commitment to school levels, one unit of increase in the standard deviation in the expertise based teacher influencing, .171 points increase happens in the teachers' commitment to school levels, and one unit of increase in the standard deviation in the relationship based teacher influencing, .107 points increase happens in the teachers' commitment to school levels if the other variables were controlled.

The Effect of Administrators' Teacher Influencing Behavior on the Teachers' Commitment to Politics: The model that was developed to predict teachers' Commitment to Politics sub-dimension over teachers' Organizational Commitment level was found significant ($F(457,6) = 10.988$, $p \leq .05$, $R^2 = .126$). The Authority Power based influencing tactics amongst the administrators' teacher influencing tactics were found to be the significant ($b_1 = .191$, $t = 3.773$, $p \leq .05$) predictor of Commitment to Politics sub-dimension of the Organizational Commitment Level.

When the standardized beta coefficients were examined, it was found that one unit of increase in the standard deviation in the authority power based teacher influencing level, .214 points increase happens in the teachers' commitment to politics levels. The developed model predicts 13% of the teachers' commitment to politics levels if other variables were controlled.

The Effect of Administrators' Teacher Influencing Behavior on the Teachers' Commitment to Colleagues The model that was developed to predict teachers' Commitment to Colleagues sub-dimension over teachers' Organizational Commitment level was found significant ($F(457,6) = 5.956$, $p \leq .05$, $R^2 = .073$). The Authority Power based influencing tactics amongst the administrators' teacher influencing tactics were found to be the significant ($b_1 = -.167$, $t = -3.039$, $p \leq .05$) predictor of Commitment to Colleagues sub-dimension of Organizational Commitment Level.

When the standardized beta coefficients were examined, it was found that one unit of increase in the standard deviation in the power based teacher influencing level, .178 points increase happens in the teachers' commitment to politics levels. The developed model predicts 7% of the teachers' commitment to colleague levels if other variables were controlled.

The Effect of Administrators' Teacher Influencing Behavior on the Teachers' Commitment to the Teaching Profession: The model that was developed to predict teachers' Commitment to Teaching Profession sub-dimension over teachers' Organizational Commitment level was found significant ($F(457,6) = 3.882$, $p \leq .05$, $R^2 = .048$). The Mutual Benefit based influencing tactics amongst the administrators' teacher influencing tactics were found to be the significant ($b_1 = -.118$, $t = -2.222$, $p \leq .05$) predictor of Commitment to the Teaching Profession sub-dimension of Organizational Commitment Level.

When the standardized beta coefficients were examined, it was found that one unit of increase in the standard deviation in the mutual benefit based teacher influencing level, .147 points decrease happens in the teachers' commitment to the teaching profession levels. The developed model predicts 5% of the teachers' commitment to the teaching profession levels if other variables were controlled.

The Effect of Administrators' Teacher Influencing Behavior on the Teachers' Commitment to the Teaching: The model that was developed to predict teachers' Commitment to Teaching sub-dimension over teachers' Organizational Commitment level was found significant ($F(457,6) = 3.391$, $p \leq .05$, $R^2 = .043$). The Authority Power based influencing tactics amongst the administrators' teacher influencing tactics were found to be the significant ($b_1 = -.132$, $t = -3.103$, $p \leq .05$) predictor of Commitment to the Teaching sub-dimension of Organizational Commitment Level.

When the standardized beta coefficients were examined, it was found that one unit of increase in the standard deviation in the power based teacher influencing, .184 points decrease happens in the teachers' commitment to the teaching profession levels. The developed model predicts 4% of the teachers' commitment to the teaching profession levels if other variables were controlled.

The Effect of Administrators' Teacher Influencing Behavior on the School Mindfulness: The model that was developed to examine the variables that have an effect on teachers' School Mindfulness was found significant ($F(457,6) = 24.476$, $p \leq .05$, $R^2 = .243$). Amongst the administrators' teacher influencing tactics; The Power based influencing tactics ($b_1 = -.348$), Mutual Benefit based influencing tactics ($b_2 = -.134$), and Relationship based influencing tactics ($b_3 = .141$) were found to be the significant ($t = -6.488$, $t = 3.831$, $t = -2.625$, $t = 2.710$ respectively) predictors of teachers' School Mindfulness level.

When the standardized beta coefficients were examined, it was found that one unit of increase in the standard deviation in the power and mutual benefit based teacher influencing level, .343 and .155 points decrease

happens in the teachers' school mindfulness, and one unit of increase in the standard deviation in the expertise and relationship based teacher influencing level creates .192 and .148 points increase happens on the teachers' school mindfulness. The developed model predicts 24% of the teachers' school mindfulness levels if other variables were controlled.

The Effect of Administrators' Teacher Influencing Behavior on the Administrators' School Mindfulness:

The model that was developed to examine the variables that have an effect on administrator' School Mindfulness was found significant ($F(457.6) = 28.320$, $p \leq .05$, $R^2 = .470$). Amongst the administrators' teacher influencing tactics; Authority Power based influencing tactics ($b_1 = -.748$), Expertise based influencing tactics ($b_2 = .200$), and Reward based influencing tactics ($b_1 = .175$) were found to be the significant ($t = -13.626$, $t = 3.419$, $t = 3.002$ respectively) predictors of Administrator Mindfulness.

When the standardized beta coefficients were examined, it was found that one unit of increase in the standard deviation in the authority power and mutual benefit based teacher influencing levels .601 and .093 points decrease happens on the administrators' school mindfulness, and one unit of increase in the standard deviation in the authority power and mutual benefit based teacher influencing levels .139 and .125 points increase happens on the administrators' school mindfulness. The developed model predicts 47% of the administrators' school mindfulness if other variables were controlled.

The Effect of School Mindfulness on the Organizational Commitment: The model that was developed to examine the variables that have an effect on teachers' Organizational Commitment was found significant. The teacher Mindfulness was significant in all sub-dimensions of the Organizational Commitment ($b_1 = .211$, $-.165$, $.442$, $.140$, $.122$, $p < .05$ respectively), and the Administrator Mindfulness was found significant in Commitment to School, Commitment to Colleagues, and Commitment to the Teaching profession sub-dimensions ($b_1 = .523$, $-.114$, $.092$, $.146$, $p < .05$, respectively).

Examination of the Effects of Administrators' Teacher Influencing Tactics on Organizational Commitment within the School Mindfulness Intermediate Variable

In order to examine this effect, the direct and indirect relations between the variable OLS technique was utilized. In the analysis of the relation between the variables for $\alpha = 0.95$ and by means of the Bootstrap technique (5000), the obtained coefficients' ranges within %95 possibility the significance values were examined. If these ranges included zero value, it was concluded that the variables' effect on the other variables were not significant. The direct and indirect effects are presented in Figure 6.

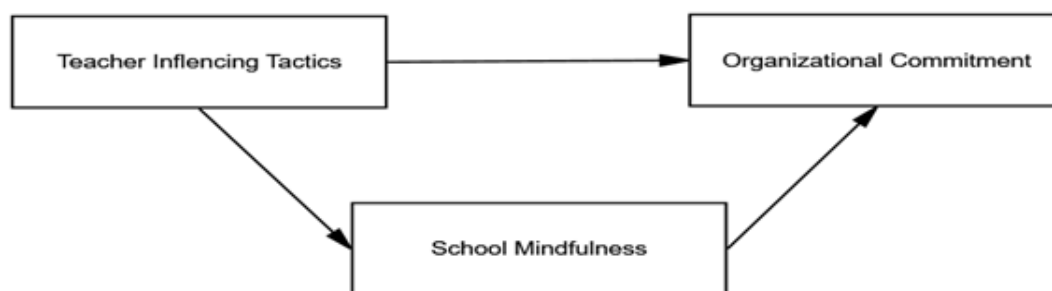


Figure 6. The Intermediator Model

Table13. The Direct Effects

Depend. Variable	Predictive Variable	β Coeff.	Stand. Error	t	p	Upper b. G.A.	Lower b. G.A.
Org. Commit.	Teacher Influencing Tactics	.0727	.0363	2.003	.0461	.0013	.1441
School Mindfulness	School Mindfulness	.3731	.0228	16.3587	.0000	.3283	.4179
	Teacher Influencing Tactics	-.5576	.0694	-8.0287	.0000	-.6941	-.4211

* $p < 0.05$

As stated in Table 13, "Administrators' Teacher Influencing Tactics" have a positive and significant effect on the "Organizational Commitment". Moreover, "Administrators' Teacher Influencing Tactics" have a negative and significant effect on the "School Mindfulness". Additionally, the "School Mindfulness" have a positive and

significant effect on the “Organizational Commitment”. Therefore, it is possible to state that all of the direct effects in the model were found to be significant.

Table14. The Indirect Effects

Indirect Effect	Effect	%95 confidence interval	Lower b. G.A	Upper b. G.A.
Teacher Influencing Tactics $\rightarrow$ School Mindfulness $\rightarrow$ Org. Commitment	-0.2080	0.0287	-0.2684	-0.1556

Table 14 reflects the indirect effects of the variables in the research. Administrators’ teacher influencing tactics have a negative and significant effect on organizational commitment with the intermediate effect of the school mindfulness. So that the direct and indirect effects on the dependent variable were significant, the intermediate effects were measured to be partial.

THE RESULTS

One of the important findings in this research is that the administrators’ influencing tactics directly increases the teachers’ organizational commitment whereas these influencing tactics decreases the teachers’ organizational commitment within the effect of the school mindfulness as the intermediate variable. Moreover, administrators’ teacher influencing tactics decreases school mindfulness but increases teachers’ organizational commitment.

The decreasing effect of the administrators’ influencing tactics on the teachers’ organizational commitment over school mindfulness can possibly depend on the dominance of the administrators’ mindfulness. Teachers’ organizational commitment highly depends on the intrinsic rewards rather than the extrinsic rewards. The authority power, mutual benefits and rewards which have formal sanctions over an administrator’s and a teacher’s mindfulness form intrinsic motivators like expertise.

The result drawn from this situation is that external pressure and rewards are active in the influencing tactics. Under these circumstances, we cannot expect an increased organizational commitment from a group of teachers who are under the effect of an extrinsic pressure and reward. The administrators’ aim to affect the teachers depending on their expertise and the reward style is the desired administrative behavior in terms of teacher’s organizational commitment. Depending on this reason, the influencing behavior which is expertise and reward based is not expected to have an effect on the organizational commitment over teacher mindfulness.

On the other hand, the best explanation of the school mindfulness’ positive and direct effect on organizational commitment is that without the effect of any variable or related with it, an administrator group’s or a teacher group’s common understanding in the process of fulfillment of the school’s aims with an effective way, is in fact a reflection of an understanding that creates a surrounding for the organizational commitment. Depending on this reason, we can say that school commitment increases teachers’ organizational commitment.

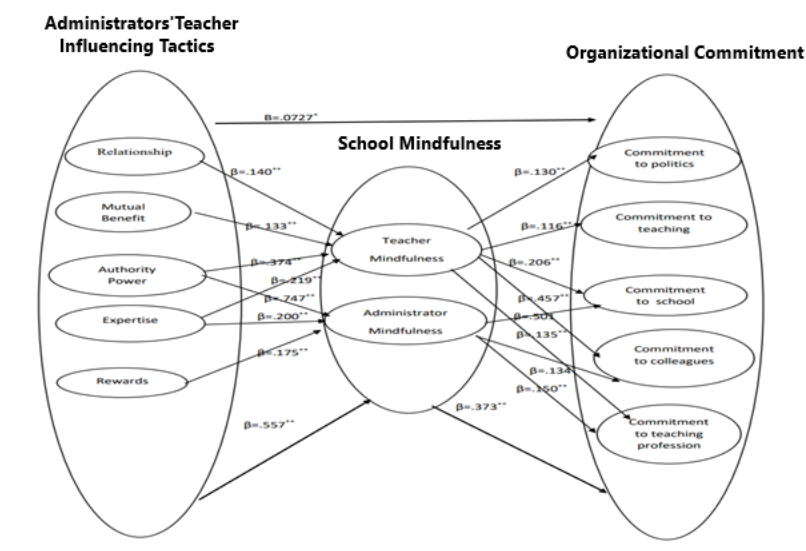


Figure7. The Direct and Indirect Effect Model between the Teacher Influencing Tactics, School Mindfulness and Organizational Commitment

Administrators' use of authority power and mutual benefit in the communication with the teachers effects the teachers' commitment to teaching negatively whereas sincere communication that depends on expertise effects the teachers' commitment to teaching and increases the productivity. The leading point in this situation is that the administrators feel more effective when their expertise and reward power are combined.

The teacher mindfulness related to design qualified teaching activities decreases the teachers' commitment to politics, but increases the teachers' commitment to school, commitment to the teaching profession, commitment to teaching and commitment to colleagues.

The administrators' influencing tactics that depend on the authority power only increases the teachers' commitment to politics. Considering that commitment is a concept based on psychological inclusion and high internal satisfaction, the authority power depends only giving orders would have a negative effect on the teachers' multi-dimensional commitment.

It is possible to state that, the administrators' influencing behavior that depends on the authority power and mutual benefit creates a teacher perspective (a political one) that is suitable with the administrators' values and beliefs. On the other hand, when the administrators' use reward power combined with the authority power, the teachers' school mindfulness and organizational commitment decreases so that this use of power is perceived as a form of threat. When the reward power is used with expertise it increases school mindfulness and organizational commitment.

An administrator's use of authority power to convince a teacher to get a membership from the educational syndicate that the administrator is already a member can stand as a good example for this situation.

It was found that the administrators' capacity that their status requires, which is having an instructional leadership virtue, increases all commitment types of the teachers except their commitment to politics. We can state that, the administrators who have the capacity to rule increase the teachers' commitment to the teaching profession, commitment to school, commitment to teaching and commitment to the colleagues rather than developing the teachers' commitment to politics.

Administrators' sincere and close relationship with the teachers that focuses on teaching increases the teachers' commitment to teaching.

The administrators' influencing tactics that depend on mutual benefit within the school mindfulness intermediate effect increases teachers' commitment to politics, but decreases other commitment types. The result is that, the teachers' approaches to their profession to fulfill their duties effectively depend on a high sense of responsibility rather than a beneficiary behavior.

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The Impact of Flipped Classroom on Student Learning in Higher Education Institutions in the Middle East

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Abstract

This research examines how flipped classroom (FC) instruction affects the academic results of university students throughout the Middle East. FC teaching pedagogy is one of the relatively new innovative teaching pedagogies that have benefited from the latest technological advancements and emerged as a potential replacement for traditional classroom teaching pedagogies. Based on activity theory, this investigation used two sections from a human-computer interaction course in the Computer Information Sciences department to conduct its quasi-experimental research design. The research included one traditional teaching approach alongside an FC methodology. The assessment of student achievement relied on moderated examinations that measured individual Course Learning Outcomes (CLOs). The research shows that students who learned through an FC approach achieved better results than traditional education methods ($p = 0.007$), scoring 81.25 on average versus 74.25, respectively. Scores measuring CLO3 (81.25) in the FC group exceeded those of CLO2 (79.85) with statistical significance ($p = 0.011$). The traditional section showed no meaningful differences between CLO2 and CLO3 results. The study demonstrates that FC tools, student-centered activities, and educational technology mediate student learning outcomes. The research demonstrates that FC pedagogies offer superior results to traditional teaching models by enhancing student learning achievements and study participation. The research provides essential quantitative findings supporting FC integration within Middle Eastern higher education institutions.

Keywords: Activity Theory, Teaching Pedagogies, Flipped Classroom, Higher Education, Traditional Education.

Introduction

Local and international accreditation commissions constantly pressure Higher Education Institutions (HEIs) in the Middle East to improve student learning outcomes in communications, problem-solving, and ability to function on multidisciplinary teams [2]. Recent research has been criticized for being overly focused on assessing these outcomes solely for accreditation purposes. The alternative is to take a broader holistic view of the student learning outcomes and that the achievement of these outcomes is contingent on the selection of teaching pedagogies that are effective in equipping students with the skills and attitudes specified in those outcomes [3]. Middle East HEIs have realized that using traditional teaching pedagogies such as informative lectures and traditional assessments with closed question types will not be enough to address the accreditation commissions' demands. They embed innovative teaching approaches in their strategic plans to address that shortage. Flipped Classroom (FC) is one of these new innovative teaching pedagogies HEIs strive to implement to address that shortage [4]. The FC model is based on the inverted classroom Yarbrow *et al.* model, where subject matter knowledge is learned outside the classroom using technology, and in-class meetings are used for active learning experiences [5]. Considering that many researchers have argued that FC teaching pedagogy can be much more effective than traditional informative lectures, the executives of Middle East HEIs are encouraging faculty to explore the impact of FC on student learning outcomes [6-8].

One public institution has adopted a new strategic plan with Hybrid Collaborative Teaching (HCT) 2.0 to ensure student-centred learning by blending traditional and innovative technological teaching pedagogies [9]. To implement a new strategic plan, the Computer Information Science (CIS) department faculty were encouraged to explore innovative teaching pedagogies and investigate their impact on student learning outcomes. This is the first research in the CIS department that delves into the FC potentials to examine their impact on students' learning outcomes. This research paper contributes to the second goal of the institution's strategic plan, which is to "Blended traditional and innovative teaching methods to ensure student-centered learning" [9] by first introducing

FC in regular classrooms as a new innovative teaching method and second by exploring the mediating potentials of FC on students learning outcomes.

The relationship between student learning outcomes and FC teaching pedagogy, including the technology used, is beginning to be explored in the literature [10]. However, there is a clear need for a theoretical framework to understand better how FC teaching pedagogy and its technology impact student learning. The overarching question of this study is to investigate how the FC teaching pedagogy mediates the relationship between learners and their learning outcomes. A quasi-experimental research design was used, and a theoretical framework was developed using activity theory. Data was obtained from students' grades in two identical sections of the same Human-Computer Interaction course, where one section was taught using traditional classroom pedagogy and the other was taught using FC pedagogy. Comparing students' performance in these two sections will help explore the mediating role of FC teaching pedagogy between learners and learning outcomes.

The FC teaching pedagogy is one of those new pedagogies receiving increased attention from researchers and practitioners [11]. However, a significant portion of the previous research on FC focused on the types of in-class and out-of-class activities, frameworks used to evaluate the studies, and the methodological characteristics of each study. It mainly focused on students and faculty's perceptions [12, 13]. While few studies reported anecdotal evidence suggesting that student learning is improved in FC compared to traditional classrooms, very little research investigated student learning outcomes objectively. Scholars have recommended that further work is needed to objectively investigate student learning outcomes using controlled experiments or quasi-experimental designs [14, 15]. Considering the mounting pressure on my college from accreditation commissions, increasing tuition costs, free online courses, competition, and reduced budget, the issue of ascertaining the impact of FC teaching pedagogy on student learning outcomes merits special attention.

The research explores FC pedagogy as it mediates students and learning results and assesses its effect on CIS department student achievement. Through the application of activity theory, the research analyzes the mutual effect of tools, rules, and community structures on learning outcomes. The study addresses a significant research void by delivering quantitative findings from Middle Eastern higher education that lacks studies about FC's effects on student cognition. The research aligns itself with institutional strategic goals at HCT while advancing international discussions about innovative teaching approaches to benefit educational policymaking and teaching practice.

1. Literature Review

This literature review aims to provide an overview of the impact of technology on teaching pedagogies and its related effect on student learning outcomes. It also aims to provide a brief overview of the relevant research on the emergence of the FC in HEIs and its links to pedagogy and learning outcomes. The literature review is organized as follows:

1.1. Technology and teaching pedagogies

The rise of technology over the last 25 years has significantly changed teaching and learning in higher education institutions [16-18]. In conjunction with that, a body of literature focused on finding innovative approaches to integrate technology into education [19]. However, there has been a shift in recent literature away from a strong focus on technology integration and its opportunities to a focus on technology as an enabler for innovative new teaching pedagogies and how those technologies can support teaching and learning [20, 21].

Ertmer *et al.* are among the scholars calling for this focus shift from technology integration to technology-enabled learning [22]. The authors stated that for the last 30 years, educators and researchers have been striving to achieve meaningful technology use. However, regardless of the significant investments in educational technologies, there are few assurances that educators are using technology for teaching and learning.

De Koster *et al.* argued for the same shift but recommended a concept-guided development of a technology approach to achieve technology-enabled learning [23]. Whether a new authentic technology-enabled learning environment [22] or a concept-guided approach [23], technology plays a vital role in enabling new teaching pedagogies that significantly impact teaching and learning.

Recent scholarship emphasizes that technology must enable pedagogical innovation rather than serve as a substitute for content delivery. This aligns with Vongkulluksn *et al.* (2023), who argue that value-driven adoption—rather than mere access—predicts meaningful integration in classrooms.

1.2. Flipped classroom and its effectiveness

The FC is a teaching pedagogy in which the learning content is not presented during classroom time; students learn the content before classroom meetings [24]. The FC pedagogy consists of two stages. The first stage is the pre-class learning stage, where students learn the subject knowledge on their own and outside classroom time using material prepared by their teachers. The second stage is in the classroom, where instructors use student-centered active learning activities [25, 26]. Technology has enabled new tools for both stages. Instead of using text-based material or pre-recorded commercial videos, technology has enabled various new media formats that teachers can use to record videos or podcasts and publish them online for their students using different learning management systems [27]. A few examples of these tools are Jing by TechSmith [28], CamStudio by RenderSoft [29], and Screen-O-Matic by ScreenOMatic [30].

The effectiveness of FC in terms of their capacity to improve students' overall motivation, improve students' higher-order thinking skills, and improve students' collaborative learning has been repeatedly investigated in both research and practical studies [31-33]. However, most of these studies are based on students' self-reporting data on their experiences, attitudes, and perceptions. Research on the FC capacity to improve students' cognitive learning outcomes is still lacking [34, 35].

Recent studies have begun to address this gap through experimental and meta-analytic research. For instance, a 2024 experimental study by Kühl *et al.* demonstrated that flipping without in-class enrichment still significantly improved knowledge retention and metacognitive awareness among psychology students [Kühl *et al.*, 2024]. Similarly, a 2022 meta-analysis by Kapur *et al.* reviewed 173 flipped-classroom studies and proposed a structured framework—Fail, Flip, Fix, and Feed—emphasizing the need for meaningful in-class activities to maximize flipped learning's impact [Kapur *et al.*, 2022]. These findings reinforce the importance of thoughtful instructional design in FC environments.

1.3. Flipped classroom in HEIs in the Middle East

There is consensus among researchers that FC pedagogy has emerged from K-12 education [37]. O'Flaherty and Phillips *et al.* investigated the reasons for this emergence by conducting a comprehensive overview of the literature on HEIs. They concluded that the increased pressure to promote student-centered learning and increase student satisfaction, student retention, and competition were among the main reasons HEIs promote FC pedagogies in their institutions [11]. However, a review of previous studies on FC in HEIs by Chen *et al.* concluded that FC in HEIs is still underutilized and underexplored [27]. The authors stated that both research and design models on FC in HEIs are insufficient. In line with the findings about the effectiveness of FC in the section above, most of the limited research conducted on FC in HEIs has focused on students' and instructors' experiences, while very few focused on students' cognitive learning outcomes. For example, Gilboy *et al.* conducted a qualitative study on HEIs to describe students' perceptions on FC [10].

Another example is the study conducted by Hao *et al.* about undergraduate students' perspectives on FC [6]. Many other qualitative studies are listed by O'Flaherty and Phillips *et al.* [11]. On the other hand, very few studies on FC in HEIs were of quantitative design that focused on student cognitive learning outcomes. For example, Bradford *et al.* experimented by implementing FC pedagogy in a first-year undergraduate mathematics course. Bradford *et al.* concluded that, on average, students performed better in assessments for topics taught using the FC pedagogy [38].

The usage of FC teaching pedagogy in HEIs in the Middle East is still in its early stages [39]. However, the past two years have seen a growing number of studies in the region exploring flipped learning in practical disciplines. For example, a 2024 quasi-experimental study in Ethiopian HEIs showed significant gains in student participation and satisfaction using flipped methods in health education courses [Ayele *et al.*, 2024]. Similarly, a gamified FC model implemented in 2025 in a Middle Eastern engineering program led to stronger conceptual understanding and reduced misconceptions across cohorts [Al-Khateeb *et al.*, 2025].

Regardless of the continuous significant investment of Middle Eastern HEIs in educational technologies, most studies and applications focused on integrating these technologies rather than on the role of technology as an enabler for innovative new teaching pedagogies [40]. For example, Gouia-Zarrad *et al.* investigated undergraduate first-year Calculus students' attitudes to FC pedagogy at the American University of Sharjah in the Middle East [41]. The authors concluded that most of the surveyed students embraced the FC experiences, and in particular, they enjoyed the student-centered activities in the classroom more.

1.4. Challenges of the flipped classroom

While the most frequently reported advantage of FC pedagogy is providing instructors with the opportunity to use classroom meeting times for student-centered activities versus spending the same time on traditional lecturing, this does not come without a cost [7]. Most of the challenges of the FC pedagogy are in the first stage of this model [42]. These challenges are related to out-of-class activities and mainly to inadequate student preparation before stage 2. For example, low self-regulated behavior by some students was reported by [8]. Failure of some students to acquire the out-of-class learning content is another challenge reported by Lai & Hwang *et al.* [43]. The cultural learning background of the student as a non-independent learner is another challenge reported by Gouia-Zarrad *et al.* [41] in their study about FC pedagogy in HEIs in the Middle East. The challenges are not only related to students; redesigning courses requires more time from instructors to develop FC courses, which Schlairet *et al.* reported as a further challenge [44].

Moreover, recent literature points out that the success of flipped learning depends not just on format but on **pedagogical alignment**. Kapur *et al.* (2022) emphasized that merely reversing content delivery without structured feedback or application leads to limited gains. Additionally, the effectiveness of flipped learning differs by discipline, requiring tailored strategies for content-heavy vs. application-based courses [Al-Samarraie *et al.*, 2023].

These are some of the main challenges that should be considered for further investigation in future research about FC pedagogy.

This literature review highlighted the lack of quantitative experimental studies about the impact of FC teaching pedagogy on students' cognitive learning outcomes in HEIs in the Middle East. This quantitative quasi-experimental study in one of the reputable HEIs in the Middle East will be a step towards filling this gap.

2. Theoretical Framework

Activity theory (AT) provides an appropriate framework to investigate the way an innovative teaching pedagogy (in this case, FC teaching pedagogy) with its technological tools mediates between the subject (in this case, it is students) and the object (the effectiveness of FC learning pedagogy represented by improving student learning outcomes). AT is a theoretical framework that analyzes and understands human interaction using tools and artefacts [45]. AT is mainly relevant for processes undergoing rapid and constant change. The origin of AT can be traced to Vygotsky, Lurija, Rubinstein, and Leontev in the 1930s [46], where cultural tools mediate the interaction between a human individual and surrounding objects. Social and contextual dimensions were added later by the Finnish scholar Engestrom [47]. The extended complex model of Engestrom is based on the concept that individual actions occur due to three main factors: The tools, the community, and the labour distribution in that community, as represented in **Figure 1**.

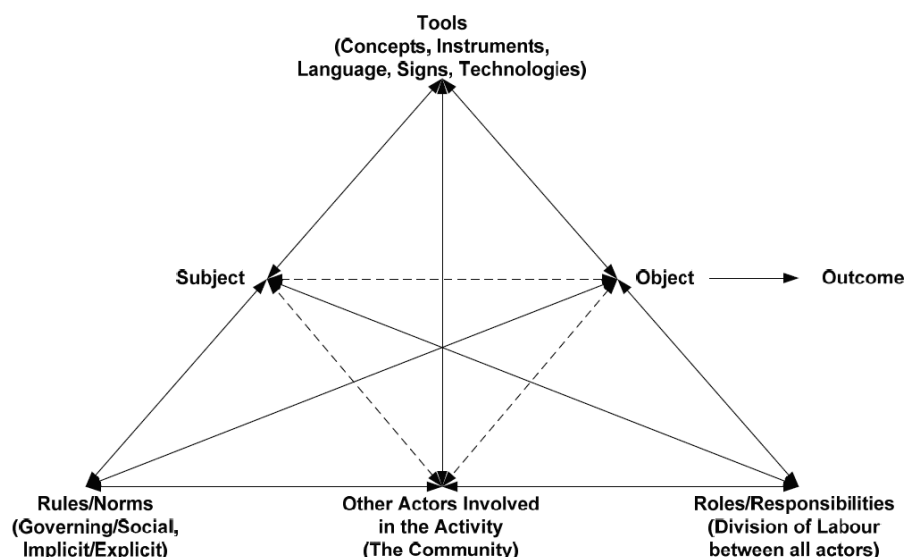


Figure 1. Engestrom's complex model of activity system [1].

Using Engestrom's complex model of the activity system as a theoretical lens to guide this study [1], the contextual factors represented by the extremities of the outer triangle and the elements of the internal triangle are identified for this study as per **Table 1** below:

Table 1. Engestrom's and this study activity system factors.

Engestrom's activity system factors	This study activity system factors
Role/ Responsibilities (division of labour between actors)	Faculty and students share the division of labour in the FC teaching pedagogy: Faculty prepare the videos for FC stage one, and students use them to learn. Faculty prepare the student-centered learning activities for FC stage two and use them in class with students to teach.
Rules/norms (Governing/Social Implicit /Explicit)	This is represented by the control of learning based on the activity theory framework suggested by the quantitative study of [48]. The control of learning includes using only student-centered, problem-solving activities.
Tools (Concepts, Instruments, Languages, Signs, Technologies)	This is represented by the FC technological tools: Interactive learning videos for FC stage one and electronic voting systems for FC stage two.
Subject	The learners
Object	The effectiveness of FC teaching pedagogy in improving students' learning outcomes
The Community (Other actors involved)	Public institution (the HEI where this activity is taking place)

Based on the above-listed activity system factors for this study, the activity system framework is summarised in **Figure 2** below.

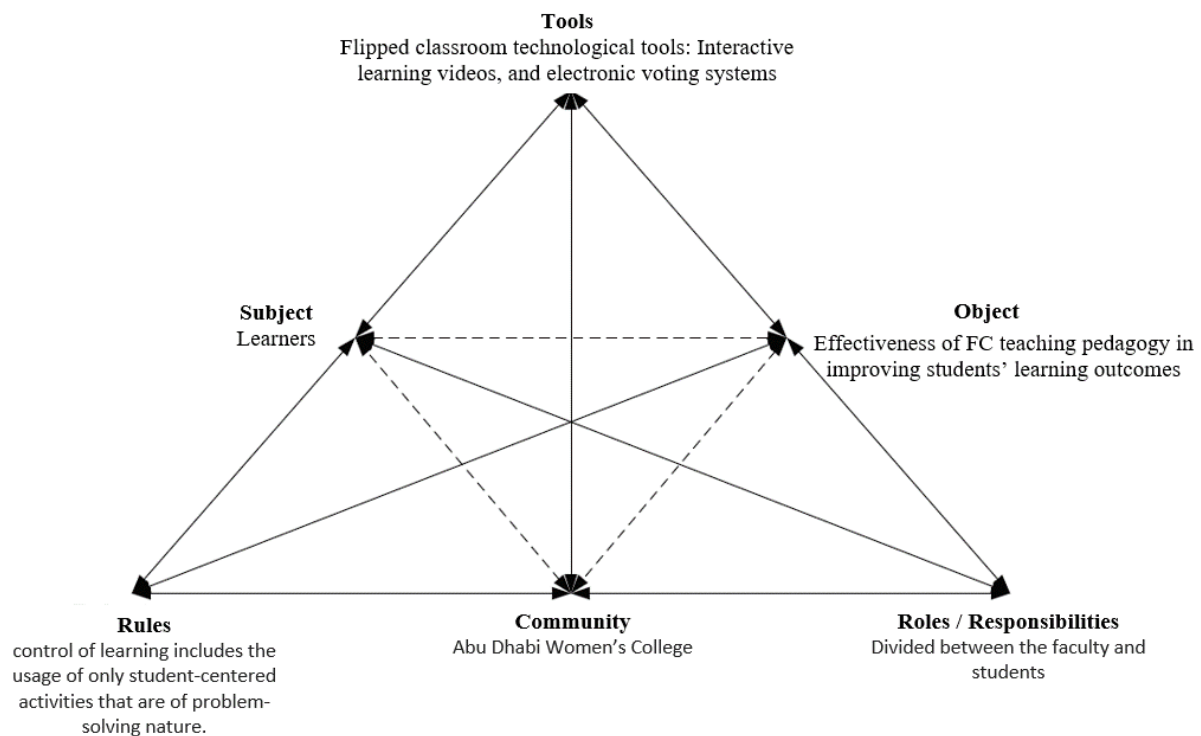


Figure 2. The activity theory framework for this study.

2.1. Research hypotheses

Based on the activity theory framework for investigating the mediating role of FC pedagogy on student learning outcomes as presented in the research design (**Figure 4 & Figure 5**), the following four hypotheses are put forward for testing:

H1: The average course grade for section 2 students in the CLO3 formative exam is significantly greater than that for section 1 students in CLO3.

H2: The average course grade for section 2 students in the CLO3 formative exam is significantly greater than their average course grade in CLO2

H3: There is a significant difference in the average course grade for section 1 students in CLO3 with their average course grade in CLO2.

H4: There is a significant difference in the average EmSAT scores between students in section 1 and section 2.

H1, H2, and H3 are derived from the activity theory framework (Figure 2), and proving them will establish the mediating role of the FC tools in improving students' learning outcomes as the object. In addition, proving these three hypotheses will also establish the mediating role of rules using student-centered activities on this object. Proving H4 will establish the community's mediating role, the ADWC, on the object where the EmSAT occurred. The four hypotheses are represented in Figure 3 below.

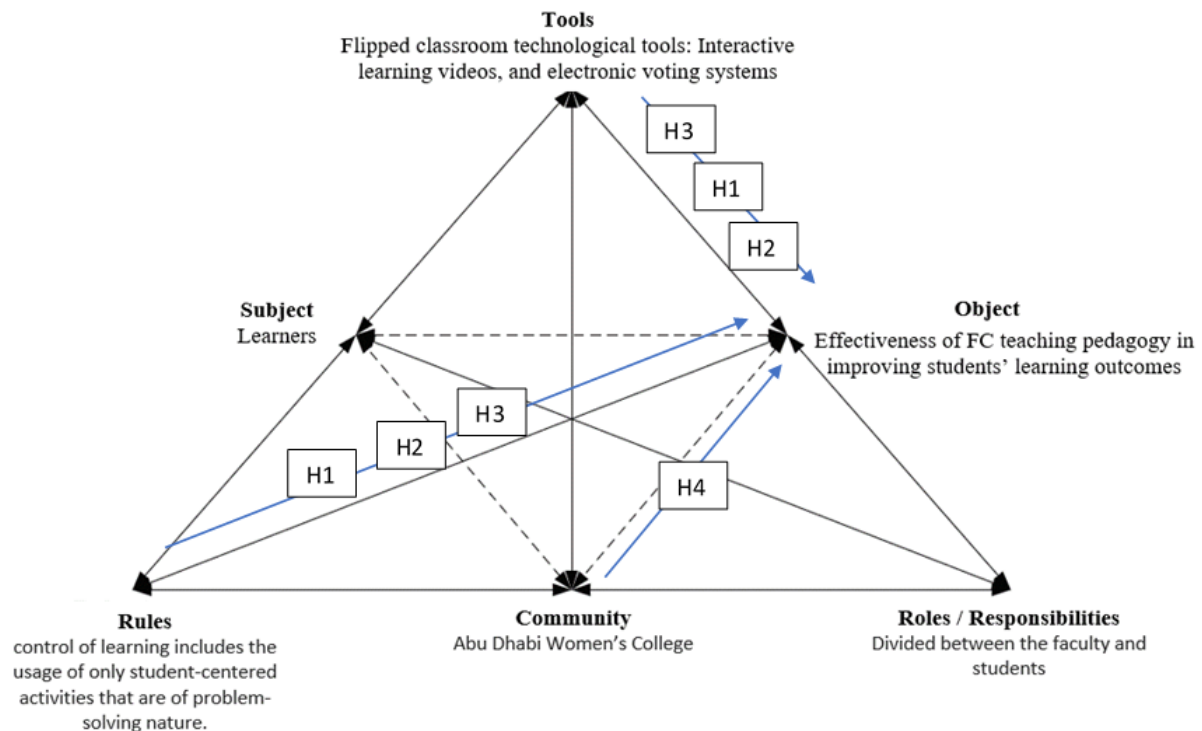


Figure 3. Research hypotheses.

3. Research Methodology

This research uses a statistical approach to understand how FC methods affect student results in university teaching. This study follows activity theory using a quasi-experimental design to examine how FC teaching connects with student success. A research team in the CIS department of a Middle Eastern higher education school taught two sections of the Human-Computer Interaction course with distinct teaching methods. One part of the study relied on standard teaching methods, whereas the other used FC approaches. This research compares student results to show how flipped learning affects learning outcomes and fills knowledge gaps about its impact in this learning environment.

3.1. Research design

A quasi-experimental design is selected for this research since the hypothesized cause of differences that this study aims to investigate has already occurred. Three main research designs are usually suggested for use in quantitative experimental research: the pre-experimental design, the true experimental design, and the quasi-experimental design [49]. A quasi-experimental research design investigates FC's impact on student learning outcomes.

Research was performed in Human-Computer Interaction (HCI) in two sections (section 1 and section 2) for third-year college students taking their courses. Twenty students are enrolled in each section. To minimize potential selection bias, students were allocated into the two sections based on standard administrative registration procedures without prior knowledge of the instructional methodology (traditional vs. flipped classroom). Both sections comprised students with comparable academic standing, as evidenced by similar average EmSAT scores. This procedure helped ensure comparability between groups, enhancing the internal validity of the study.

During the first five weeks of this semester, the first two-course learning outcomes, CLO1 and CLO2, were covered for sections 1 and 2 using traditional classroom teaching pedagogy. Over the next 5 weeks, section 1 was taught the CLO3 using the same traditional teaching pedagogy used for the first two CLOs, while section 2 was taught using the FC teaching pedagogy. Two formative assessments were conducted for both sections: one at the end of CLO1 and 2 and one at the end of CLO3. The two formative assessments were of the same type with multiple choice questions and an applied part and were delivered using the same learning management system: Blackboard Learn. Students' grades were collected at the end of the two assessments for both sections. **Figure 4** and **Figure 5** give a visual representation of the research site.

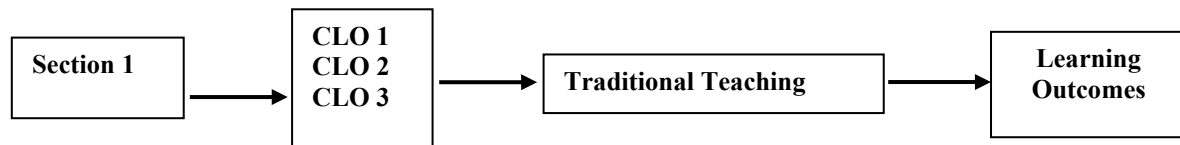


Figure 4. Section 1 traditional teaching model.

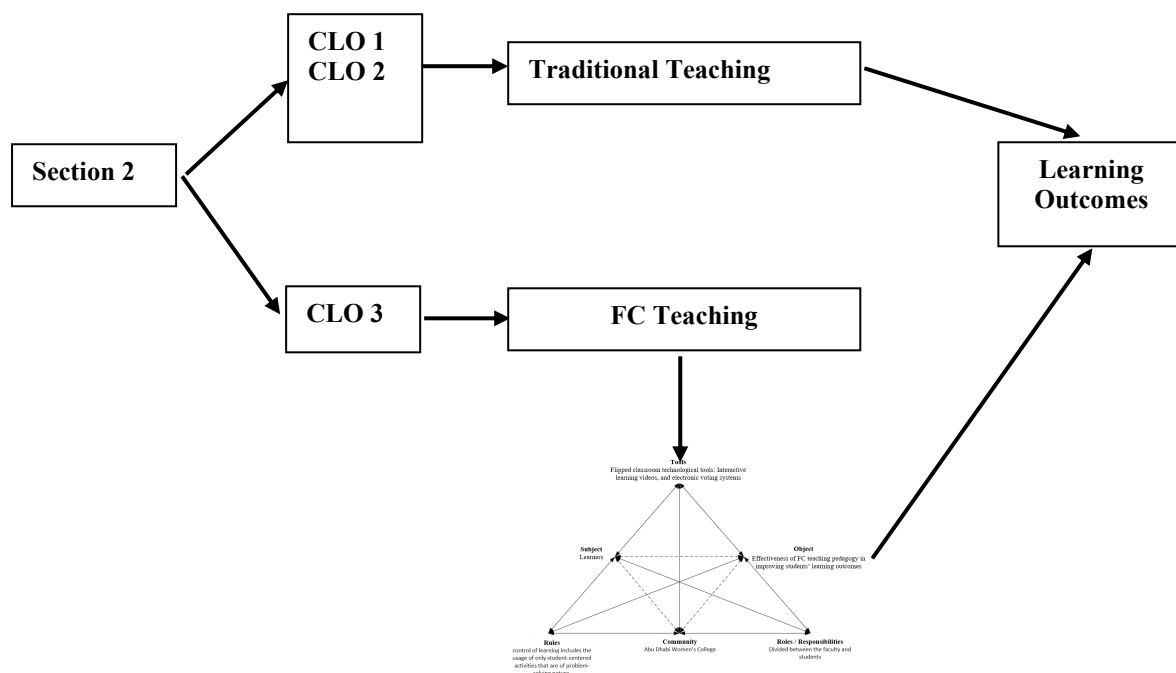


Figure 5. Section 2 FC teaching model.

An exogenous variable was used in the quasi-experimental design to increase the internal validity of this study. The entrance exam is a standardized test that all grade 12 students should take before joining any HEIs in the Middle East. The EmSAT scores are used in the admission decisions of the students at my college. HEIs consider EmSAT scores in the Middle East reliable and valid predictors of students' achievement and grades. There is no predicted percentage yet for the EmSAT with students' grades in HEIs, as this standardized test is still relatively new in the Middle East. However, HEIs in the Middle East have established their minimum acceptance criteria for admission. The EmSAT scores of the students in the two sections were collected.

3.2. Quality and trustworthiness of the study/findings

In order to improve the quality and trustworthiness of this study, several steps were implemented. First, the EmSAT exogenous variable was used in the quasi-experimental design. Second, four hypotheses were put forward for testing between a group-independent design (comparing results from section 2 with section 1) and a repeated measure design of a single group design (comparing results from section 2 itself). Finally, the quasi-experimental design validates causality empirically and permits researchers to study the causal effect of cognitive, motivational, and social variables [50-52].

Informed consent was obtained from all participants. The data collected in this research was used solely for the purposes of the study and was not shared with anyone. The personal information of the students was anonymized

and not identified. Digital data was stored securely and will be retained for three years before being deleted. This research fell under the exempt research type described by Cozby, as the risk of harm to participants was not greater than the risks they encountered during their regular activities [53].

4. Data analysis technique

The independent-means t-test compares grades between sections 1 and 2, and the dependent-means t-test compares the grades of the same students in the same section. The independent-means t-test is a statistical tool that compares and establishes differences between independent groups [54]. In this case, the grades of students in section 1 and section 2 are coming from two independent groups; hence, it is appropriate to use the independent-means t-test to look for differences. Therefore, the independent means t-test is used to analyze H1 and H4. On the other hand, the dependent-means t-test is a statistical tool used to investigate differences between means coming from the same entities in the same group [55]. In this case, the student's grades in the same section come from one group; hence, using the dependent-means t-test to look for differences is appropriate. Therefore, the dependent means t-test is used to analyze H2 and H3. The following descriptive statistical measures will also be used to compare means: Mean (M), Standard Deviation (Std), Standard Error Mean (SE), and Degree of Freedom (df). SPSS V25 is used to do all statistical calculations.

5. Findings

The four hypotheses are tested using sections 1 and 2, where students' grades were collected from the formative exams on CLO3 and CLO2 and students' EmSAT scores. The findings are then discussed.

5.1. Testing H1

In order to reject or accept H1, there is a need first to test its null hypothesis H0. The Null hypothesis H0 of H1 states no difference in the average CLO3 course grade between section 1 and section 2 (section 2 is taught using FC teaching pedagogy). Students' grades for the CLO3 formative exams for sections 1 and 2 were coded in SPSS. An independent-means t-test was conducted. Moreover, **Table 2** lists the descriptive statistical results and the t-test results:

Table 2. Evaluation of Results for Hypothesis 1.

Table 2: Evaluation of Results for Hypothesis 1:									
Traditional Classroom/ Flipped Classroom?				N	Mean	Std. Deviation	Std. Error Mean		
Grades		Section 1 TC		20	74.25	7.348	1.643		
		Section 2 FC		20	81.25	8.104	1.812		
Independent Samples Test									
Grades	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	0.507	0.481	-2.862	38	0.007	-7.000	2.446	-11.952	-2.048
Equal variances are not assumed.			-2.862	37.641	0.007	-7.000	2.446	-11.995	-2.047

The calculation of the means reveals that section 2 students achieved higher average scores than section 1. Levene's test for equality of variances has the significance of $p = 0.48$, which means that the assumption of homogeneity of variance is met [55]. The confidence interval percentage is set at 95%, $t(38) = -2.86$ ($df = 38$), and the significance (2-tailed) is $p = 0.007$, which is less than 0.05; hence, H0 rejected, and H1 accepted. Based on these figures, it can be concluded that:

On average, course grades for students in section 2 ($M = 81.25$, $SE = 1.81$) were significantly greater than course grades achieved by students in section 1 ($M = 74.25$, $SE = 1.64$), $t(38) = -2.86$, $p = 0.007 < 0.05$. Therefore, H0 is rejected, and H1 is accepted. Accepting H1 establishes the significant impact of the mediating role of the tools and rules on the object in the activity theory framework listed in **Figure 2**.

5.2. Testing H2

The null hypothesis H0 of H2 states no difference between the grade averages achieved in CLO3 and CLO2 for students in section 2. Students' CLO3 and CLO2 formative exam grades were coded in SPSS. It is important to note that a traditional classroom teaching pedagogy was used to teach the CLO2 for section 2 students like other

students. Only the CLO3 was taught using the FC teaching pedagogy for section 2. A dependent t-test comparison was conducted on these grades since the study deals with repeated measured experiments with grades from the same group. **Table 3** lists the descriptive statistical results, the correlation results, and the t-test results.

Table 3. Evaluation of Results for Hypothesis 2.

Group Statistics								
		Mean	N	Std. Deviation		Std. Deviation Mean		
Pair 1	CLO2 Traditional Classroom	79.85	20	7.936		1.774		
	CLO3 Flipped Classroom	81.25	20	8.104		1.812		
Paired Samples Correlations								
Pair 1	CLO2 Traditional Classroom & CLO3 Flipped Classroom	N		Correlation		Sig.		
		20		0.962		0.000		
Paired Sample Test (Paired differences)								
Pair 1	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
CLO2 Traditional Classroom- CLO3 Flipped Classroom	-1.400	2.210	0.494	-2.434	-0.366	-2.833	19	0.011

The calculation of the means reveals that section 2 students achieved higher average scores in CLO 3 ($M = 81.25$) than in CLO2 ($M = 79.85$). Pearson's correlation coefficient $r = 0.96$ is a high correlation and significant since $p = 0 < 0.05$. The confidence interval percentage is set at 95%, $t(19) = -2.833$ ($df = 19$), and the significance (2-tailed) is $p = 0.011$, which is less than 0.05. Hence, H_0 is rejected, and H_2 is accepted. Based on these results, it can be concluded:

On average, CLO3 course grades for students in section 2 ($M = 81.25$, $SE = 1.81$) were significantly greater than course grades achieved by the same students in CLO2 ($M = 79.85$, $SE = 1.774$), $t(19) = -2.833$, $p = 0.011 < 0.05$. Therefore, H_0 is rejected, and H_2 is accepted. Accepting H_2 establishes the significant impact of the mediating role of the tools and rules on the object in the activity theory framework listed in **Figure 2**.

5.3. Testing H3

The null hypothesis H_0 of H_3 states no difference between the grade averages achieved in CLO3 and CLO2 for students in section 1. Students' CLO3 and CLO2 formative exam grades were coded in SPSS. It is important to note that a traditional classroom teaching pedagogy was used to teach CLO2 and CLO3. A dependent t-test comparison was conducted on these grades since the research deals with repeated measured experiments with grades from the same group. **Table 4** lists the descriptive statistical results, the correlation results, and the t-test results.

Table 4. Evaluation of Results for Hypothesis 3.

Group Statistics					
		Mean	N	Std. Deviation	Std. Deviation Mean
Pair 1	CLO2 Traditional Classroom	73.85	20	7.471	1.671
	CLO3 Flipped Classroom	74.25	20	7.348	1.643
Paired Samples Correlations					

Pair 1	CLO2 Traditional Classroom & CLO3 Flipped Classroom	N		Correlation		Sig.			
		20		0.976		0.000			
Paired Sample Test (Paired differences)									
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	CLO2 Traditional Classroom- CLO3 Flipped Classroom	-0.400	1.635	0.366	-1.165	-0.365	-1.094	19	0.288

The calculation of the means reveals that section 2 students achieved slightly higher average scores in CLO 3 ($M = 74.25$) than in CLO2 ($M = 73.85$). Pearson's correlation coefficient $r = 0.97$ is a high correlation and significant since $p = 0 < 0.05$. The confidence interval percentage is set at 95%, $t(19) = -1.094$ ($df = 19$), and the significance (2-tailed) is $p = 0.288$, which is more significant than 0.05. Hence, H_0 is accepted, and H_3 is rejected. Based on these figures, the following can be concluded:

On average, CLO3 course grades for students in section 1 ($M = 74.25$, $SE = 1.671$) were slightly more significant than course grades achieved by the same students in CLO2 ($M = 73.85$, $SE = 1.643$). However with $t(19) = -1.094$, $p = 0.288 > 0.05$, there is no significant difference that can be established. Therefore, H_0 is accepted, and H_3 is rejected. Rejecting H_3 establishes the significant impact of the mediating role of the tools and rules on the object in the activity theory framework listed in **Figure 2**.

5.4. Testing H4

The null hypothesis H_0 of H_4 states no difference between the EmSAT scores in sections 1 and 2. EmSAT scores for students in sections 1 and 2 were coded in SPSS. An independent-means t-test was conducted since the study deals with non-repeated measures. **Table 5** lists the descriptive statistical results and lists the t-test results.

Table 5. Evaluation of Results for Hypothesis 4.

Group Statistics										
Traditional Classroom/ Flipped Classroom?			N		Mean		Std. Deviation		Std. Error Mean	
Grades	Section 1		20		1157.45		31.882		7.129	
	Section 2		20		1155.70		28.310		6.330	
Independent Samples Test										
Grades		F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed		0.487	0.490	0.184	38	0.855	1.750	9.534	-17.5 51	-21.0 51
Equal variances are not assumed.				0.184	37.476	0.855	1.750	9.534	-17.5 60	-21.0 60

The calculation of the means reveals that students in section 1 have achieved slightly higher EmSAT average scores than those in section 2. Levene's test for equality of variances has the significance of $p = 0.49$, which means that the assumption of homogeneity of variance is met. The confidence interval percentage is set at 95%, $t(38) = 0.184$ ($df = 38$), and the significance (2-tailed) is $p = 0.855$, which is far greater than 0.05. Hence, H_0 cannot be rejected, and H_4 cannot be accepted. Based on these figures, it can be deduced:

On average, the EmSAT average score for students in section 1 ($M = 1157.45$, $SE = 7.129$) was slightly higher than the EmSAT average score for students in section 2 ($M = 1155.70$, $SE = 6.330$). However, this slight difference is insignificant since $t(38) = 0.184$, $p = 0.855 > 0.05$. Therefore, H_0 cannot be rejected, and hence H_4 is rejected. Rejecting H_4 establishes the significant impact of the mediating role of the community on the object in the activity theory framework listed in **Figure 2**.

6. Discussion

Research results demonstrate that FC methods help students achieve better results in Middle Eastern higher education settings. This study reveals that the new teaching method shows clear benefits in helping students perform better at school while staying more engaged mentally and achieving better results. Research shows that FC produces better student learning results than standard teaching practices [11]. Students in the FC section showed better results than their traditional peers because the flipped method creates an active learning space. The data shows that students in the FC approach learned better at CLO2 and CLO3 than those who received traditional teaching. The data supports Bradford *et al.*'s research, which found that students who learn with flipped instruction methods achieve higher test scores than students in traditional classrooms [38]. Traditional classroom teaching methods, such as the FC approach, fail to boost performance because they do not reach their full potential.

According to this research study, mediating factors in FC education play a central role. Through interactive videos and electronic voting systems, students became more engaged in problem-solving and group talks, and these tools helped them improve their studies. Ertmer and Ottenbreit-Leftwich's 2013 research confirms that technology-driven learning spaces create powerful change in education [22]. The research team used activity theory as a foundation to explore how FC teaching methods affect student learning results. The framework showed that tools, rules, and community relationships affect how well flipped pedagogy works. This research uncovers how FC enhances learning results by showing their important tools and elements.

By validating FC, this research highlights their usefulness for achieving HCT's strategic objectives. Institutional, educational goals and accreditation requirements become attainable through teaching strategies emphasizing student involvement. The research results show that FC transforms education beyond being an alternative to traditional instruction. Students gain essential critical thinking abilities and learn to solve problems with their peers through this method, according to Sergis *et al.* [7].

FC benefits in higher education must match the unique requirements of Middle Eastern educational environments. Traditional educational systems that put teachers in charge of student learning can block the change to student-focused methods.

Students who use traditional learning methods will find it hard when they need to take charge of their learning in FC. Teachers resist flipped teaching because they do not know digital tools for instruction and find developing interactive content too hard. According to Gouia-Zarrad and Gunn's findings in 2017, strong institutional backing is essential for flipped pedagogy success [41].

Higher education institutions must fund coaching for instructors to master FC skills and get needed materials. Faculty training workshops and technology access help teachers easily shift to FC teaching. Schools must guarantee equal student access to essential technology tools for flipped learning to work effectively, according to Schlairet *et al.* [44]. The success of FC methods depends on how well they match the learning material and what students need to achieve. The research focused on CIS department learning, but flipped teaching approaches work differently across subject areas. Courses built on practical application benefit most from flipped teaching, while theoretical lessons require different instructional methods. Each academic discipline needs its own customized FC strategy to work correctly.

This research shows that FC supports higher education objectives by creating a genuine student participation system. Institutions focus on preparing students for the modern workplace by making the FC approach essential. Higher education institutions use these methods to increase market value while preparing students to handle modern workplace requirements. This research confirms that FC teaching positively changes students' learning results. The inverted classroom model, combined with technology and active learning, creates a better teaching method than traditional methods at Middle Eastern universities. The research outcomes show why flipped learning should be used broadly despite facing implementation barriers. Schools that adopt this approach learn better students who become more engaged learners.

7. Study's limitation and future recommendation

This study has several limitations that provide avenues for future research. The scope of the research was confined to a single institution and focused on a specific course with a limited sample size. These constraints limit the generalizability of the findings to other contexts and disciplines. Additionally, this study did not examine the influence of demographic factors, such as gender or prior exposure to technology, which could play a role in determining the success of flipped pedagogy. Future research should explore these dimensions and consider longitudinal studies to assess the long-term impacts of FC on student outcomes. Furthermore, investigating how different technological tools interact with specific subject areas could provide insights into optimizing flipped pedagogical strategies.

8. Conclusion

This Research shows that FC learning methods generate substantial positive academic results at higher education institutions throughout the Middle East region. This was achieved by revealing the impact of the FC teaching pedagogy on students' performance among the students in the CIS department. Not only was the impact revealed, but a significant extent was confirmed. Using Engeström's complex model of the activity system, this study adopted an activity theory framework for FC teaching pedagogy, which was used as a lens to guide this quantitative study, which can also be used by other researchers interested in investigating FC teaching pedagogy's impact. This quantitative quasi-experimental study contributes to the body of knowledge on the impact of FC teaching pedagogy on students' cognitive learning outcomes in HEIs in the Middle East. This represents one step in addressing the lack of quantitative experimental studies identified in the literature review. However, many questions remain regarding the relationship between technology and FC and the impact of other variables, such as the demographic characteristics of students and faculty, course level, and subject matter. Further research is needed to extend the findings of this study to other departments in my college and other Middle East tertiary institutions.

Statement and declarations

Conflicting Interests

The authors declared no potential conflicts of interest concerning this article's research, authorship, and publication.

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9. Appendix A: Video Recording Tools Used in the Flipped Classroom Model

1. Jing (TechSmith) – A free screen-capturing and recording tool (now retired). Website (archived): <https://www.techsmith.com/jing-tool.html>
2. Rendersoft CamStudio – An open-source desktop screen recorder. Website: <http://www.rendersoftware.com/>
3. Screen-O-Matic (Screencast-O-Matic) – A freemium tool for recording and editing screen content. Website: <https://screencast-o-matic.com>

The Impact of Task-Technology Fit on the Intention to Use Artificial Intelligence in the Education of Information Technology Students in Universities: The Role of Self-Efficacy

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Ethics Committee Approval: For studies requiring ethical approval, information regarding the ethics committee permission should be provided in this section. Accordingly, ethical approval for this study was granted by the Scientific Research and Publication Ethics Committee of Istanbul Topkapı University. The approval was reviewed and accepted at the Scientific Research and Publication Ethics Committee meeting held on September 5, 2024 (Approval No. 2024/9), confirming that the study complies with the principles of scientific research and publication ethics.

ABSTRACT

This study aims to examine university students' intentions to use artificial intelligence (AI) applications in their educational processes within the context of job characteristics (JC), technology characteristics (TC), task-technology fit (TTF), and self-efficacy (SE). The research was conducted with 965 students enrolled in Information Technology programs at four foundation universities in Istanbul. Data were collected through a structured questionnaire and analyzed using SPSS 24. Linear regression analysis was employed to interpret the relationships among the variables. According to the findings, both job characteristics ($\beta = 0.609$, $p < 0.01$) and technology characteristics ($\beta = 0.883$, $p < 0.01$) were found to have a positive and significant effect on TTF. Furthermore, TTF was identified as a significant predictor of AI usage intention ($\beta = 0.644$, $p < 0.01$). Also, the self-efficacy variable moderate significantly the relationship between TTF and AI usage intention ($\beta = 0.115$, $p < 0.01$). The independent variables in the research model explained 18% of the variance in task-technology fit and 64% of the variance in AI usage intention. The findings suggest that enhancing students' technological self-efficacy and developing user-friendly AI solutions may encourage the adoption of AI technologies in educational settings. One of the limitations of this study is that the sample was restricted to students from four foundation universities in Istanbul. Therefore, future research is recommended to include larger and more diverse samples from different regions and disciplines to improve the generalizability of the results.

Keywords: Artificial Intelligence Technologies, Task Technology Fit Model, Self-Efficacy, Artificial Intelligence, Information Technologies.

Introduction

Artificial Intelligence (AI) is defined as the ability of computer systems to mimic human-like cognitive processes (Russell, 2016). Encompassing capabilities such as learning, problem-solving, decision-making, and language comprehension, AI has been driving transformative changes across various domains, including healthcare, finance, transportation, education, and industry (McAfee, 2017). In particular, advancements in deep learning algorithms have significantly enhanced AI's capacity to analyze complex datasets and generate outputs that closely resemble human intelligence (LeCun, 2015). In this context, the integration of AI into the field of education enables the emergence of new paradigms in teaching and learning processes (Halverson, 2019).

The potential of AI in education can be summarized as offering personalized learning experiences to students, reducing teachers' workload, optimizing assessment processes, and creating new opportunities in education overall (Halverson, 2019). The use of AI in education dates back to the 1980s and has evolved through applications such as expert systems, personalized instructional software, and intelligent tutoring systems (Brusilovsky, 2001). Since the 2000s, progress in machine learning and deep learning has further strengthened the application of AI in educational settings (Siemens, 2013). Today, AI is employed in various areas including

predicting student performance, identifying learning difficulties, personalizing educational content, analyzing student feedback, and assisting teachers in managing instructional processes (Siemens, 2013). These developments demonstrate the transformative potential of AI within educational systems. However, realizing this potential requires careful consideration of issues such as ethical use of AI, data privacy, equity, and accessibility (Watkins, 2018).

In Turkey, the integration of Artificial Intelligence (AI) into the field of education has also gained momentum in recent years (Aydın, 2021). Current studies focus on the potential of AI to personalize learning experiences, support teachers, and optimize educational management processes (Ercan, 2020). Particularly, AI applications in online learning platforms, educational software, and intelligent tutoring systems have become increasingly prevalent (Akin, 2019; Gökçe, 2018). Examples of such applications include platforms that analyze student performance to offer personalized learning recommendations, tools that provide customized educational content based on students' interests and learning styles, and intelligent assistants that support teachers in lesson planning (Gökçe, 2018). However, the integration of AI in the Turkish education system is still in its early stages, and there is a need for more research, practical implementations, and policy development in this area (Yıldız, 2022). In this context, the Technology Acceptance Model (TAM) (Davis, 1989) and Task-Technology Fit (TTF) model (Goodhue & Thompson, 1995), which aim to explain individuals' behaviors regarding the adoption and use of new technologies, have gained importance. TAM explains technology acceptance through the constructs of perceived usefulness and perceived ease of use (Venkatesh, 2000). The TTF model, on the other hand, reflects individuals' beliefs regarding the integration of a given technology into their tasks and the extent to which the technology enhances task performance (Bandura, 1997).

This study investigates the Task-Technology Fit (TTF) levels and usage intentions regarding the use of AI in education among students at foundation (non-profit private) universities in Istanbul, while also examining the moderating role of self-efficacy perceptions in this relationship.

The primary aim of this study is to determine the TTF levels, usage intentions, and self-efficacy perceptions of students from foundation universities in Istanbul in the context of AI use in education, and to reveal the moderating role of self-efficacy in the relationship between TTF and usage intention.

Literature Review

In the era of rapid digital transformation, the integration of Artificial Intelligence (AI)-based applications into educational systems is becoming increasingly widespread. This development has heightened the need for comprehensive and empirically validated theoretical models to understand individuals' acceptance processes toward such innovative technologies. In this context, the Technology Acceptance Model (TAM) and the Task-Technology Fit (TTF) model are widely recognized and frequently utilized theoretical frameworks in the academic literature for explaining users' technology adoption behaviors.

Technology Acceptance Model (TAM)

Developed by Davis (1989), the Technology Acceptance Model explains individuals' intentions and behaviors regarding the adoption of new technologies through two fundamental cognitive beliefs: perceived usefulness and perceived ease of use. According to the core proposition of the model, a user's intention to use a technology is primarily influenced by these two determinants. Over time, the model has been revised and expanded—first as TAM2 by Venkatesh and Davis (2000), and later as TAM3—to incorporate additional factors such as social influence, cognitive instrumental processes, and individual differences.

Post-2020 Applications of TAM

TAM has been extensively applied to analyze the acceptance of e-learning platforms, AI-supported educational systems, mobile learning applications, and cloud-based solutions. For instance, Al-Emran and Shaalan (2021) analyzed university students' acceptance levels of AI-supported learning systems within the TAM framework, empirically demonstrating the decisive effect of perceived usefulness on usage intention. Similarly, Chatterjee et al. (2022) employed the TAM and Extended TAM (ETAM) models to examine students' adaptation to digital systems in post-pandemic hybrid learning environments.

Task-Technology Fit (TTF) Model

Developed by Goodhue and Thompson (1995), the Task-Technology Fit (TTF) model posits that the effective use of a technology depends on the alignment between the capabilities of the technology and the requirements of the user's tasks. In other words, if the features of a technological tool enhance the user's ability to perform their tasks, both the intention to use the technology and its actual usage are expected to increase. The TTF model is particularly evaluated in terms of its impact on individual performance and is frequently applied in educational

contexts to assess the alignment between digital applications and the needs of students and instructors. At its core, the model emphasizes the principle of mutual compatibility among technology, task, and individual.

Post-2020 Applications of TTF

In the post-2020 literature, the TTF model is often integrated with the Technology Acceptance Model (TAM) to enable more holistic analyses. For example, Misra and Pandey (2021) combined TAM and TTF to examine the fit between university students in India and e-learning systems, analyzing the relationship between learning outcomes and technology fit. Their findings indicated that task-technology fit had an indirect yet significant effect on learning performance. Similarly, Yousafzai et al. (2023) investigated the acceptance of AI-based learning systems within the combined frameworks of TAM and TTF, and statistically demonstrated the indirect effects of TTF constructs on students' academic performance.

These studies illustrate that the joint application of TAM and TTF provides a valuable approach to analyzing technology acceptance processes more comprehensively. While TAM focuses on individual perceptions and attitudes, TTF assesses the degree of technical fit within the context of the user's tasks. The post-2020 literature encourages the integration of these two models, offering more valid and comprehensive explanations for the adoption processes of AI-based systems in education. Empirical studies conducted within this framework underscore the theoretical and practical contributions of using TAM and TTF together to better understand the acceptance of educational technologies.

Future research is recommended to test the validity of this integrated approach across various educational levels, cultural contexts, and technology types. Furthermore, the effects of cultural, demographic, and institutional differences on technology acceptance processes can be examined in greater detail within this framework.

Methodology

This study was conducted using a quantitative research method based on the descriptive survey model. Quantitative research designs are systematic approaches grounded in objective data analysis, aiming to measure and interpret causal relationships between phenomena through numerical data (Creswell, 2014). In this context, data were collected using structured scales to statistically determine the relationships among variables that influence the adoption of AI-based educational technologies—the main objective of the study.

A five-point Likert-type scale was employed as the data collection instrument. This scale allowed participants to express their attitudes and perceptions toward specific statements on a continuum ranging from "Strongly Disagree" to "Strongly Agree." Likert-type scales are widely recognized as reliable and valid tools for measuring attitudes (Likert, 1932). The scale used in this study was adapted from previously validated instruments to ensure content validity and reliability (Jarada, 2021; Güleren, 2017; Torun, 2019).

During the data collection process, the scale was administered both online and in printed form. Participation was based on the principle of voluntariness. The collected data were analyzed using the SPSS 24 statistical analysis software.

Purpose of the Study

The primary aim of this study is to examine the intention of students studying in the field of Information Technologies at foundation universities in Istanbul to use Artificial Intelligence (AI) technologies in educational processes. The analysis is conducted within the framework of the variables: task characteristics (TC), technology characteristics (TEC), task-technology fit (TTF), and self-efficacy (SE).

Research Model and Hypotheses

The conceptual framework of this research focuses on investigating the factors that influence students' adoption and intention to use Artificial Intelligence (AI) applications. The core variables included in the research model, presented in Figure 1, along with their conceptual definitions, are described below:

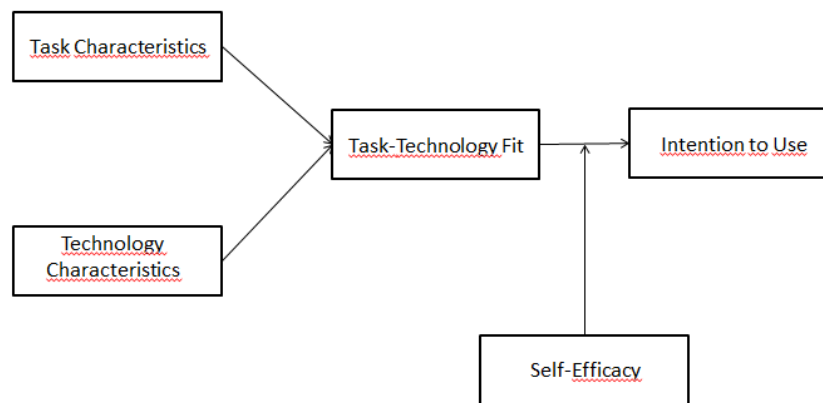


Figure 1. Research Model

Task Characteristics

This variable refers to students' perceptions regarding the potential benefits of AI applications in the context of their academic tasks. It encompasses students' beliefs about the capacity of AI to facilitate their academic work, enhance productivity, support academic success, and contribute positively to the overall learning process (Halverson, 2019). In this context, task characteristics represent the perceived advantages that students may gain from using AI technologies for educational purposes.

Technology Characteristics

This variable reflects students' perceptions of the technical attributes of AI applications. It includes key factors such as ease of use, reliability, security, accessibility, and other technical features that shape the overall user experience (Siemens, 2013). Students' views on the practical usability and functionality of AI systems are assessed under this construct.

Task-Technology Fit (TTF)

TTF refers to students' perceptions of how well AI applications align with their academic workflows and their ability to benefit from the potential advantages these technologies offer (Venkatesh, 2000). This construct captures students' beliefs regarding the extent to which AI is suitable for their learning processes, assignments, research activities, and overall academic goals. A high level of TTF indicates a strong belief that using AI for educational purposes is compatible with their individual needs and preferred working styles.

Intention to Use

This variable reflects students' tendencies and willingness to use AI applications in the future (Taylor, 1995). It measures the strength of their intention to actively engage with AI technologies in their educational activities and to benefit from such tools. A high level of intention to use indicates that students are likely to view AI as an integral part of their learning processes and are inclined to adopt it regularly.

Self-Efficacy

Self-efficacy refers to students' beliefs in their own abilities to successfully use, learn, and manage AI applications (Bandura, 1977). This construct represents their confidence in interacting with AI technologies, overcoming technical difficulties, and utilizing AI tools effectively. High self-efficacy suggests that students feel competent in their ability to engage with AI and believe they can successfully learn and apply these technologies.

In this study, the relationships among the variables described above are examined to gain a more comprehensive understanding of students' adoption and use of AI for educational purposes. In particular, the moderating role of self-efficacy in the effects of task characteristics and technology characteristics on task-technology fit and intention to use is explored.

Research Hypotheses

H1: The task characteristics of artificial intelligence perceived by university students have a positive effect on task-technology fit.

H2: The technology characteristics of artificial intelligence perceived by university students have a positive effect on task-technology fit.

H3: The task-technology fit of artificial intelligence perceived by university students has a positive effect on their intention to use AI.

H4: Self-efficacy moderates the relationship between task-technology fit and the intention to use artificial intelligence among university students.

Population and Sample Selection

The target population of this study consists of students enrolled at foundation universities located in Istanbul. The sample comprises university students studying in information technology-oriented programs at İstinye University, Istanbul Topkapı University, Istanbul Esenyurt University, and Istanbul Gelişim University. A purposive sampling method was employed for the selection of participants. Purposive sampling is a non-probability sampling technique in which participants are deliberately selected based on specific characteristics that align with the research questions and objectives (Patton, 2015). Rather than relying on random selection, this method emphasizes the researcher's knowledge and judgment in identifying appropriate participants. Purposive sampling is particularly common in qualitative research aiming to gain in-depth understanding of a specific phenomenon, benefit from expert opinions, or focus on a particular subgroup (Creswell, 2014).

Data Collection Method and Instrument

In this study, a survey method was employed. Questionnaires were administered in both online and printed formats. The survey, consisting of items formatted on a five-point Likert scale, was completed by students on a voluntary basis in order to address the research problem.

Likert Scale: This is one of the most widely used scaling methods. It asks participants to indicate the degree to which they agree or disagree with a given statement on a scale ranging from "Strongly Agree" to "Strongly Disagree" (Likert, 1932).

During the validity and reliability testing of the scale, one item from the "task characteristics" variable was found to have low item-total correlation and reduced the reliability of the scale; therefore, it was removed from the study. The final analysis proceeded with three items representing the task characteristics construct. The third item under task characteristics was a reverse-coded item, and as such, it was recoded accordingly prior to analysis.

Findings

For the data analysis process, SPSS version 24—widely used in the social sciences and recognized for its robust statistical computing capabilities—was utilized. To ensure the validity and reliability of the scales, comprehensive evaluation criteria recommended in the literature were followed, drawing upon the methods proposed by Jarada (2021), Güleren (2017), and Torun (2019). During the analysis, Cronbach's Alpha coefficient (Cronbach, 1951) and Composite Reliability (Field, 2018) values were calculated to demonstrate the measurement reliability of the scales. These analyses provided scientific evidence regarding the repeatability, consistency, and internal reliability of the measurement instruments.

As presented in Table 2, the demographic characteristics of the participants were analyzed in detail. In terms of age distribution, a significant majority (68.0%) of respondents were in the 17–20 age range, followed by 24.7% in the 21–24 age range, and 7.4% aged 25 and above. This indicates that the study sample predominantly consisted of younger individuals. Regarding education level, 93.2% of participants were enrolled in associate degree programs, while only 6.8% were pursuing undergraduate (bachelor's) studies. This finding reveals that the study primarily focuses on students engaged in vocational and technical education.

In terms of gender distribution, 71.9% of the respondents were male, and 28.1% were female. This indicates a male-dominated sample, which should be considered when interpreting the findings. In summary, the majority of participants were young, enrolled at the associate degree level, and predominantly male. These demographic characteristics are key factors in shaping both the structure of the sample and the framework for interpreting the results obtained in this study.

Table 2. Descriptive Statistics

Variable	Category	Frequency (n)	Percentage (%)
Age	17–20	656	68.0%
	21–24	238	24.7%

Variable	Category	Frequency (n)	Percentage (%)
Education Level	25 and above	71	7.4%
	Total	965	100.0%
	Associate Degree	899	93.2%
	Bachelor's Degree	66	6.8%
	Total	965	100.0%
Gender	Male	694	71.9%
	Female	271	28.1%
	Total	965	100.0%

Reliability Analysis Results

As shown in Table 3, the validity and structural integrity of the measurement scales used in this study were ensured by applying evaluation methods recommended in the literature, particularly those proposed by Jarada (2021), Güleren (2017), and Torun (2019). To assess the reliability of the study, the repeatability and internal consistency of the scales were evaluated using Cronbach's Alpha coefficient (Cronbach, 1951) and Composite Reliability values (Field, 2018), which are commonly employed in social science research.

These analyses provided scientific evidence that the data collection instruments yielded reliable and replicable results, free from significant measurement errors. As a result, the data quality of the study was strengthened, supporting the accuracy and validity of the findings obtained.

One item under the "Task Characteristics" construct was excluded from the analysis due to its negative impact on the validity and reliability of the scale. Consequently, the analyses proceeded with the remaining three items.

Table 3. Reliability Analysis Results

Construct	Number of Items	Cronbach's Alpha (α)
Task Characteristics	3	0.739
Technology Characteristics	3	0.843
Task-Technology Fit	4	0.875
Self-Efficacy	3	0.715
Intention to Use	4	0.885

Hypothesis Testing

To evaluate whether the data conformed to a normal distribution, skewness and kurtosis values were analyzed. According to Tabachnick and Fidell (2013), skewness and kurtosis values within the ± 1.5 range indicate that the assumption of normality is largely satisfied. As shown in Table 4, the skewness and kurtosis values for all variables fall within this acceptable range. Based on these results, it can be concluded that the dataset meets the assumption of normality, and the use of parametric tests is appropriate for subsequent analyses.

Table 4. Skewness and Kurtosis Values

Construct	vness	Error (Skewness)	Kurtosis	Std. Error (Kurtosis)
Intention to Use	-0.941	0.110	1.454	0.220
Self-Efficacy	-0.913	0.110	1.393	0.220
Task Characteristics	-0.675	0.110	1.468	0.220
Technology Characteristics	-0.706	0.110	1.493	0.220
Task-Technology Fit	-0.645	0.110	1.012	0.220

The skewness and kurtosis values presented in Table 4 were analyzed to assess the normality of the distributions for the variables included in the study. The results indicate that all skewness values are negative and fall within acceptable limits. Specifically, the skewness values for Intention to Use (-0.941), Self-Efficacy (-0.913), Task Characteristics (-0.675), Technology Characteristics (-0.706), and Task-Technology Fit (-0.645) suggest a slight left-skew in the data distribution; however, these values do not indicate substantial deviation from normality and can be considered acceptable.

Regarding kurtosis, the values for Intention to Use (1.454), Self-Efficacy (1.393), Task Characteristics (1.468), Technology Characteristics (1.493), and Task-Technology Fit (1.012) range between 1.012 and 1.493. These results suggest that all variables exhibit slightly platykurtic distributions, yet remain close to normal. Furthermore, the fact that all skewness and kurtosis values fall within the ± 2 range supports the conclusion that the data do not contain significant distortions, thereby justifying the use of parametric statistical analyses (George & Mallery, 2010; Kline, 2011).

Overall, these findings confirm that the dataset satisfies the fundamental assumptions required for statistical testing and is suitable for parametric techniques such as linear regression.

Table 5. Correlation Coefficients

Relationship	r	p-value
Task Characteristics and Task-Technology Fit	0.424	0.000
Technology Characteristics and Task-Technology Fit	0.805	0.000
Task-Technology Fit and Intention to Use	0.583	0.000

$p < 0.01$

Based on the correlation analysis results presented in Table 5, a positive and significant relationship was found between Task Characteristics and Task-Technology Fit ($r = 0.424$, $p < 0.01$). This finding suggests that the structural features of academic tasks play a supportive role in aligning users with AI systems. Similarly, a very strong and positive correlation was observed between Technology Characteristics and Task-Technology Fit ($r = 0.805$, $p < 0.01$). This indicates that attributes of technological systems—such as ease of use, perceived usefulness, and user-friendly interfaces—positively influence their integration into task-related processes.

Moreover, there was a strong and significant relationship between Task-Technology Fit and Intention to Use ($r = 0.583$, $p < 0.01$). This suggests that users' perceptions of alignment between their tasks and technological systems significantly affect their willingness and tendency to adopt AI technologies in educational contexts.

According to the regression coefficients presented in Table 6, Task Characteristics have a positive and significant effect on Task-Technology Fit ($\beta = 0.609$, $p < 0.01$). This result indicates that the structure and nature of academic tasks facilitate users' integration with AI-based systems and contribute to the adaptation of such technologies into their workflows.

Likewise, Technology Characteristics were also found to have a highly positive and significant impact on Task-Technology Fit ($\beta = 0.883$, $p < 0.01$). This highlights that technical features—such as usability, accessibility, and functional performance—strengthen individuals' perceptions of task-technology alignment.

In terms of explanatory power, Task Characteristics account for 18% of the variance in Task-Technology Fit ($R^2 = 0.180$), while Technology Characteristics explain 64.7% of the variance in Task-Technology Fit ($R^2 = 0.647$). Furthermore, Task-Technology Fit explains 34% of the variance in Intention to Use AI ($R^2 = 0.340$).

Additionally, the moderating effect of Self-Efficacy in the relationship between Task-Technology Fit and Intention to Use was found to be statistically significant ($B = 0.115$; $R^2 = 0.452$; $F = 794.512$; $p < 0.001$). These findings suggest that the development of user-friendly AI solutions and enhancement of students' technological self-efficacy may significantly encourage the adoption of AI applications in educational environments.

Table 6. Regression Coefficients Indicating the Effects in the Regression Models

Model	R ²	F	P-value	β (Standardized)	VIF	Hypothesis Decision
Effect of Task Characteristics on Task-Technology Fit	0.180	211.148	0.000	0.609	1.000	Accepted
Effect of Technology Characteristics on Task-Technology Fit	0.647	1768.699	0.000	0.883	1.000	Accepted
Effect of Task-Technology Fit on Intention to Use	0.340	495.070	0.000	0.644	1.000	Accepted
Moderating Role of Self-Efficacy in the Effect of Task-Technology Fit on	0.452	794.512	0.000	0.115	1.000	Accepted

Model	R ²	F	p-value	β (Standardized)	VIF	Hypothesis Decision
Intention to Use (Interaction: TTF × SE)						

As proposed by Baron et al. (1986), a moderator variable is defined as a factor that can alter both the direction and the strength of the relationship between an independent and a dependent variable. The empirical testing of such moderating effects follows the methodology outlined by Sharma et al. (1981), which involves creating an interaction term representing the product of the independent variable and the potential moderator. This interaction term is then included as a predictor in the regression model. A statistically significant effect of the interaction term on the dependent variable is interpreted as evidence of a moderating relationship.

In the context of the present study, the potential moderating role of self-efficacy is examined. Accordingly, an interaction term was computed to capture the interaction between task-technology fit (independent variable) and self-efficacy (moderator). This interaction term was subsequently included in a simple linear regression model as an additional predictor.

The results for this interaction term are presented in Table 6. Through this analysis, the study aims to determine whether self-efficacy serves to strengthen or weaken the existing relationship between task-technology fit and intention to use (dependent variable).

Research Delimitations

This study is limited to students enrolled in Information Technology programs at four foundation universities located in Istanbul. As such, the generalizability of the findings to student populations in other geographic regions, public universities, or different academic disciplines is constrained. Future research could enhance the scope and generalizability of the results by including samples from public universities, institutions in various cities, and students from a broader range of academic fields.

Conclusion and Recommendations

The linear regression analyses conducted within the scope of this study confirmed that all proposed relationships were statistically significant, and the hypotheses were supported. The effect of Task Characteristics on Task-Technology Fit was found to be significant ($B = 0.609$; $R^2 = 0.180$; $F = 211.148$; $p < 0.01$), indicating a positive and substantial relationship between the nature of work processes and technological alignment. This finding suggests that technological solutions designed in accordance with task requirements contribute significantly to users' ability to integrate with the technology.

Similarly, the effect of Technology Characteristics on Task-Technology Fit was found to be highly significant and strong ($B = 0.883$; $R^2 = 0.647$; $F = 1768.699$; $p < 0.01$). This result indicates that users' positive perceptions of technological features greatly enhance the integration of such technologies into work processes. The user-friendliness and functional accessibility of technological infrastructure emerge as critical factors that strengthen task-technology fit.

The study also found a significant and positive effect of Task-Technology Fit on Intention to Use ($B = 0.644$; $R^2 = 0.340$; $F = 495.070$; $p < 0.01$). This suggests that when a technology is perceived as compatible with users' workflows, it increases their intention to actively use that technology. However, the moderate effect size implies that task-technology fit alone is not a sufficient determinant; other influencing factors should also be considered. One of the most influential among these appears to be users' self-efficacy—their belief in their own abilities to effectively use AI technologies. Individuals with high self-efficacy are more likely to adopt and efficiently use new technologies.

Lastly, the moderating effect of self-efficacy on the relationship between task-technology fit and intention to use was found to be statistically significant ($B = 0.115$; $R^2 = 0.452$; $F = 794.512$; $p < 0.01$). This indicates that self-efficacy positively moderates this relationship. Individuals with higher self-efficacy are more motivated to use technologies that are aligned with their tasks.

In this regard, promoting the adoption of AI applications in educational environments requires enhancing users' self-efficacy and improving the accessibility and user-friendliness of technological systems. Educational institutions should develop supportive strategies to empower users in technology adoption, which would, in turn, increase both the acceptance and usage rates of AI-based solutions in learning environments.

Discussion

The findings of this study are largely consistent with the existing literature. In particular, the significant impact of self-efficacy on intention to use aligns well with previous research. For example, Korkmaz et al. (2024), in their study titled “*The Impact of Attitude, Ease of Use, Sophistication, and Trust in Artificial Intelligence on Purchase Intention*,” concluded that individuals who use AI technologies tend to be satisfied with them and are inclined to continue using them in the future. Similarly, in the present study, university students’ positive attitudes toward AI and their high levels of self-efficacy emerged as strong predictors of their intention to use AI in educational contexts.

The effect of task-technology fit on usage intention also mirrors findings reported in the literature. In a study by İşler et al. (2021), titled “*The Use and Development of Artificial Intelligence in Education*,” the authors emphasized the increasing role of AI applications in educational settings and their supportive role in learning processes. These findings support the current study’s result that alignment between work processes and technological infrastructures positively influences users’ attitudes toward such technologies.

Additionally, a study by Bayraktar et al. (2023) found that teachers working in schools affiliated with the Turkish Ministry of National Education generally held favorable attitudes toward the use of AI technologies in education. This is in line with the positive attitudes displayed by university students in the present study and highlights a growing trend of acceptance and interest in AI technologies across different age and professional groups within the education sector.

Comparable results are also found in the international literature. Zawacki-Richter et al. (2019) drew attention to the rising role of AI applications in education, particularly emphasizing the effectiveness of algorithms that support student-centered learning processes in enhancing learning motivation. Moreover, Lee (2021) emphasized that increasing students’ self-efficacy significantly boosts their trust in and engagement with AI-based learning systems. These findings corroborate the moderating role of self-efficacy found in our study.

In conclusion, the findings of this study underscore the critical role of variables such as self-efficacy, technology characteristics, and task-technology fit in the adoption of AI technologies in educational settings. Based on the results, it is recommended that programs aiming to enhance users’ technological competence be implemented, and that greater efforts be made to ensure that AI systems are accessible and user-friendly in order to support their effective use in education.

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Conflict of Interest

The authors declare that there are no personal or financial conflicts of interest related to this study.

Author Contributions

The authors contributed equally to the planning, execution, and writing of this study.

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The Role of RENU and NITA-U in Providing Infrastructure and Online Access in Ugandan Higher Education

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Abstract

This study investigates the role of national ICT agencies in facilitating access to digital academic content in Ugandan higher education. Specifically, it examines the impact of the Research and Education Network for Uganda (RENU) and the National Information Technology Authority-Uganda (NITA-U) on two contrasting institutions, Makerere University (public) and Kampala International University (private). Using a qualitative case study design, data was collected through semi-structured interviews with 30 participants, including ICT administrators, academic staff, and students. Observation of ICT infrastructure and Document review of institutional ICT policies and national strategic plans complemented the interviews. Thematic analysis was used to interpret the findings. Significant disparities in ICT access were found between the two institutions. Public Universities benefited from strong partnerships with national ICT agencies and robust infrastructure, while private Universities faced barriers including limited connectivity, inadequate devices, and minimal engagement with national programs. The study also revealed systemic gaps in national ICT policies, particularly the exclusion of private institutions from key infrastructure initiatives. Recommendations include expanding government funding to private universities, improving technical capacity, and developing inclusive ICT strategies that prioritize equity. The findings have critical implications for doctoral education, where digital access directly influences research quality, supervision, and academic progression. This study contributes original insights into how national ICT policies affect institutional access to online academic content in developing countries. It offers evidence-based recommendations to support digital equity and enhance doctoral education outcomes in Uganda and similar contexts.

Keywords: Digital Access, Online Content, Equity, Higher Education in Uganda

Background

In recent decades, digital technologies have become indispensable in transforming the landscape of higher education worldwide. Universities are increasingly dependent on Information and Communication Technologies (ICT) to support teaching, research, collaboration, and administration (Anderson, 2008; Bates, 2015). The ability to access, create, and disseminate knowledge online has reshaped how academic communities operate, promoting the idea of globally networked learning environments. However, this transformation has not occurred uniformly. Many institutions in low-income and developing countries continue to experience substantial barriers to digital inclusion, particularly in sub-Saharan Africa (UNESCO, 2019; van Dijk & van Deursen, 2019).

In Uganda, the higher education sector is marked by uneven access to ICT infrastructure and online content. Public universities, particularly Makerere University (Mak), have benefited from relatively sustained government and international donor investments in digital infrastructure (Makerere University, 2020; Graham, Andersen, & Mann, 2015). By contrast, private universities continue to experience chronic underfunding, unreliable internet connectivity, limited digital devices, and insufficient technical support (Bagarukayo & Kalema, 2015; Van der Westhuizen, 2016). These institutional disparities exacerbate the digital divide within the country's academic ecosystem, with direct consequences on the quality of teaching, student engagement, and research productivity.

The government of Uganda has introduced several policy initiatives aimed at reducing this divide. Notably, the Research and Education Network for Uganda (RENU) and the National Information Technology Authority-Uganda (NITA-U) were established to expand broadband infrastructure and support digital transformation across sectors (RENU, 2020; NITA-U, 2019). RENU's mandate includes providing affordable high-speed internet to research and education institutions, while NITA-U's initiatives, such as the National Backbone Infrastructure (NBI) and the Last Mile Connectivity Project, aim to extend fiber-optic access across all districts. While these efforts have seen some success in strengthening public university networks, questions persist regarding the inclusivity, efficiency, and sustainability of these interventions, particularly for private institutions (Zennaro, Pelsser, Albinet, & Manzoni, 2020).

Further complicating the digital access landscape is the lack of consistent national funding, limited technical expertise at institutional levels, and slow policy uptake among higher education administrators (Uganda National Council for Higher Education [UNCHE], 2020). This has led to a fragmented ICT environment where some institutions are well-resourced while others remain digitally marginalized. The digital infrastructure gap has wide-ranging implications for academic equity and inclusion, especially in doctoral education, where robust access to global scholarly databases and high-speed connectivity are critical for research development (Czerniewicz, 2015; Van der Westhuizen, 2016).

Problem Statement

Despite Uganda's national ICT strategies and significant investments in broadband infrastructure (NITA-U, 2019), there is a persistent digital divide that undermines the effectiveness of e-learning, impedes research capacity, and limits opportunities for international academic collaboration (van Dijk & van Deursen, 2019). While national initiatives such as RENU and NITA-U were established to democratize ICT access, their reach and effectiveness across institutional types remain unclear (Zennaro et al., 2020). Without targeted, evidence-based intervention frameworks, Uganda's higher education policy risks perpetuating structural disparities, ultimately reinforcing inequalities in access to academic content, digital research tools, and global scholarly engagement.

Purpose of the Study

This study aims to investigate the role of RENU and NITA-U in facilitating access to online content in Uganda's higher education sector. Through a comparative case study of Mak and KIU. The research explores how institutional characteristics (public vs. private status) shape online content access and utilization.

Literature Review

ICT as a Catalyst for Educational Transformation:

The global shift towards digitalization in higher education has been fueled by advancements in Information and Communication Technologies (ICT), which now underpin pedagogy, content delivery, research access, and institutional management (Bates, 2015; Selwyn, 2016). ICT has become essential for promoting open learning, especially through virtual learning environments (VLEs), massive open online courses (MOOCs), and digital libraries that facilitate access to global knowledge (UNESCO, 2019). In doctoral education, where extensive research, access to scholarly databases, and collaboration across institutions are vital, reliable ICT infrastructure directly influences academic success (Anderson, 2008; Czerniewicz, 2015). However, the mere availability of digital platforms does not automatically translate to improved outcomes. The utility of ICT in higher education is contingent upon institutional readiness, digital literacy, affordability, and quality of connectivity (Van Dijk, 2020).

ICT Access in Ugandan Higher Education:

Uganda's higher education system reflects a dichotomy in ICT access, especially between public and private universities. Makerere University, as a flagship public institution, has made substantial investments in ICT infrastructure, including broadband connectivity, learning management systems (LMS), and e-library services (Makerere University, 2020; Graham, Andersen, & Mann, 2015). These advancements are supported by international collaborations and national funding mechanisms. In contrast, private institutions from low-resource settings often face persistent barriers, including outdated technology, low bandwidth, limited access to devices, and financial constraints (Bagarukayo & Kalema, 2015; Mpungose & Khoza, 2022). Students and faculty at these institutions report difficulties engaging with online academic content due to unstable internet connections and limited access to scholarly databases, which exacerbates inequalities in academic engagement (Czerniewicz et al., 2020).

National ICT Policies and Strategic Initiatives:

In response to these access disparities, Uganda has implemented several national ICT strategies aimed at fostering digital inclusion. Two of the most prominent actors in this space are the Research and Education Network for Uganda (RENU) and the National Information Technology Authority-Uganda (NITA-U). RENU, a not-for-profit

consortium, aims to provide affordable high-speed internet and related services to research and education institutions (RENU, 2020). It has enabled public institutions to significantly reduce connectivity costs and enhance their digital infrastructure.

NITA-U has taken a broader national approach through projects such as the National Backbone Infrastructure (NBI) and the Last Mile Connectivity Initiative, which aim to expand internet access to all districts and public offices, including universities (NITA-U, 2019). These efforts have been partially successful in increasing broadband availability across urban centers. However, research shows that their impact remains uneven, with limited penetration in private and rural institutions due to bureaucratic delays, inadequate funding models, and infrastructure constraints (Zennaro, Pelsser, Albinet, & Manzoni, 2020).

The Persistent Digital Divide:

Despite these national interventions, the digital divide in Ugandan higher education remains a pressing issue. Van der Westhuizen (2016) emphasizes that structural inequalities, such as outdated computers, poor maintenance, lack of skilled personnel, and unreliable electricity, continue to limit ICT adoption in many African universities. These challenges disproportionately affect private universities, which often operate with constrained budgets and receive limited government support (Czerniewicz et al., 2020). Moreover, digital exclusion is not solely a technical issue; it also has socio-pedagogical dimensions. Students from disadvantaged backgrounds are less likely to own personal devices or have home internet access, further marginalizing them in digitally mediated learning environments (Selwyn, 2016; Czerniewicz, 2015). Addressing the digital divide thus requires an intersectional approach that accounts for institutional capacity, national policy, and socioeconomic inequalities.

ICT and Higher Education:

Higher education is particularly vulnerable to infrastructural limitations in digital access. Research training depends heavily on timely access to online journals, data repositories, virtual supervision platforms, and international scholarly networks (UNESCO, 2019). Inadequate ICT infrastructure can delay research progress, restrict collaborative opportunities, and increase attrition among doctoral candidates (Bagarukayo & Kalema, 2015; Anderson, 2008). For institutions aiming to enhance their research output and postgraduate training, investing in robust, equitable ICT systems is no longer optional; it is essential.

Gaps in the Literature:

Existing literature on ICT in African higher education predominantly focuses on technological adoption at public institutions and offers generalized assessments of policy outcomes. Few studies provide comparative analyses between public and private universities or critically evaluate the role of national ICT initiatives like RENU and NITA-U. In Uganda, the differential impact of these agencies across institutional types remains underexplored, particularly regarding online content access, research enablement, and postgraduate education outcomes (UNCHE, 2020; Zennaro et al., 2020).

Methodology

Research Design:

This study employed a qualitative case study design to explore the challenges and opportunities related to ICT access in Ugandan higher education, with particular attention to the roles of RENU and NITA-U. The case study approach was selected due to its suitability for in-depth exploration of contextualized phenomena within their real-world settings (Yin, 2018). Given the complexity of digital access disparities and the involvement of multiple institutional actors, this design enabled a nuanced investigation of how national ICT initiatives are operationalized across different types of universities. A multiple-case approach was adopted, focusing on two contrasting institutions: Makerere University (Mak), the leading and a well-resourced public university in Uganda, and Kampala International University (KIU), the largest private university in Uganda. This contrast enabled an analysis of how institutional characteristics, including funding models, governance structures, and student demographics, influence experiences with digital access.

Sampling and Site Selection:

Purposive sampling was used to identify institutions and participants with direct experience of ICT use and infrastructure. Mak was chosen due to its status as Uganda's premier public university and its historical involvement in national ICT initiatives. KIU was selected to represent private universities, which often face unique challenges in digital access due to limited funding and policy support.

Participants were selected from three categories:

RENU and NITA-U staff (n = 8): IT Implementation teams.

University staff (n = 12): Librarians and ICT staff responsible for managing institutional content, infrastructure, and liaising with RENU and NITA-U. Faculty members who regularly use ICT tools in teaching, supervision, and research.

Students (n = 10): Undergraduate and postgraduate students who access online academic content as part of their learning experience.

This sample of 30 participants provided diverse perspectives across both institutions.

Data Collection Methods:

Data were collected using three qualitative techniques: unstructured interviews, observation, and document review. Interviews were conducted with the 30 participants mentioned above. An interview guide was developed to ensure consistency, covering themes such as digital infrastructure, access to online content, institutional partnerships with RENU/NITA-U, and perceived barriers to digital engagement. Interviews lasted between 45 and 60 minutes and were recorded with consent. This method enabled rich, first-hand accounts of the lived experiences of ICT access. Participant observation was used to observe activities and the physical availability of devices, the quality of connectivity, and the distribution of wireless access points. Key documents were analyzed to contextualize interview data and verify institutional and national ICT strategies. These included: Institutional ICT policies from Mak and KIU; Strategic plans from RENU and NITA-U; Reports from the Uganda National Council for Higher Education (UNCHE); and Government broadband rollout progress updates. This triangulation enhanced the trustworthiness and credibility of the findings (Creswell & Poth, 2018).

Data Analysis:

Data were analyzed using thematic analysis, following the six-step approach outlined by Braun and Clarke (2006). Transcribed interviews were coded inductively to identify recurring themes and subthemes. These included: Access to infrastructure; Connectivity and bandwidth constraints; Device availability; Institutional support mechanisms; and Perceptions of RENU and NITA-U. Thematic patterns were compared across the two institutions to identify similarities, divergences, and critical gaps in service provision. Document data were analyzed deductively using a content analysis framework focused on ICT policy provisions, coverage goals, and implementation outcomes. Participant observation was used to validate certain aspects of the study, such as the availability of devices, the quality of connectivity, and the distribution of wireless access points.

Trustworthiness and Ethical Considerations:

To ensure the rigor of the research, Lincoln and Guba's (1985) criteria were applied: Credibility was enhanced through member checking and prolonged engagement; Transferability was supported by detailed descriptions of institutional settings; Dependability was ensured through an audit trail of procedures and decision-making; Confirmability was addressed by triangulating data sources and maintaining reflective notes.

Ethical approval was obtained from the Lira University Research and Ethics Committee, and permission to conduct this study in Uganda was granted by the National Council for Science and Technology. Participants were briefed on the study's purpose and provided informed consent. Anonymity was guaranteed by coding interview transcripts and withholding institutional identifiers where appropriate.

Limitations of the Study:

While this study provides valuable insights into the facilitation of online content access in Ugandan higher education, it is important to acknowledge its limitations to contextualize the findings and suggest directions for future research. This study employed a qualitative, multiple-case study design with a purposively selected sample of 30 participants. This approach was ideal for achieving thematic saturation and obtaining rich, in-depth data relevant to the research questions. However, the sample size, while adequate for qualitative inquiry, limits the statistical generalizability of the findings. Future research could employ large-scale surveys to quantitatively measure the prevalence of the challenges and strategies identified here across a broader population of institutions.

The primary data collection method was semi-structured interviews, which inherently rely on participants' self-reported experiences, perceptions, and recollections. While this is a strength for understanding subjective realities, it introduces the potential for recall bias, social desirability bias and perceptual inaccuracies. To mitigate this, the study employed methodological triangulation by corroborating interview data with direct observation and document analysis. Nevertheless, the findings should be interpreted as representing the perspectives of key stakeholders within the studied ecosystem.

While the specific findings may not be directly transferable to other regions, the identified themes may offer valuable insights for researchers and policymakers in other resource-constrained settings facing similar digital equity challenges. The transferability of the findings is thus analytical rather than statistical.

Results

This section presents the findings from the case study analysis of Mak and KIU, based on interviews with key stakeholders, observation, and document review. The results are organized thematically to reflect the most salient issues: disparities in ICT infrastructure, challenges to internet connectivity, access to digital content, and perceptions of RENU and NITA-U interventions.

Table 1: Summary of Key Disparities between Public and Private Universities

Dimension	Public Universities	Private Universities
ICT Infrastructure	Modern computing labs, centralized LMS (MUELE), robust server infrastructure, and backup power.	Outdated computers, limited Wi-Fi coverage, and frequent power outages disrupt operations.
Internet Connectivity	Stable, high-speed broadband via RENU and NITA-U. Challenges involve peak-time network management.	Unreliable, costly connectivity from commercial ISPs is cited as a major barrier to online learning.
Access to Digital Resources	Institutional subscriptions to major databases (JSTOR, Scopus). NITA-U-supported device loan schemes.	Limited access to premium academic databases. High student reliance on under-resourced university labs.
Role of RENU/NITA-U	High awareness and utilization. RENU praised for cost-saving and stability. NITA-U provides advisory support.	Low awareness and engagement. Perceived bureaucratic barriers to accessing NITA-U services.
Technical Support & Training	A dedicated ICT directorate provides support. Digital literacy training is available, though capacity can be stretched.	Inadequate technical support staff. Minimal structured digital literacy training for staff

Source: Primary Data based on Observation, Document Review, Interviews

ICT Infrastructure and Connectivity Disparities:

The findings revealed that ICT infrastructure is not merely a technical backbone but a marker of institutional privilege and systemic inequality. Public universities, particularly Makerere, had made visible investments in modern computer laboratories, reliable connectivity, and subsidised high-speed Internet. For example, a stakeholder noted “*Makerere is a flagship university which has adopted most of RENU’s services. These services include the highest bandwidth subscription and updated network devices*” (RENUSF4). These gains were tied to partnerships with RENU and NITA-U, demonstrating how national infrastructure bodies disproportionately benefit public institutions. As one systems administrator explained, “*Our bandwidth is relatively stable thanks to RENU. The issue is more about managing network demand during peak periods. We also receive training and advisory service from NITA-U.*” (MAKSF 4). This reflection illustrates that for public Universities, the challenge has shifted from basic connectivity to optimising user experiences, a sign of infrastructural maturity. By contrast, the situation in private universities was characterized by ICT infrastructural limitations. The accounts of both students and staff emphasised frustration with outdated hardware and unstable Internet services. A student expressed this poignantly: “*Sometimes we go to the lab and spend an hour waiting for the computers to boot because the power is sometimes on and off, but the Internet is available, but sometimes slow*” (KIUST 5). Here, digital exclusion was not only a question of bandwidth but the cumulative effect of weak electricity supply, obsolete machines, and unaffordable data packages. The sense of being locked out of the digital academy was tangible, as access to even the most basic online resources was often determined by infrastructural failure rather than user choice. These disparities reinforce what Ssembatya (2012) describes as a structural imbalance in Uganda’s higher education, where public institutions enjoy resource advantages not available to their private counterparts.

Differential Access to Resources and National Support:

The inequalities extended beyond connectivity to the realm of academic resources and national support mechanisms. For example, a stakeholder revealed, “*We have rolled out Eduroam connectivity and it’s active in all public Universities, some private ones are yet to seek integration, but the technology has been deployed across the country*” (RENUSF 1). Public university staff and students had access to a wide array of subscribed databases and occasionally benefited from government-backed device loan schemes, initiatives designed to stimulate digital inclusion. For them, national infrastructure bodies such as RENU were not abstract policy actors but lived enablers of academic life. One librarian proudly remarked, “*We benefit a lot from RENU subscriptions and federated access systems. Students don’t have to struggle with passwords and VPNs*” (MAKSF 2). Such testimonies

highlight how government and consortia-level programmes filter down to improve day-to-day academic practices in public universities.

The picture was starkly different in private institutions, where staff and students consistently reported feeling excluded from these national streams of support. Awareness of RENU's role was minimal, and engagement with NITA-U was limited. A faculty member underscored this exclusion bluntly: *"We've tried to engage NITA-U, but their programs mostly prioritise government institutions. There is a need to adopt an inclusive strategy so that private institutions can equally benefit from national initiatives"* (KIUSF 5). The perception of systemic marginalisation was not incidental but deeply entrenched, shaping how private institutions navigated resource constraints largely without state support. *"NITA-U currently supports the rest of the Universities with last-mile connectivity through RENU, but the rest of the services currently benefit public institutions."* (NITASF 1). Czerniewicz et al. (2020) similarly observe that digital transformation policies in African higher education often reinforce existing institutional hierarchies, with public universities positioned to benefit more readily from national ICT initiatives.

Cross-Cutting Challenges: Support and Literacy:

While infrastructural and resource disparities defined the divide between public and private universities, the findings also surfaced challenges that transcended institutional boundaries. Both public and private universities reported inadequate technical support and limited digital literacy among staff and students. A Makerere lecturer noted, *"Even when the Internet is there, many colleagues don't know how to use the databases effectively. So librarians will have to always organize trainings"* (MAKSF 7), while a private university student echoed, *"We are taught how to navigate databases, but I think there is need for continuous training on the use of proper academic tools"* (KIUST 3). These voices suggest that connectivity alone does not guarantee meaningful access; digital skills and pedagogical support are equally critical.

The shortage of ICT support staff further compounded these difficulties. A systems officer lamented, *"There are just a few of us handling all IT issues for the whole university. You can imagine the overwhelming task if most of the students and staff are to be fully supported"* (KIUSF 2). Such testimonies underscore that Uganda's universities are not only underinvesting in machines and networks but also in the human capital required to sustain digital transformation. The problem, therefore, is not simply technological but systemic, rooted in policy priorities that privilege infrastructure deployment over long-term investment in digital competencies.

Taken together, these findings illuminate a landscape of stratified digital readiness: robust but overstretched systems in public universities, fragile and underdeveloped infrastructure in private institutions, and shared gaps in literacy and technical support across both.

Discussion

The discussion of findings from the case study analysis of Mak and KIU, based on interviews with key stakeholders, observation, and document review, is hereby presented. The discussion is organized thematically to reflect the most salient issues.

ICT Access in Organizational and Environmental Contexts:

The stark disparities between public and private universities are not merely technological but are deeply rooted in organizational capacities and environmental constraints. While the superior ICT infrastructure at public universities aligns with global patterns where flagship institutions often lead digitalization (Cloete & Maassen, 2015; Lwoga & Komba, 2015), the severity of the divide in Uganda underscores a critical environmental failure: the lack of a policy framework that mandates or incentivizes equitable access across all accredited institutions. This finding contrasts with models in countries like South Africa or Kenya, where national ICT policies more explicitly aim to include a diverse range of higher education providers, though with varying success (Czerniewicz & Brown, 2014; Mutula, 2009). The situation at private universities reflects a broader trend in sub-Saharan Africa, where policy vacuums and market-driven logics often prioritize profitability over robust ICT investment (Molla, 2008). This study demonstrates that in Uganda, the organizational advantage of public institutions is compounded by an environmental context that systematically disadvantages their private counterparts.

Technological and Socio-Economic Constraints:

The identification of internet connectivity as the principal barrier confirms established literature (Van der Westhuizen, 2016). However, this study adds a critical layer by revealing the limitations of current national models. While RENU's subsidized bandwidth is effective for its members, its reach is restricted. This presents a stark contrast to the more integrated NREN models in regions like Europe (via GÉANT) or even in neighboring Rwanda, where efforts to connect a wider array of institutions are more centralized and publicly funded (Jensen,

2010; Zennaro et al., 2020). The reliance on a membership-based model for RENU, while practical, inadvertently creates a tiered system. The findings suggest that Uganda's approach, heavily reliant on organizational partnerships, needs to be supplemented by stronger environmental mandates from bodies like NITA-U and the Uganda Communications Commission (UCC) to ensure affordability and coverage transcend institutional type.

Institutional Capacity from a Dimension of Digital Inclusion:

The significant capacity gaps, especially in technical support and digital literacy at KIU, highlight a critical flaw in the assumption that providing technology leads to its effective use. This aligns with global critiques of technology-driven reform that neglect human capacity (Bates, 2015; Trotter & Hodgkinson-Williams, 2021). The findings critically extend this argument by showing that in a resource-constrained environment like Uganda, this oversight is catastrophic for private institutions. Unlike in wealthier nations, where faculty and students might compensate for institutional shortcomings with personal resources, the lack of institutional support in Uganda directly truncates educational opportunities. This underscores that digital equity is as much about building organizational human capital as it is about installing hardware.

The Asymmetric Impact of RENU and NITA-U as Key Stakeholders:

The study reaffirms RENU's positive impact but critically examines the environmental and organizational reasons for the uneven reach of NITA-U's portfolio services. The limited engagement with private universities is not simply an oversight but a result of a policy architecture that primarily focuses on public institutions as the engines of national development. This contrasts with more holistic digital transformation strategies in African higher education, which view the entire sector as a cohesive ecosystem vital for national innovation (Trotter & Hodgkinson-Williams, 2021). NITA-U's broader infrastructure focus is commendable, but the findings reveal a gap in the deployment of a wide array of services for both public and private institutions. What is prominent is the national backbone deployment and last-mile connectivity potential to all universities. The last-mile limitations within the higher education sector can be viewed on a case-by-case basis. If researched, it could reveal a manifestation of a multi-layered digital divide beyond connectivity. However, this study provides a clear case study for the implications of ICT infrastructure on access to online content for equity.

Table 2: Implications for Policy and Practice

TOE Context	Implications for Policy and Practice
Environmental Level	Policymakers must develop an equitable ICT funding model that explicitly includes private institutions in national subsidy schemes and infrastructure projects, shifting from a purely public institution focus.
Organizational Level	Mandate and support institutional capacity building. RENU and NITA-U, in partnership with NCHE, should establish ICT governance certification standards and deliver targeted training programmes for staff across all institutions.
Technological Level	Provide targeted technological support for research. This includes dedicated bandwidth for academic databases and cloud-based research tools for postgraduate students across all institutions, recognising research as a national priority.
Cross-Cutting	Formalise public-private partnerships in ICT planning. Establish a national task force involving RENU, NITA-U, UCC, and representatives from both public and private universities to build a cohesive and inclusive digital ecosystem.

Conclusion

This study set out to investigate the facilitation of access to online content in Ugandan higher education, with a specific focus on the roles of RENU and NITA-U. The findings reveal profound disparities in digital infrastructure, connectivity, and institutional capacity, but the study's primary contribution lies in explicating the systemic mechanisms behind these inequities. The most significant finding is the critical interplay between institutional typology and access to national ICT resources. While public universities have advanced by leveraging direct funding and strategic partnerships with RENU and NITA-U, private institutions remain systematically marginalized. This is not merely a funding gap but a policy and design failure in national digital inclusion strategies, which have historically prioritized public entities. The study establishes that limited access to stable internet, scholarly databases, and cloud-based collaboration tools directly impedes research productivity, quality, and timely completion for postgraduates in underserved institutions. This threatens the entire national project of building a robust knowledge economy, as a significant segment of the academic community is effectively disenfranchised. Therefore, this study's central policy implication is the urgent need to redefine "national" ICT infrastructure to include all accredited higher institutions of learning, regardless of their public or private status. Equitable access must be legislated through targeted funding models, mandatory inclusion in subsidized bandwidth programs, and capacity-building partnerships mandated for bodies like RENU and NITA-U.

Recommendations

Based on the study's findings, the following recommendations are proposed to strengthen digital access across Uganda's higher education landscape:

1. Expand Equitable ICT Funding to Private Institutions

Stakeholders should develop funding models that explicitly include private universities. These models could involve: Co-funding schemes for infrastructure upgrades; Subsidies for broadband connectivity and equipment; Competitive grants that reward innovative digital transformation plans.

2. Enhance Institutional Capacity for ICT Support

Universities must invest in: Recruiting and training ICT professionals; Establishing help desks and support centers for students and faculty; Conducting periodic capacity-building workshops on digital literacy, cybersecurity, and scholarly resource use.

3. Bridge the Device Access Gap

To overcome the barrier of limited personal devices, institutions and national bodies should: Introduce student laptop loan schemes; Partner with tech companies for subsidized device procurement; Establish communal digital labs with extended operating hours.

4. Integrate ICT Policies into National Doctoral Training Frameworks

The Ministry of Education and UNCHE should incorporate ICT standards into national doctoral education policies by: Requiring institutions to demonstrate ICT readiness in postgraduate program accreditation; Encouraging the use of open-access platforms and research management systems; Monitoring digital equity outcomes through periodic assessments.

5. Establish Cross-Institutional Knowledge Sharing Networks

Institutions should collaborate through: Peer learning forums where best practices on ICT integration are shared; Joint workshops and symposia organized in partnership with RENU/NITA-U; Shared service agreements where well-resourced institutions support those with lower digital capacity.

Final Reflection

Ultimately, the promise of digital transformation in Ugandan higher education lies not merely in infrastructure development but in equitable access, inclusive policy implementation, and sustained capacity-building. Bridging the digital divide requires collaborative efforts that span government, universities, national ICT bodies, and the private sector. Only through such systemic and inclusive engagement can Uganda fully realize its vision of a digitally empowered academic ecosystem, one in which every student and scholar, regardless of institutional affiliation, can participate meaningfully in the global knowledge economy.

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