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Table of Contents

From The Editor

Welcome to Volume 26 Issue 3 of TOJDE

Siti Haslina Md HARIZAN & Mohamed ALLY

Artificial Intelligence in Micro-Credentials for Open and Distance Learning:
A Technologically Enhanced Systematic Review 1-24

Aysegul ATALAY

Leading From Afar: Navigating the Challenges and
Strategies of Distance Management in Education 25-39

Sunita SAIKIA & Yeasmin SULTANA

Faculty Voices Explored: A Mixed-Method Research on Attitude towards OER
Adoption in Central Universities of North East India 40-59

Elena CARRION CANDEL, Cristina DE-LA-PENA & Beatriz CHAVES-YUSTE

A Gamified Digital Framework in Higher Education: Impact on Learning and Motivation 60-84

Betul AYDIN & Suleyman Sadi SEFEROGLU

Risks of the Digital World: Digital Risk-Taking Scale (DRTS) Validity and Reliability Study 85-96

Khaled AMIN & Vichayanan RATTANAWIBOONSOM

Modeling Users' Continued Engagement in E-Learning in
The Post-Covid Era in a Developing Country: GSCA-SEM Approach 97-127

Nazir Ahmed JOGEZAI, Fozia Ahmed BALOCH, Muhammad JAFFAR & Gulab KHILJI

Generative AI in Higher Education: University Faculty Perspectives on
Opportunities and Challenges 128-143

Muhammed Ozgur YASAR & Enisa MEDE

Can Self-Made Videos Promote L2 Speaking Skills in a MOOC-Based Flipped Classroom Model? 144-191

Arief ARDIANSYAH, I Nyoman SUDANA DEGENG

Dedi KUSWANDI & Henry PRAHERDHIONO
A New Model for Blended Learning in Islamic Higher Education:
Integrating Peer Instruction with Just-in-Time Teaching 192-216

Halil ELIBOL

The Empty Classroom: Exploring Non-Attendance in Online French Language Classes 217-237

Liliana Herrera NIEVES, Emilio Crisol MOYA & Rosana Montes SOLDADO

Moodle Usability Assessment Methodology Using the Universal Design for Learning Perspective 238-255

Saif MOHAMMED & Laszlo KINYO

Differences between Arabic and English Medium School Learners in terms of
E-Learning Technology Acceptance and Use from the Aspect of
The Constructivist Learning Approach 256-287

Gerby R. MUYA, Alexie Erasga BASILEYO, Ryan Joseph G. CALINAO

Jan Racky MASA, Salome L. MORANDARTE & Florcelita ZAMORA
Modelling Hybrid Teaching in the Next Normal for Philippine Private Higher Education 288-314

RULINAWATY, Ojat DAROJAT & Brightly Avi JONATHANS

E-Learning Practised Innovation towards Knowledge Management and
Massive Open Online Courses (MOOCs) in Open University, Indonesia 315-331

Sultan NARIN, Zeynep COMERT & Yavuz SAMUR
What do Teachers Say about Metaverse in Education? 332-345

Borey BE
Book Review: Best Practices in Engaging Online Learner through Active and
Experiential Learning Strategies 346-349

Dear TOJDE Readers,

Welcome to Volume 26 Issue 3 of TOJDE.

There are 15 articles and a book review in the July 2025 issue of TOJDE. 41 authors from 14 different countries contributed to the issue. These countries are Bangladesh, Cambodia, Canada, Colombia, Hungary, India, Indonesia, Malaysia, Pakistan, Philippines, Russian Federation, Spain, Thailand and Türkiye.

The title of the first article is ARTIFICIAL INTELLIGENCE IN MICRO-CREDENTIALS FOR OPEN AND DISTANCE LEARNING: A TECHNOLOGICALLY ENHANCED SYSTEMATIC REVIEW. The authors are Siti Haslina Md HARIZAN and Mohamed ALLY. This research seeks to address this issue through a systematic review using specialized software to comprehensively analyze the relevant literature. This study contributes to the existing body of knowledge and paves the way for further exploration of AI integration into micro-credentials in ODL, thus offering new opportunities for future research and development.

LEADING FROM AFAR: NAVIGATING THE CHALLENGES AND STRATEGIES OF DISTANCE MANAGEMENT IN EDUCATION, authored by Aysegul ATALAY, is the 2nd article. The research investigates whether behaviors such as effective interpersonal communication, planning and monitoring educational processes, and providing effective leadership change as physical distance increases. The study involves interviews with both teachers and administrators. According to the article, principals should display different characteristics in distance management processes compared to the leadership behaviors they exhibit in school.

Sunita SAIKIA and Yeasmin SULTANA are the authors of the 3rd article titled FACULTY VOICES EXPLORED: A MIXED-METHOD RESEARCH ON ATTITUDE TOWARDS OER ADOPTION IN CENTRAL UNIVERSITIES OF NORTH EAST INDIA. This study investigates the adoption of OER in the higher educational institutes of North East India. The article highlights that faculty members exhibit a moderate level of attitude towards OER adoption.

The 4th article, A GAMIFIED DIGITAL FRAMEWORK IN HIGHER EDUCATION: IMPACT ON LEARNING AND MOTIVATION, is written by Elena CARRION CANDEL, Cristina DE-LA-PENA and Beatriz CHAVES-YUSTE. This study proposes to analyze the improvement in student learning and motivation following the application of a didactic experience using gamified digital resources (Nearpod, Genially, Educaplay, Breakout, and Quizizz) in an online university classroom. The findings reveal a positive impact across all evaluated areas following the didactic intervention, with significant improvements ranging from perceptible to moderate in university students' perceptions of learning and motivation.

RISKS OF THE DIGITAL WORLD: DIGITAL RISK-TAKING SCALE (DRTS) VALIDITY AND RELIABILITY STUDY is the title of the 5th article. The authors are Betul AYDIN and Suleyman Sadi SEFEROGLU. This study aims to conduct validity and reliability of a measurement tool developed to determine university students' levels of digital risk taking. 646 undergraduate students from 8 different universities voluntarily participated in the study. The results are discussed in the article.

The title of the 6th article is MODELING USERS' CONTINUED ENGAGEMENT IN E- LEARNING IN THE POST-COVID ERA IN A DEVELOPING COUNTRY: GSCA-SEM APPROACH. Khaled AMIN and Vichayanant RATTANAWIBOONSOM are the authors. The study aims to identify factors propelling users to use the system for a sustained time in the post-pandemic era in a developing country. The study can be an important blueprint for the leaders of higher education institutions willing to facilitate and expedite e-learning, for policymakers and stakeholders looking for policies to expedite the sustained integration of educational technology, ensuring competencies and readiness to face future uncertainties, and for the commercial vendors envisioning expanding their operations in Southeast Asia.

The authors of the 7th article are Nazir Ahmed JOGEZAI, Fozia Ahmed BALOCH, Muhammad JAFFAR and Gulab KHILJI. The title is GENERATIVE AI IN HIGHER EDUCATION: UNIVERSITY FACULTY PERSPECTIVES ON OPPORTUNITIES AND CHALLENGES. This study aims to understand how

faculty members at higher education institutions in Pakistan respond to the opportunities and challenges associated with using Generative AI in teaching and learning. The study provides first-hand insights by analyzing teachers' responses.

CAN SELF-MADE VIDEOS PROMOTE L2 SPEAKING SKILLS IN A MOOC-BASED FLIPPED CLASSROOM MODEL? Is the 8th article. Muhammed Ozgur YASAR and Enisa MEDE are the authors. This study explores the impact of self-made videos as a pre-class activity within a flipped classroom approach, using a Massive Open Online Course as the primary online learning content. The findings of the research reveal a significant positive impact of self-made videos on both L2 speaking performance and course achievement in the MOOC-based flipped classroom model.

AriefARDIANSYAH, INyoman SUDANA DEGENG, Dedi KUSWANDI and Henry PRAHERDHIONO are the authors of the 9th article. The title of this article is A NEW MODEL FOR BLENDED LEARNING IN ISLAMIC HIGHER EDUCATION: INTEGRATING PEER INSTRUCTION WITH JUST-IN-TIME TEACHING. This research seeks to create a model for instructional system design that outlines learning procedures, integrating the Peer Instruction strategy within a blended learning framework informed by a just-in-time teaching methodology. The built model is intended to guide instructors in creating learning to stimulate learners' higher-order thinking skills.

The 10th article which is authored by Halil ELIBOL is titled THE EMPTY CLASSROOM: EXPLORING NON-ATTENDANCE IN ONLINE FRENCH LANGUAGE CLASSES. This study investigates the experiences of Anadolu University preparatory class students of French Language Teaching Programs during the 2022-2023 spring term, aiming to understand the issue of non-attendance within the framework of distance education. In this study, recommendations are formulated based on the findings to improve engagement and retention in online language courses.

MOODLE USABILITY ASSESSMENT METHODOLOGY USING THE UNIVERSAL DESIGN FOR LEARNING PERSPECTIVE is the title of the 11th article. Liliana Herrera NIEVES, Emilio Crisol MOYA and Rosana Montes SOLDADO are the authors. This study examines the importance of accessibility, usability and the availability of Assistive Technologies in an inclusive virtual education that meets the needs of students. Authors conclude that Universal Design for Learning principles and guidelines are positively valued by students and have a positive impact on certification rates.

The title of the 12th article is DIFFERENCES BETWEEN ARABIC AND ENGLISH MEDIUM SCHOOL LEARNERS IN TERMS OF E-LEARNING TECHNOLOGY ACCEPTANCE AND USE FROM THE ASPECT OF THE CONSTRUCTIVIST LEARNING APPROACH. The authors are Saif MOHAMMED and Laszlo KINYO. This study aims to examine the impact of language of instruction on students' attitudes towards technology, teaching practices, and learning outcomes in secondary and upper primary schools in Iraq. According to study, no significant positive difference was observed in the effect of perceived usefulness on the Constructivist learning approach for either Arabic medium school students or English medium school students.

Gerby R. MUYA, Alexie Erasga BASILEYO, Ryan Joseph G. CALINAO, Jan Racky MASA, Salome L. MORANDARTE and Florcelita ZAMORA are the authors of the 13th article. The title is MODELLING HYBRID TEACHING IN THE NEXT NORMAL FOR PHILIPPINE PRIVATE HIGHER EDUCATION. This study investigates the factors influencing faculty members' behavioral intention to adopt hybrid teaching approaches in selected Philippine private higher education institutions. The study provides insights for educational policymakers and technology developers to foster successful hybrid teaching adoption through strategies tailored to user experiences, institutional support, and technology-pedagogy integration.

The 14th article titled E-LEARNING PRACTISED INNOVATION TOWARDS KNOWLEDGE MANAGEMENT AND MASSIVE OPEN ONLINE COURSES (MOOCS) IN OPEN UNIVERSITY,

INDONESIA is authored by RULINAWATY, Ojat DAROJAT and Brightly Avi JONATHANS. The results of this study show that e-learning practice models have a positive and significant effect on knowledge management and Massive Open Online Courses (MOOCs).

The 15th article, WHAT DO TEACHERS SAY ABOUT METAVERSE IN EDUCATION?, is authored by Sultan NARIN, Zeynep COMERT and Yavuz SAMUR. This study indicates that teachers are optimistic about the advantages to be gained in the educational context with the metaverse, but the education system is not yet ready for this.

There is a book review in this issue. BEST PRACTICES IN ENGAGING ONLINE LEARNER THROUGH ACTIVE AND EXPERIENTIAL LEARNING STRATEGIES is the title of the book. Stephanie Smith BUDHAI and Ke'Anna Brown SKIPWITH are the authors. The reviewer is Borey BE.

Hope to meet again in the next issue of TOJDE.

Cordially,

Dr. T. Volkan YUZER

Editor in Chief

ARTIFICIAL INTELLIGENCE IN MICRO-CREDENTIALS FOR OPEN AND DISTANCE LEARNING: A TECHNOLOGICALLY ENHANCED SYSTEMATIC REVIEW

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ABSTRACT

Micro-credentials are increasingly meeting the growing need for a flexible workforce and are particularly well suited to the open and distance learning (ODL) environment. While artificial intelligence (AI) is driving educational advancements, its integration into micro-credentials for ODL remains fragmented, hindering further growth. This research seeks to address this issue through a systematic review using specialised software to comprehensively analyse the relevant literature. Employing a hybrid approach that combines bibliometric and thematic analyses, this study examines 46 articles on AI's role in micro-credentials within ODL contexts. This review identifies significant research gaps and offers suggestions for future directions in this emerging field. The findings provide valuable, updated insights with theoretical and practical implications. For industry practitioners, the review serves as a comprehensive resource, helping to bridge the gap between academic research and real-world applications. Ultimately, this study contributes to the existing body of knowledge and paves the way for further exploration of AI integration into micro-credentials in ODL, thus offering new opportunities for future research and development.

Keywords: Artificial intelligence, bibliometric analysis, micro-credentials, open and distance learning, SPAR-4-SLR, systematic review.

INTRODUCTION

The integration of artificial intelligence (AI) into micro-credential courses within open and distance learning (ODL) in higher educational institutions marks a pivotal shift in the educational paradigm aimed at enhancing accessibility, personalisation, and efficiency. This evolution aligns with rapid technological advancements and the increasing demand for flexible, lifelong learning opportunities that cater to a diverse global learner population. AI plays an important role in transforming ODL through micro-credentials by involving adaptive learning systems, personalised content delivery, and the automation of administrative tasks, which collectively aim to improve learning outcomes and student engagement. By leveraging AI technologies, institutions can offer more personalised and adaptive learning experiences, meeting the individual needs of learners and addressing the diverse competencies required in today's dynamic job market. This integration also promises to enhance the scalability and effectiveness of ODL programmes, making higher education more accessible to a broader audience. However, the integration of AI into micro-credential courses within ODL contexts is not without its challenges. Many areas are yet to be explored, given the current state of knowledge.

Nevertheless, emerging trends and innovative practices in the use of AI in micro-credentials within ODL highlight the potential for significant improvements in personalised learning, accessibility, and learner support. Thus, the integration of AI into micro-credential courses within ODL in higher education institutions may offer promising opportunities to redefine the learning experience, making it more personalised, accessible, and aligned with the needs of 21st-century learners. By addressing the challenges and leveraging emerging trends, higher education institutions can harness the power of AI to enhance the value and impact of their ODL programmes and micro-credentials.

BACKGROUND OF STUDY

ODL is an educational system that eliminates barriers related to time, location, and access, emphasising the role of technology in facilitating education for learners who are physically separated from their instructors (Ghosh et al., 2012). ODL leverages technology and flexible methodologies to provide accessible, inclusive, and learner-centred education. Micro-credentials are particularly relevant in ODL settings, as they provide a flexible learning pathway that caters to learners desiring to upskill or reskill. Micro-credentials, aligned with the gig economy, are short, industry-based learning units facilitated by digital platforms that contribute to education privatisation, transferring employment preparation costs to individuals and tightening higher education's ties to immediate workplace demands, rather than broader occupational skills (Wheelahan & Moodie, 2022). In addition, micro-credentials are focused, and competency-based certifications designed to support reskilling and upskilling, making them highly relevant in today's fast-paced and dynamic job market. Micro-credentials offer a means for learners to gain new skills or enhance existing ones without committing to long-term educational programmes (Orman et al., 2023). These credentials are often delivered online and obtainable through platforms, such as Coursera, Udemy, and EdX. Micro-credentials typically include metadata that transparently shows the learner's identity, awarding body, date of issue, study hours needed, type of assessment, and form of participation (Caetano et al., 2023).

The rise of micro-credentials reflects a shift towards more flexible, affordable, and accessible education options that are stackable and tailored to the evolving needs of learners and the job market. This flexibility allows learners to study at their own pace and from any location. It is designed to provide specific skills or knowledge that can be immediately applicable in the workplace. This has become increasingly important in the context of the COVID-19 pandemic, which has accelerated the adoption of online learning and highlighted the need for adaptable educational models (Ahmat et al., 2021). In particular, micro-credentials are valuable for professional development as they enable educators and other professionals to update their skills, stay current with industry trends, and demonstrate their competencies to employers. This form of credentialing is increasingly being recognised and valued by employers, enhancing employability and career progression (Hunt et al., 2020). Micro-credentials can be standalone certifications or combined (stacked) to contribute to broader qualifications, such as degrees or professional certifications. Stackability makes them versatile tools in the educational landscape, allowing learners to progressively build a portfolio of skills (Sargent et al., 2023). Micro-credentials offer a new approach to professional development by providing opportunities to document learning using work samples, videos, and other artefacts. This method enables teachers and other professionals to share their learning and achievements more broadly and can lead to recognition and rewards in their careers (Berry et al., 2016).

AI has emerged as a leading-edge technological trend. AI can significantly transform ODL by addressing various challenges and enhancing learning experiences for students and educators. AI also has the potential to enhance ODL through personalised learning experiences, automating administrative tasks, and improving student engagement and performance. AI enables personalised learning by tailoring educational content to meet the individual needs of learners. This customisation can improve engagement and comprehension by adjusting the pace and complexity of the material based on each student's progress and learning style (Yu et al., 2017). In addition, AI-powered support systems, such as chatbots and virtual tutors, provide students with instant feedback and assistance. These systems can answer common questions, guide learners through difficult concepts, and offer personalised tutoring, thereby enhancing the overall learning experience (Wen & Lin, 2008). AI can also analyse vast amounts of data to identify patterns and predict student outcomes, which helps educators intervene early when a student is struggling while personalising instruction.

to improve academic performance (Dogan et al., 2023). AI-driven interactive platforms, including virtual and augmented reality, can create immersive learning environments. These technologies engage students more deeply by providing hands-on experiences and simulations that enhance understanding and retention (Rad et al., 2021). AI can also automate administrative tasks, such as grading, scheduling, and plagiarism detection, allowing educators to focus more on teaching and student interaction. This increases efficiency and reduces educators' workloads (Fadzil & Munira, 2008). The adaptability of AI systems to the diverse needs and backgrounds of learners offers an inclusive educational environment that ensures that all students have the opportunity to succeed regardless of their starting point (Holmes & Anastopoulou, 2019). By leveraging AI technologies, educational institutions can offer more flexible, efficient, and effective learning solutions.

Integrating AI into micro-credentials within ODL can significantly enhance the effectiveness, accessibility, and personalisation of learning experiences. AI technologies facilitate various aspects of the educational process, from personalised learning paths to automated support systems, making education more adaptable to individual learners' needs. AI enables personalised learning by tailoring educational content to each learner's unique needs. This is achieved through adaptive learning systems that adjust the complexity and pace of the material based on the learner's progress and preferences. Such systems are particularly beneficial in ODL settings, where direct interaction with instructors is limited (Fadzil & Munira, 2008). The development of AI-powered virtual teaching assistants, such as T-BOT and Q-BOT, helps both students and tutors by providing real-time tutoring and evaluation. These AI agents can engage with students through natural language, offering support and feedback, which enhances the learning experience on platforms such as Moodle (Rodriguez et al., 2008). Integrating AI into the learning management system (LMS) may streamline and enhance various educational processes, such as content delivery, student assessment, and feedback. AI technologies automate administrative tasks, provide personalised learning paths, and offer analytics to monitor and improve student performance (Firat, 2023). AI-driven insights also help educators design more effective courses by analysing student data to identify learning patterns and areas for improvement. This leads to the creation of more engaging and effective educational content (Goksel & Bozkurt, 2019).

Despite the emerging interest in AI, which significantly impacts the higher educational research landscape, systematic literature reviews concerning the integration of AI into micro-credentials, particularly in the context of ODL, are relatively new and rarely focused. To date, the existing systematic literature reviews have yet to provide a holistic, comprehensive, non-fragmented, and updated state of research and development of the integration of AI in micro-credentials, particularly in the context of ODL. The extent of the research is fragmented, potentially impeding the field's advancement when challenged by conflicting viewpoints and limited replications.

LITERATURE REVIEW

Thi Ngoc Ha et al. (2023) reviewed micro-credential research and practices in higher education based on the academic literature published from 2012 to 2022. The authors analysed 29 articles to determine the awareness, benefits, challenges, and factors impacting the effectiveness of micro-credentials. The findings indicate that although micro-credentials have potential advantages for higher education, their implementation is not straightforward for students or institutions. Currently, micro-credentials are in the early stages of integration into higher education, and more research is needed to fully understand their long-term viability and impact. However, the review underscored the challenges associated with the implementation of micro-credentials, as these are not micro tasks for students to complete or for higher education providers to offer meaningful learning experiences for students. Therefore, the viability and effectiveness of micro-credentials in higher education, particularly in the long term, have yet to be assessed.

Alsobhi et al. (2023) conducted a systematic literature review of studies published between 2016 and 2022, assessing them against established requirements for blockchain-based systems and identifying research gaps, thus providing insights into recent developments in micro-credentialing systems for higher educational institutions. The review suggested that an intelligent blockchain-based micro-credential framework for higher education students to manage micro-credentials and provide learning recommendations for students has yet to be explored and further developed.

A review of the emerging role of micro-credentials and digital badges in higher educational institutions suggests that they represent a significant shift in learning models through technology. Ahsan et al. (2023) reviewed 56 peer-reviewed articles published between 2015 and 2021 and highlighted the increasing interest in micro-credentials within higher education. The findings suggest a need for further investigation of the technological impacts and various stakeholder perspectives on micro-credentials. The study synthesises key themes into a conceptual framework for implementing micro-credentials in higher education and points out research gaps, thus contributing to the evolving discussion on how micro-credentials can revolutionise higher education degree delivery and student learning achievements. However, the use of machine learning or other AI-based research tools was not identified in the review.

A review by Mena-Guacas et al. (2023) examined the progression of teaching methods in short-term courses through a systematic PRISMA methodology-based review. The review focused on studies that detailed the teaching methods designed for courses not exceeding 90 days and excluded longer courses and incomplete studies. Conducted on 9th April 2022, the research used the Scopus database, and the 42 selected articles were rigorously reviewed and analysed multiple times by different researchers. The findings were categorised into learning experience, teaching methodology, technological resources, and assessment methods, highlighting a shift towards experiential learning in short-term courses over traditional memory-based activities.

In addition, it is important to become acquainted with gaps in the integration of AI into micro-credentials in ODL. Since ODL often lacks personalised learning pathways tailored to individual student needs, making it challenging to address diverse learning preferences and requirements effectively, AI can help by providing adaptive learning experiences (Garrido et al., 2016). As ODL programmes grow, scaling personalised support becomes increasingly difficult; however, AI solutions can be efficiently employed to scale, providing consistent support to a large number of learners simultaneously (Dai et al., 2022). ODL learners often face delays in receiving feedback, which can hinder their progress (Forkan et al., 2023). AI is believed to provide instant feedback and guidance, thus enhancing the learning experience and keeping students engaged. Moreover, the administrative workload in managing micro-credentials, such as grading and verification, is high; therefore, AI can help in automating these processes, improving efficiency, and allowing educators to focus more on teaching (Hatzl et al., 2012).

Based on the coverage of past reviews and the gaps identified, there is an urgent need to undertake a systematic literature review motivated by the absence of insights regarding the integration of AI into micro-credentials that render a sufficient basis for reviews on current research. The availability of research on AI across various disciplines also limits the comprehensive understanding of these areas. The dearth of reviews that incorporate the essence of AI into micro-credentials within ODL has triggered an urgency to provide a comprehensive and holistic state-of-the-art review that captures the current and potential state-of-the-art research and development of AI in micro-credentials for ODL settings. This has raised multiple questions, as follows:

- RQ1: What is the trend of publication and citation in research that incorporates AI in micro-credential courses within the ODL context?
- RQ2: What are the major themes in AI in micro-credentials for ODL research?
- RQ3: What avenues are available for future research that intends to incorporate AI into micro-credential courses within the ODL context?

This study reviews the integration of AI into micro-credentials within the context of ODL. This review aims to address the knowledge gaps by highlighting comprehensive, holistic, and updated insights regarding the development and integration of AI into micro-credentials within the ODL context, which could stimulate future research agendas in its relevant domains. The objectives of this study are (1) to address and map the existing research that incorporates AI into micro-credential courses within the ODL context using review protocols and analytical techniques supported by bibliometric software technology; (2) to identify major themes in the current body of knowledge that constitutes AI in micro-credentials for ODL; and (3) to propose and suggest potential future trends for further understanding and benefits, theoretically and practically. The subsequent parts of the study highlight the methodology and research protocols, findings on the current trends and developments, major themes, and discussions on the research gaps for future research avenues of the abovementioned topics.

METHODOLOGY

A domain-based review was employed using a hybrid approach that combines bibliometric and thematic analyses aided by the most appropriate and latest software. The review observed the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) protocol (Paul et al., 2021). SPAR-4-SLR provides a comprehensive methodological framework for conducting systematic literature reviews. This protocol emphasises a rigorous and transparent approach to the literature review, incorporating clearly defined steps, such as formulating research questions, systematic searching, screening for relevance, quality appraisal, data extraction, and synthesis of findings. SPAR-4-SLR aims to enhance the reliability and reproducibility of systematic literature reviews by ensuring methodological rigour and reducing bias. SPAR-4-SLR has been applied in various research contexts to improve the systematic review process. For instance, Ahiadu and Abidoye (2023) used this protocol to review the impact of economic uncertainty on property performance, highlighting the utility of SPAR-4-SLR in systematically organising and analysing large datasets. Similarly, Alkadi and Abed (2023) applied the SPAR-4-SLR protocol in their review of consumer acceptance of fintech payment services, demonstrating its effectiveness in structuring and analysing comprehensive literature datasets.

SPAR-4-SLR consists of three stages (assembling, arranging, and assessing) and six substages that follow sequentially (identification, acquisition, organisation, purification, evaluation, and reporting). The assembling stage involves gathering all relevant studies from various databases using predefined search criteria. This stage focuses on ensuring a comprehensive collection of articles that align with the research questions. It includes defining search terms, selecting appropriate databases, and applying inclusion and exclusion criteria to filter the initial search results. The arranging stage involves organising and categorising the studies collected from the assembling stage. This includes systematically sorting the studies based on relevance, thematic areas, and research questions. It also involves the removal of duplicates and the initial screening of titles and abstracts to ensure that the studies meet the predefined criteria for further detailed analysis. The assessing stage of the SPAR-4-SLR protocol entails evaluating the quality and relevance of the selected studies. This includes critical appraisal using predefined criteria to assess the methodological rigour, validity, and reliability of the studies, thereby ensuring that only high-quality research contributes to the final synthesis.

During the final synthesis, the articles were arranged and assessed using appropriate software before being coupled into several major research streams. The articles were reviewed through a subsequent thematic analysis, in which different authors independently read the articles to identify the major themes discussed in each research stream. An inductive coding approach was employed to explore the essence of each generated cluster and to distinguish between major themes across the identified research streams. The gaps across the research streams were highlighted to identify future research considerations and suggestions.

Assemble

This stage involved the identification and acquisition of publications for review. Only articles published in the World of Science (WoS) and Scopus databases between 2010 and 2024 were considered, as these are the largest multidisciplinary databases that host the publications mostly used in bibliometric studies (Galetsi et al., 2019; Visser et al., 2021). The assembling stage ended on 13 March 2024. The search query used comprised the Boolean operator 'AND', and a truncation of major keywords of the topic, i.e. 'micro-credentials' AND 'open and distance learning', AND 'artificial intelligence'. Based on the search query, 108 publications were assembled, signifying the maturity of the domain for review.

Arrange

The arranging stage involved the organisation and purification of published articles using the inclusion and exclusion criteria. Only full research, early access, and review articles were included. Proceedings, book chapters, and data papers were excluded. A total of 95 articles comprising 75 articles from WoS and 20 articles from Scopus gathered in the assembling stage were finally retained for the subsequent stage.

Assess

The final stage of the review protocol involved the evaluation and reporting of the articles. Article evaluations were performed using bibliometric analyses that run algorithms and quantitative techniques to extract specific compilations of the research stream of scholarly literature (Kraus et al., 2022). There were two components of bibliometric analysis in this study: science mapping and performance analysis (Lim & Kumar, 2023). Using performance analysis, the study assessed publications and citations in the shared fields of AI, micro-credentials, and ODL. This study also presented science mapping using keyword co-occurrence analysis (Igami et al., 2014) and bibliographic coupling (Waltman et al., 2010) to form clusters of publications based on the co-occurrence of keywords and similarities in shared references, respectively. The analyses were performed using Bibliometrix-R and visualised using VOSviewer.

The outcome of the analyses exhibited a two-dimensional map that located items based on the similarity of keywords and references. A higher degree of relatedness between the articles was indicated by the closer proximity between the items. A minimum threshold for keyword co-occurrence and bibliographic coupling was established to ensure that all selected articles were included in the analysis. To better ensure a sharper focus on the core articles for each cluster, the minimum number of occurrences of keywords and total citation link strength were set at three. This resulted in 46 articles, which were coupled into six major thematic clusters. The articles in the clusters were conscientiously reviewed using interpretive analysis. Each researcher read the articles independently and picked out important and major themes for each research stream.

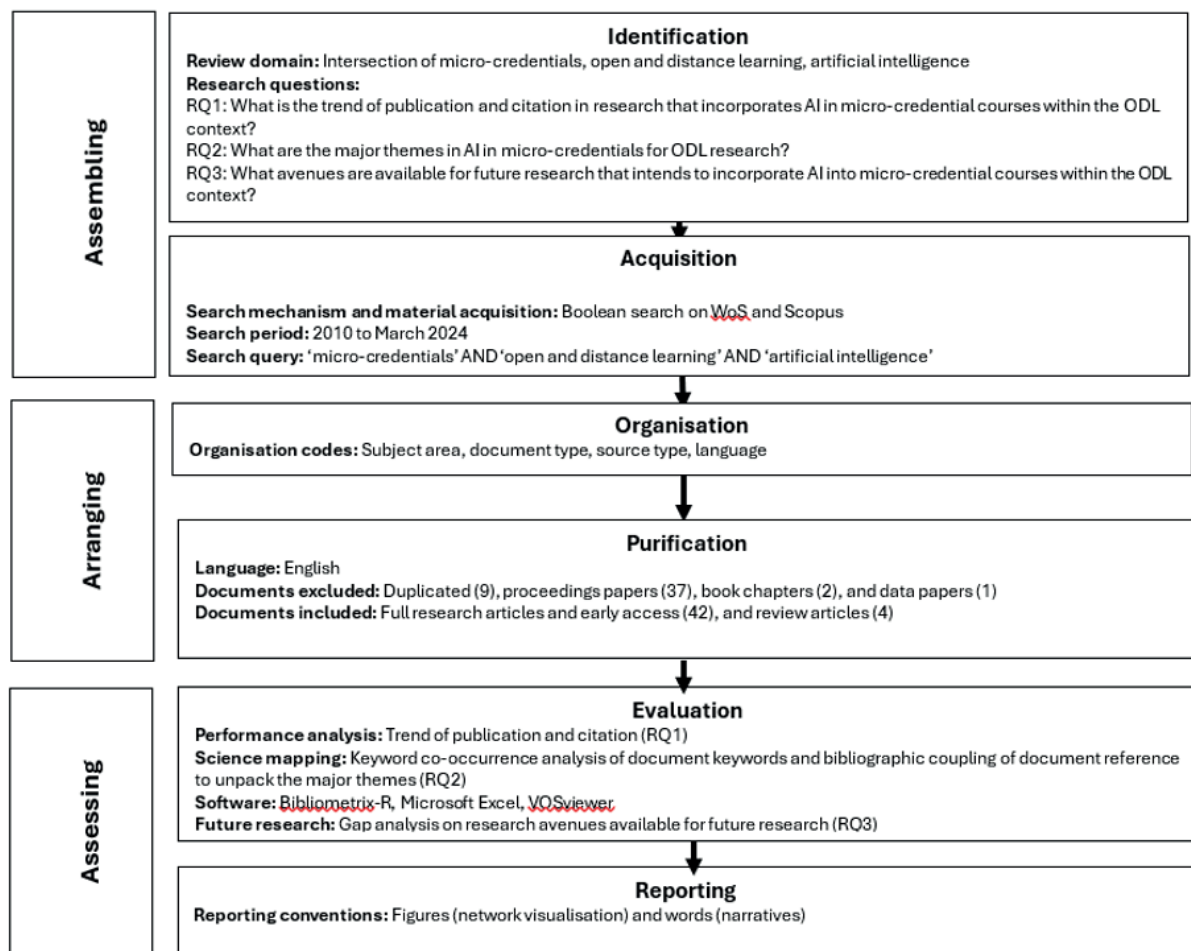


Figure 1. SPAR-4-SLR protocol

Source: Paul et al., (2021)

RESULTS AND FINDINGS

Trend of Publications and Citations (RQ1)

The body of knowledge focusing on AI in micro-credentials for ODL was published between 2010 and March 2024 (see Figure 2). The majority of the articles were published as full research articles (91.3%), while the remainder were review articles (8.75%). The annual publication growth rate was 8.16%, with an average of 4.63 citations per document. The total number of authors recorded was 333, out of which 30% of authors published single-authored documents, while international co-authorship was 20.31%. The average co-authorship per document is 2.82. A total of 4,014 references were used in composing the articles, with an average of 4.63 citations per document.

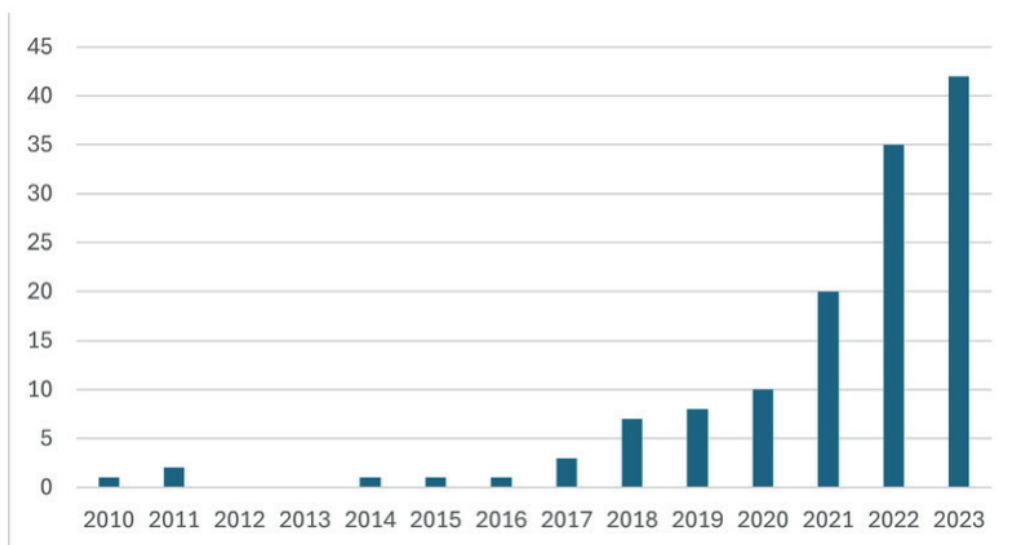


Figure 2. Number of articles published between 2010 and 2023

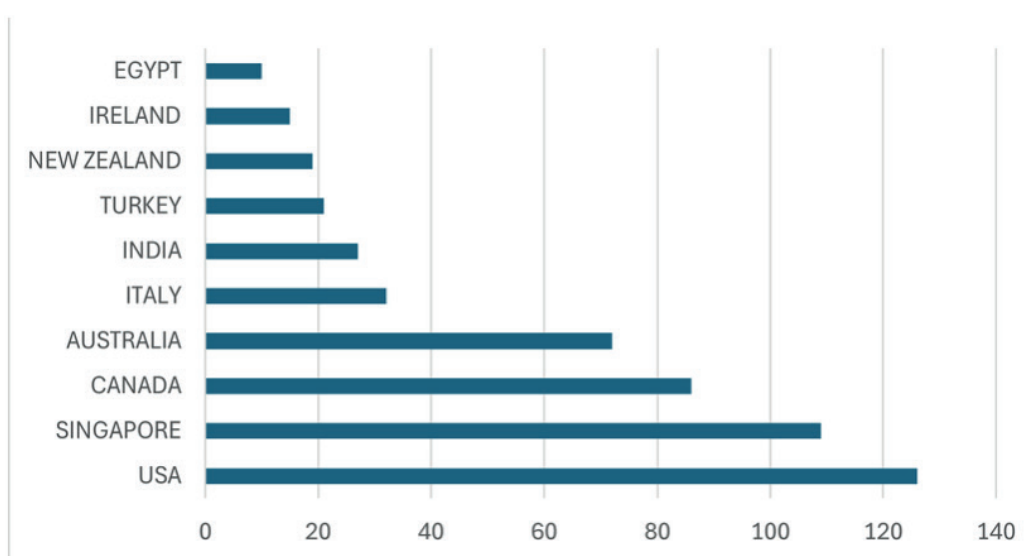


Figure 3. Country of citations (total article citations)

Figure 3 shows the countries of citations. The most cited country was the U.S. (126 citations), followed by Singapore (109 citations), Canada (86 citations), Australia (72 citations), Italy (32 citations), India (27 citations), Turkey (21 citations), New Zealand (19 citations), Ireland (15 citations), and Egypt (10 citations).

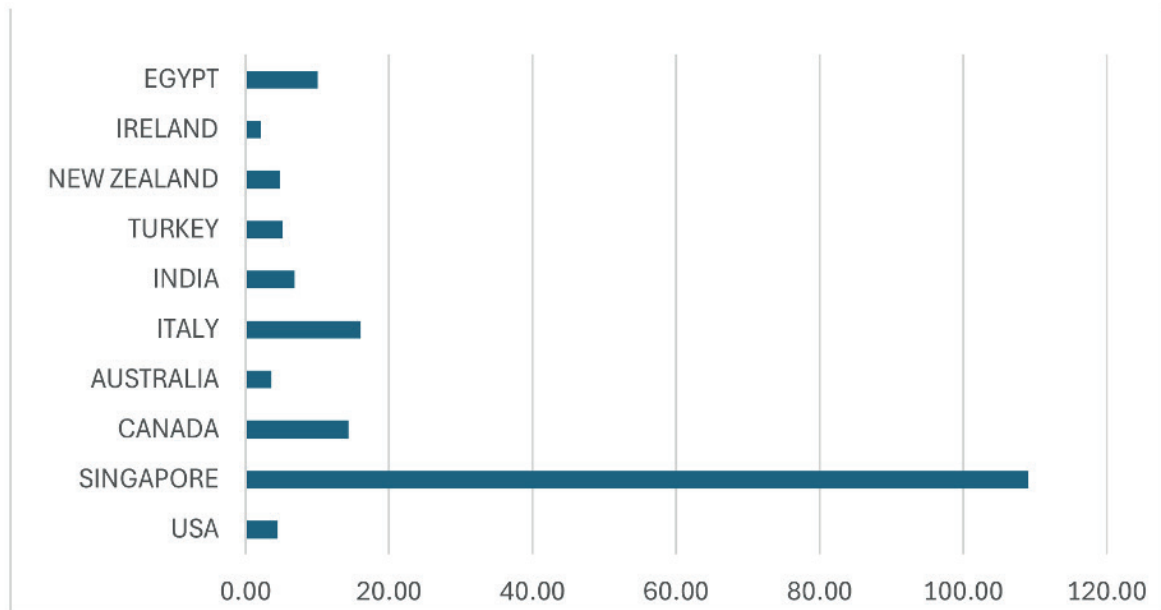


Figure 4. Average article citations by country

In terms of average article citations by country (see Figure 4), Singapore has the highest number of average article citations (109), followed by Italy (16 citations), Canada (14.3 citations), Egypt (10 citations), India (6.8 citations), Turkiye (5.2 citations), New Zealand (4.8 citations), the U.S. (4.5 citations), Australia (3.6 citations), and Ireland (2.1 citations).

Table 1. Most frequent keywords

Terms	Frequency
higher education	8
students	8
perception	6
digital badges	5
education	5
badges	4
motivation	4
achievement	3
curriculum	3
engagement	3

In Table 1, the most frequent keywords used in the publication are higher education (n=8) and students (n=8), followed by perceptions (n=6), digital badges (n=5), education (n=5), badges (n=4), motivation (n=4), achievement (n=3), curriculum (n=3), and engagement (n=3).

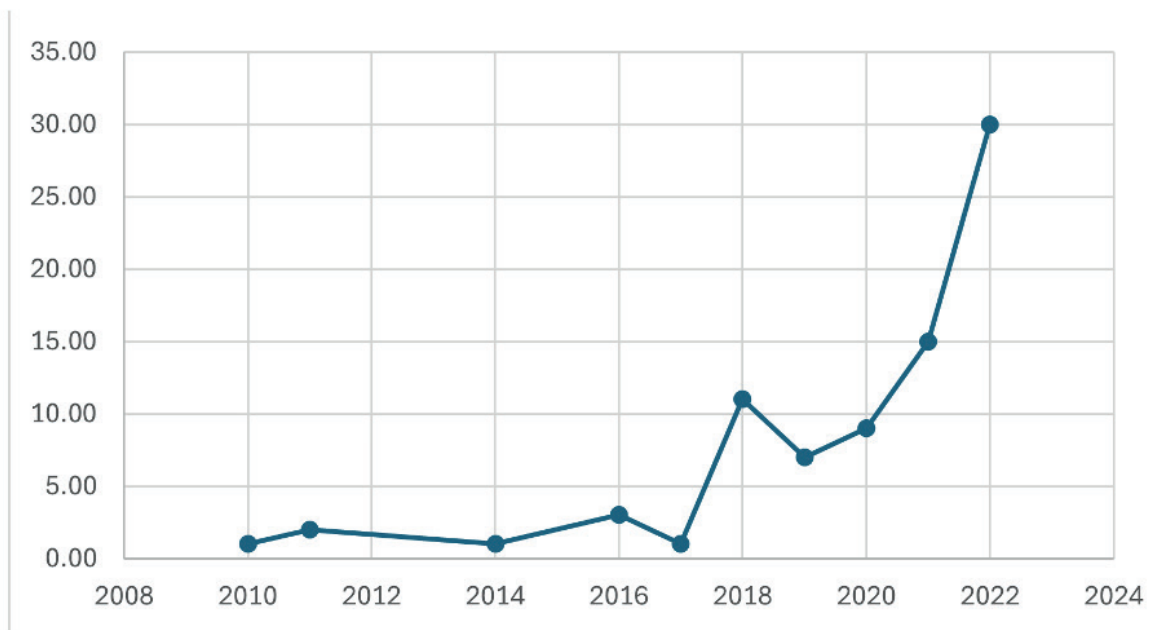


Figure 5. Annual total citations per year

There is an increasing trend in the annual total citations per year from 2010 to 2022 (see Figure 5). The humble trend started with one citation per year in 2010, followed by two citations in 2011, one citation in 2014, and three citations in 2016, which dropped to one citation in 2017 before spiking to 11 citations in 2018 and down to seven and nine citations in 2019 and 2020, respectively. The latter trend saw a dramatic increase of 15 annual total citations per year in 2021 to 30 citations in 2022. The 2023 and 2024 figures are not yet available.

Major Thematic Cluster (RQ2)

Keyword Co-occurrence Analysis

A keyword co-occurrence analysis was conducted to identify major emerging themes in the literature that integrate AI into micro-credentials within the ODL context. The resulting outcome of the keyword co-occurrence network uncovers major areas of interest via the mapping of keywords that have been enlisted by authors in their articles (Donthu et al., 2021). Figure 6. shows the keyword co-occurrence network of AI, micro-credentials, and ODL. This network was generated and visualised using VOSviewer apps. The distance between two keywords in the visualisation indicates the relatedness of the keywords in terms of co-citation links. In general, the closer two keywords are to each other, the stronger their relatedness. The strongest co-citation links between keywords are also represented by lines.

Six thematic clusters resulted from the keyword co-occurrence analysis. Each cluster is represented by different colours of the network (see Figure 6). Red networks denote motivational drives underlying micro-credentials, green networks represent alternative aspects of micro-credentials, blue networks manifest motives underlying lifelong learning, and yellow networks signify AI-based learning. Purple networks indicate micro-credentials for teacher education, while cyan networks exhibit equity and inclusivity of open education.

The keyword co-occurrence network supplements the bibliometric information that demonstrates the co-occurrences among all keywords in Table 2. The keyword co-occurrences and the relationships between topics in each cluster are explained in a logical sensemaking manner (Lim & Kumar, 2023), in which keywords are organised to logically present a coherent narrative of each cluster (Donthu et al., 2021).

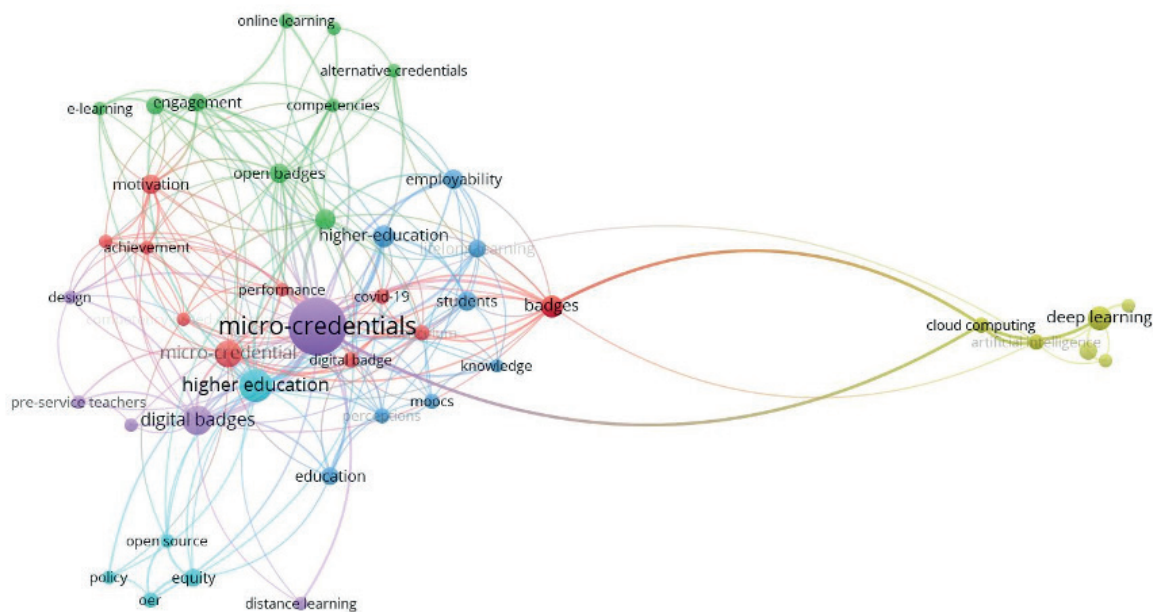


Figure 6. Keyword co-occurrence network between AI, micro-credentials, and ODL research

Table 2. Major keyword co-occurrence clusters in the research

Themes and keywords			
<u>Co-word cluster 1: Motivational drives underlying micro-credentials (red network)</u>		<u>Co-word cluster 2: Alternative aspects of micro-credentials (green network)</u>	
Achievement	Micro-credential	Alternative credentials	Open badges
Badges	Motivation	Competencies	Skills
Competency-based education	Performance	e-learning	
Covid-19	Self-efficacy	Engagement	
Curriculum		Massive open online course (MOOC)	
Digital badge		Online learning	
<u>Co-word cluster 3: Motives underlying lifelong learning (blue network)</u>		<u>Co-word cluster 4: AI-based learning (yellow network)</u>	
Education	Perceptions	Artificial intelligence	
Employability	Students	Classification	
Higher education		Cloud computing	
Knowledge		Deep learning	
Lifelong learning		Machine learning	
		Metaheuristics	

<u>Co-word cluster 5: Micro-credentials for teacher education (purple network)</u>	<u>Co-word cluster 6: Equity and inclusivity of open education (cyan network)</u>
Design	Equity
Digital badges	Higher education
Distance learning	Open Educational Resources (OER)
Micro-credentials	Open source
Pre-service teachers	policy
Teacher education	

Keyword co-occurrence cluster 1: Motivational drives underlying micro-credentials (red network)

The first keyword co-occurrence cluster focuses on the motivational factors that drive learners to undertake micro-credential courses. From the perspective of policymakers and higher educational institutions, this cluster represents the objectives of offering chunk-based micro-credential courses and programmes that utilise it. This cluster is formed by ten keywords: ‘achievement’, ‘badges’, ‘competency-based education’, ‘Covid-19’, ‘curriculum’, ‘digital badge’, ‘micro-credentials’, ‘motivation’, ‘performance’, and ‘self-efficacy’. The motivational drive underlying micro-credentials is stimulated by the desire for achievement, enhanced self-efficacy, and the practical benefits of competency-based education. Digital badges serve as powerful motivators, providing visible recognition of skills and fostering a culture of continuous learning and improvement, especially in the context of the evolving educational landscape post-Covid-19. The motivational drives underlying micro-credentials are multi-faceted and deeply rooted in the pursuit of achievement, self-efficacy, and the need for competency-based education, particularly following the Covid-19 pandemic.

Keyword co-occurrence cluster 2: Alternative aspects of micro-credentials (green network)

The second keyword co-occurrence cluster deals with alternative aspects of micro-credentials. This cluster is formed by eight keywords: ‘alternative credentials’, ‘competencies’, ‘e-learning’, ‘engagement’, ‘MOOC’, ‘online learning’, ‘open badges’, and ‘skills’. The alternative aspects transform education by fostering engagement, enhancing employability, and promoting lifelong learning. These credentials offer a practical and flexible approach to skill acquisition, preparing learners for the dynamic demands of the modern workforce. Micro-credentials provide a targeted approach to learning, focusing on the acquisition of discrete, job-relevant skills rather than traditional, time-bound degrees. This shift is particularly significant in the context of online learning, in which engagement and flexibility are paramount. By integrating micro-credentials into massive open online courses (MOOCs) and other e-learning environments, educators can create more personalised and interactive learning experiences that cater to the diverse needs of students.

Keyword co-occurrence cluster 3: Motives underlying lifelong learning (blue network)

The third keyword co-occurrence cluster encapsulates motives for lifelong learning, which comprises seven keywords: ‘education’, ‘employability’, ‘higher education’, ‘knowledge’, ‘lifelong learning’, ‘perceptions’, and ‘students’. The motives underlying lifelong learning are deeply intertwined with the evolving demands of education, employability, and the pursuit of knowledge. These motives encompass a blend of practical and aspirational goals that are centred on the continuous pursuit of education, employability, and knowledge in an ever-changing world. In today’s world, the concept of lifelong learning has gained significant importance, driven by the need to stay relevant in the workforce and adapt to new technologies and methodologies. Education is no longer confined to the traditional boundaries of primary, secondary, and higher education. It has expanded to encompass a continuous, self-directed process that extends throughout an individual’s life. This shift is motivated by the recognition that knowledge and skills must be constantly updated to meet the demands of an ever-evolving job market.

Keyword co-occurrence cluster 4: AI-based learning (yellow network)

The fourth keyword co-occurrence cluster focuses on AI-based learning. This cluster is made up of six keywords: ‘artificial intelligence’, ‘classification’, ‘cloud computing’, ‘deep learning’, ‘machine learning’, and ‘metaheuristics’. AI-based learning represents a significant leap forward in education driven by artificial intelligence, machine learning, deep learning, and cloud computing. Through classification algorithms, AI can assess a student’s strengths and weaknesses, enabling more targeted interventions that optimise learning outcomes. Meanwhile, metaheuristics, which are the advanced optimisation algorithms used in AI, also contribute to educational advancements by solving complex problems related to resource allocation and curriculum planning. These algorithms help institutions optimise their operations, ensuring that resources are used efficiently and effectively to support student learning.

Keyword co-occurrence cluster 5: Micro-credentials for teacher education (purple network)

The fifth keyword co-occurrence cluster taps into micro-credentials for teacher education. This cluster is formed by six keywords: ‘design’, ‘digital badges’, ‘distance learning’, ‘micro-credentials’, ‘pre-service teachers’, and ‘teacher education’. The integration of micro-credentials and digital badges into teacher education is a transformative development that supports the professional growth of pre-service teachers. By leveraging these innovative tools, teacher education programmes can better prepare educators for the dynamic and technologically advanced educational landscape, ultimately leading to improved teaching outcomes and student success.

Keyword co-occurrence cluster 6: Sustainable development goals (sdgs) – equity and inclusivity of open education (cyan network)

The sixth and last keyword co-occurrence cluster concentrates on the equity and inclusivity of open education. This cluster is made up of five keywords: ‘equity’, ‘higher education’, ‘Open Educational Resources (OERs)’, ‘open source’, and ‘policy’. This cluster contains the least number of keywords, indicating possible future research avenues for educational policies and Sustainable Development Goal 4 (SDG4) studies. SDG4 is a commitment to ‘ensure inclusive and equitable quality education and promote lifelong learning opportunities for all’ (United Nations, n.d.).

In an increasingly interconnected world, the principles of equity and inclusivity are becoming paramount in the realm of the liberalisation of education. Thus, OERs and open-source policies play a pivotal role in democratising access to higher education. By providing free and openly licensed educational materials, OERs eliminate financial barriers that often prevent marginalised communities from accessing quality learning resources. This inclusivity ensures that students, regardless of their socio-economic background, have the opportunity to engage with high-quality educational content, fostering a more equitable learning environment. In short, the equity and inclusivity of open education, bolstered by OERs and open-source policies, represent a transformative approach to higher education. By championing these principles, educational institutions can create a more equitable and inclusive future in which knowledge is accessible to all, regardless of their background or circumstances.

Bibliographic Coupling of the Research

Bibliographic coupling was performed using data clustering techniques. Similar articles based on common referencing pattern coverage are categorised under the same cluster (Weinberg, 1974). Figure 7 shows the article network that was generated and visualised using VOSviewer. The six main thematic clusters that emerged from the bibliographic coupling analysis are indicated by the colours of the network constituting the body of knowledge. Each colour of the network represents each theme identical to those generated earlier in the keyword co-occurrence analysis. Motivational drives underlying micro-credentials are denoted by red networks, while alternative aspects of micro-credentials are represented by green networks. Motives underlying lifelong learning are denoted by blue networks, while AI-based learning is represented by yellow networks. Micro-credentials for teacher education are indicated by purple networks, while equity and

inclusivity of open education are expressed by cyan networks. The bibliographic coupling network detailing the authors and publications in Figure 7 distinguishes the semantic associations among the articles to identify and uncover latent research themes that may guide future research directions.

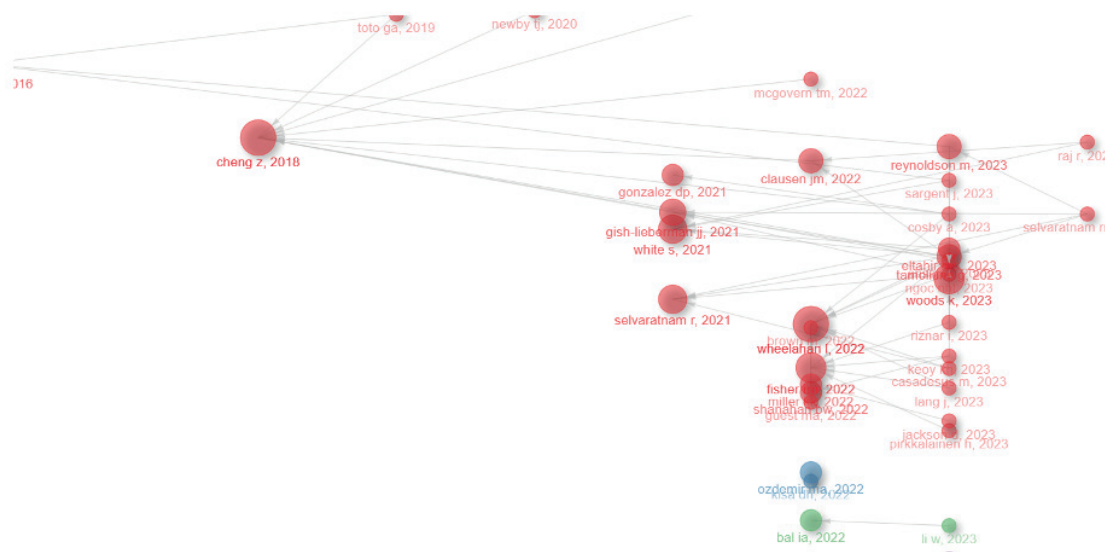


Figure 7. Bibliographic coupling networks between AI, micro-credentials, and open and distance learning research

Bibliographic cluster 1: Motivational drives underlying micro-credentials

The first bibliographic cluster focuses on the motivational drives underlying micro-credentials. Fourteen prolific studies formed this cluster. Wheelahan and Moodie (2021) asserted the importance of micro-credentials in higher education, arguing that this aligns curricula with labour market demands, employability, and 21st-century skills. Applying Basil Bernstein's sociological theory, the authors examined how micro-credentials shaped education through the lens of human capital theory, focusing on re-contextualisation and the market-oriented 'homo economicus'. In another study, Wheelahan and Moodie (2022) stressed that micro-credentials that are indeed aligned with the gig economy contribute to education privatisation, transferring employment preparation costs to individuals, and tightening higher education's ties to immediate workplace demands, rather than broader occupational skills.

Cheng et al. (2018) argued for integrating open digital badges with a set goal – optimising learning – and provided design recommendations for incorporating open digital badges as technological tools. Newby and Cheng (2020) found that pre-service teachers who used digital badges with instructional scaffolding reported higher confidence and achieved better grades compared to those who used traditional instructional projects. This highlights the potential of these badges to enhance learning performance. McGovern and Gogan (2022) asserted that a stackable badged micro-credential system can enhance academic flexibility, helping students manage personal and societal crises by certifying mastery in modules of a graduate-level course. This also offers structure, temporal flexibility, and portability, thereby easing course interruptions and resumptions.

In 2018, the New Zealand Qualifications Authority (NZQA) recognised micro-credentials, defined their credit limits, and publicised this on the NZQA website. This framework applies to tertiary education organisations, while universities create their own recognition schemes (Fisher & Leder, 2022). The rules address international and non-university tertiary education organisations (TEO) providers and identify potential issues, such as qualification disaggregation and future recognition.

White (2021) critiqued the development of credit-bearing micro-credentials for Australian teachers' professional advancement, which are designed to support learning and create pathways to advanced education

by examining design stages, challenges, and benefits. Selvaratnam and Sankey (2021) reported that surveys conducted by the Australasian Council on Open, Distance, and eLearning revealed increased interest and policy work and that significant implementation efforts are required. Furthermore, Selvaratnam et al. (2024) suggested that as the demand for micro-credentials rises, education providers need guidance to enhance their capacity and capability for high-quality, profitable learning outcomes. The authors developed a maturity model to help providers assess and improve their micro-credential delivery. A survey of Australasian higher education providers validated the model. Technical infrastructure was the most mature model, while quality, resourcing, standards, and strategy were the least mature. In another study, Reynoldson (2023) emphasised neoliberal ideals in which students were viewed as independent consumers managing their employability; however, the study lacked students' perspectives. In this study, micro-credentials in Australian higher education are seen as innovative, industry-linked educational credits. Proponents include public institutions, private companies, and governments.

In the United States, Gonzalez and Villaire (2021) elaborated on the Healthy People 2030, which advocates for increasing organisational health literacy. To support this endeavour, the Institute for Healthcare Advancement offers the Health Literacy Specialist Certificate Program for professional development and the Health Literacy Solutions Center for networking. This specialist certificate includes seven micro-credentials developed by experts, and the solutions centre provides over 10,000 members with resources and education. Clausen (2022) highlighted the opportunities and challenges of a comprehensive micro-credentialing system aligned with the International Society for Technology in Education (ISTE) (standards that serve as a framework for innovation and excellence in learning, teaching, and leading adopted by the United States and many countries worldwide) to prepare teachers for technology integration. This system addresses the lack of a required educational technology course and receives feedback for further improvement. Given the current U.S. higher education climate, in which university faculty and staff are tasked with doing more with less, Woods and Woods (2023) explored the benefits of micro-credentials for students and universities, detailing the creation of graduate certificates within a master's programme and offering insights into design challenges and opportunities.

Gish-Lieberman et al. (2021) asserted that micro-credentials support self-directed learning by providing visible learning pathways with digital badges. Rooted in historical badge systems, self-regulated learning phases, which comprise forethought, performance, and self-reflection, were suggested for micro-credentials as an effective implementation process requires standards, best practices, and integration with feedback and collaborative learning. Raj et al. (2024) identified key barriers to micro-credential implementation that hinder the motivation to enrol, namely, unclear definitions, ambiguous courses, lack of accreditation, quality assurance, remuneration policies, coordination issues, inadequate learning volume, and low acceptance by individuals and organisations. The findings are derived from the literature, expert input, and ranking methods, which guide educational institutions and policymakers.

The following issues are covered by the prominent articles in this cluster: meeting the contemporary rapid labour market demand, facilitating the flexibility of 21st-century learning, integrating with the national education frameworks and systems, suitability with self-directed learning orientations, and overcoming barriers that hinder the motivations to undertake micro-credential courses.

Bibliographic cluster 2: Alternative aspects of micro-credentials

The second bibliographic cluster concentrates on the alternative aspects of micro-credentials. This cluster also includes MOOCs, which can be inferred from the near-similar characteristics of micro-credentials, innovations in current pedagogy, and ideal applicability for corporate training. This cluster comprises nine prominent studies. Traditional education systems inadequately prepare learners for the future of work through standardised and inequitable approaches. Based on this assumption, Laughlin (2021) envisioned the integration of emerging learner-centred paradigms into micro-credentialing to create relevant learner-focused educational experiences that would benefit future workforce preparations while addressing individual needs. West et al. (2020) reviewed societal, educational, employer, and learner needs for new alternative credentials, provided theoretical rationales for open micro-credentials, and examined their credentialing, motivational, and technological functions, including those of open badges. On a global scale,

Bean et al. (2023) highlighted the evolution and key developmental challenges of alternative credentials, and the opportunities arising therefrom. The researchers outlined the implications of using these credentials and badges for higher education, based on lessons learned from their extensive experience in credentialing initiatives across continents and sectors of North America, Europe, and Australasia.

Innovation in the current pedagogy is also emphasised. Tang and Qian (2022) proposed the LITTLE framework that emphasised learner-centred, inquiry-based, technology-enriched, trophy-driven, literature-guided, and evidence-based design strategies to enhance the effectiveness of existing micro-credentials and MOOCs, which have been promoted as disruptive, low-cost higher education options but face issues of low retention and forum participation rates. Examples and theoretical justifications were provided to illustrate these guidelines. Delivering blended-mode eLearning in Technical and Vocational Education and Training (TVET) is challenging due to motivational and engagement issues; therefore, Jayalath and Esichaikul (2022) proposed a gamified operational model to enhance learner success in TVET by embedding motivational (attention, relevance, confidence, and satisfaction) and engagement (behavioural, emotional, and cognitive) frameworks. Fifteen game dynamics, mechanics, and components were suggested and tested in a sample online course. Ruutmann (2023) outlined the psycho-didactical model of Engineering Pedagogy for effective science, technology, engineering, arts, and mathematics (STEAM) education. The author presented the attributes and skills of 21st-century engineering graduates and the International Society for Engineering Pedagogy (IGIP) competency model for educators and described a micro-credential programme for STEAM teachers that emphasised interconnecting learning activities to achieve specific educational goals.

In corporate training, Egloffstein and Ifenthaler (2017) investigated 119 employees' perspectives on MOOCs for workplace learning, focusing on motivation, credentials, and incentives. The findings showed a high interest in career development through MOOCs but a low acceptance of MOOC credentials among stakeholders. Implications for MOOC design and implementation in professional contexts were discussed. Subsequently, Egloffstein (2018) explored MOOCs for digital workplace learning, discussing basic designs, platform features, and current providers. The study highlighted the strengths, weaknesses, opportunities, and threats and offered insights into implementing MOOCs in corporate settings and future developments. In another study, Clements et al. (2020) provided a practical guide for organisations in designing and implementing open badging systems that cover key terms, past uses, and technologies for creating badges, including a framework with step-by-step implementation instructions to recognise diverse skills and experiences across various settings. Given that MOOCs are a growing trend in professional learning, the authors explored openSAP as an example of Enterprise MOOCs and found it valuable for global professional learning. However, it often does not focus on digital workplace learning in which alternative achievement metrics are required.

The increasing preferences for micro-credentials and MOOCs in organisational and corporate training through alternative credentials and open badges are among the issues highlighted in this cluster. Indeed, the expected outcomes are commonly shared, which consistently focus on enhancing the competencies, and skills, and better student engagement through innovative technology, including e-learning and online learning.

Bibliographic cluster 3: Motives underlying lifelong learning

The third bibliographic cluster encapsulates the motives underlying lifelong learning. It is known that the rise of digital micro-credentials in education has led to confusion among stakeholders, prompting global efforts to define the quality of learning and its beneficial impacts. Therefore, in response to the Fourth Industrial Revolution, Lang (2023) came out with commentary reviews of literature on micro-credentials that emphasised their role in lifelong learning and workforce upskilling. Keoy et al. (2023) examined the adoption of micro-credentials in Malaysia from the perspectives of higher education providers in which technological, organisational, and people-related challenges were identified, while proposing a framework for successful implementation. By addressing these recommendations, the study hoped to enhance student learning and transform higher education, thus meeting digital age demands. Jackson and Dean (2023) surveyed 84,000 Australian graduates' participation in employability related activities and the impact on work readiness and employment outcomes. Over half of them participated with notable differences in

age, gender, disability, citizenship, and socio-economic background. It was also found that graduates from disadvantaged backgrounds experienced significant benefits, particularly in leadership roles, awards, and mentoring programmes. In summary, this cluster wraps up the underlying factors that motivate lifelong learning. The important issue is the focus on the pursuit of lifelong learning through micro-credentials, and MOOCs are largely driven by the need to acquire higher education and knowledge about employability based on students' perceptions.

Bibliographic cluster 4: AI-based learning

In this cluster, AI-based learning is highlighted. This cluster illustrates the significance of AI in supporting student learning. With AI, online learning is conveniently accessible and flexible. Important studies underlying this cluster comprise Babu et al. (2023), Pence (2020), and Rajendran et al. (2022). Babu et al. (2023) used AI techniques to predict student performance by analysing large educational datasets. The study proposed the Metaheuristic Optimization-based Feature Subset Selection with an Optimal Deep Learning (MOFSS-ODL) model, which combined feature selection and deep learning to enhance predictive accuracy. Tested on University of California Irvine machine learning repository (UCI) dataset, the model achieved 96.49% accuracy, outperforming the recent methods of Educational Data Mining. Rajendran et al. (2022) highlighted the significance of edge computing for decentralised healthcare by leveraging wearable devices and mobile apps for immediate diagnosis and treatment, which are supported by scalable data privacy mechanisms. The study found that AI and edge computing could enhance medical care by integrating deep learning with medical technology, reducing latency, and improving real-time patient monitoring. Pence (2020) acknowledged that new instructional technologies, such as smartphones, cloud computing, AI, 3D printing, virtual reality, and augmented reality, are transforming chemistry education by extending learning beyond the classroom. However, it is important to note that these technologies can lead to student isolation and pose challenges for faculty in fostering essential social skills and managing individualised learning. AI-based learning forms an important catalyst for the future design and implementation of micro-credentials. Therefore, it is important to utilise and design the available AI tools and techniques to enhance the practicability and significance of micro-credentials in the ODL context.

Bibliographic cluster 5: Micro-credentials for teacher education

This cluster addresses the importance of designing and developing micro-credentials for teachers' training and curriculum. A Maryland university developed a micro-credential in Computational Thinking (CT) for K-8 pre-service and in-service teachers (Bal et al., 2022). The analysis of surveys, journal entries, and lesson plans showed growth in CT awareness and integration. Thus, the micro-credential effectively adds CT content to an already packed curriculum to enhance teachers' knowledge and implementation skills.

Given the effectiveness of digital badges and micro-credentials' unclear roles in improving learning, Newby and Cheng (2020) have found that pre-service teachers who used digital badges with instructional scaffolding reported higher confidence and achieved better grades compared to those who used traditional instructional projects. This outcome further recognises the effectiveness of micro-credentials in enhancing learning performance. Through a niche study, Ruutmann (2023) outlined the psycho-didactical model of Engineering Pedagogy for effective STEAM education (STEAM education is an approach to learning that uses science, technology, engineering, the arts, and mathematics) by presenting the attributes and skills of 21st-century engineering graduates, introducing the IGIP competency model for educators, and describing a micro-credentials programme for STEAM teachers. The model emphasises interconnected learning activities to achieve specific educational goals. Given the evidence of micro-credential development across various fields of teacher education, it is important to implement more micro-credentials for the educational sector to reap its benefits in facilitating teachers' training and enhancing their skills and competencies.

Bibliographic cluster 6: SDGs – equity and inclusivity of open education

This cluster centres on the equity and inclusivity of open education, despite niche focuses on AI, micro-credentials, and ODL aspects. Three important studies are elaborated upon. The Covid-19 pandemic, rising

education costs, and employer concerns about skills have driven universities, colleges, and credentialing agencies to refocus on open education and micro-credentials. By providing affordable flexible options for students and meeting employer needs for skilled employees, micro-credentials ensure acceptance, stackability, and secure digital records of skills while supporting Education for All (SDG4). Based on these findings, McGreal et al. (2022) encouraged institutions, governments, UNESCO, and NGOs to undertake and implement micro-credentials in their respective entities.

Lane and Goode (2021) detailed the cost-effective implementation of open-source technologies by highlighting the technological benefits of Open Education Resource universitas (OERu), an international consortium offering stackable micro-credentials. Through an open-source Next Generation Digital Learning Ecosystem (NGDLE) that supports hundreds of thousands of learners with an annual budget under US\$10,000, technological autonomy, resilience, and educational opportunities are enhanced for learners and educators globally.

Furthermore, Ossiannilsson (2023) highlighted the UNESCO OER recommendations, which were adopted in 2019 and aligned with multiple UN SDGs, particularly SDG 4 (education), SDG 5 (gender equality), SDG 9 (industry, innovation, and infrastructure), SDG 10 (reducing inequalities), SDG 16 (peace, justice, and strong institutions), and SDG 17 (partnerships). The author also explored ways in which OERs support these goals, advocated for stakeholder involvement, and addressed accessibility and quality issues by highlighting the interconnectedness of OERs with universal values, such as equality and social justice, and proposed a model that links OER implementations with achieving these SDGs.

Open education significantly contributes to SDGs related to equity and inclusivity by providing accessible, affordable, and flexible learning opportunities for all individuals, regardless of their socio-economic status, geographic location, or background. By leveraging digital platforms and resources, open education reduces barriers to learning, enabling marginalised and underserved populations to acquire essential skills and knowledge. By aligning with SDGs, open education not only addresses immediate educational disparities but also contributes to long-term societal transformation by creating a more informed, skilled, and equitable global community.

Discussion, Gaps, and Future Research Avenue (RQ3)

This part of this review identifies and discusses notable knowledge gaps encountered that address and suggest future research that can be pursued.

Gap 1: Lack of Research in the Actual Implementation of Micro-credentials.

Although open digital badges are recognised as micro-credentials, their potential to enhance learning through goal setting is under-researched (Cheng et al., 2018), while their effectiveness in improving learning is unclear (Newby & Cheng, 2020). More research is needed to refine and assess the designs and effective implementation through standards, best practices, and integration with feedback and collaborative learning in micro-credentials (Gish-Lieberman et al., 2021). In Selvaratnam et al.'s (2024) study, future research was suggested to refine and extend a maturity model that helps providers assess and improve their micro-credential delivery.

Gap 2: Lack of Research in Measuring the Achievement of Micro-credentials in Workplace Settings

Gaps remained in adhering to the motivational and engagement issues, for example, Jayalath and Esichaikul (2022) suggested that game dynamics, mechanics, and components should be further tested in a sample online course. Enterprise MOOCs are found to be valuable for global professional learning. However, they do not focus on digital workplace learning (Egloffstein & Schwerer, 2019). Therefore, alternative achievement metrics are needed.

Gap 3: Lack of Research on Micro-credentials for Teacher Education

Despite the importance of teacher empowerment as far as their roles are concerned, there are limited studies on micro-credentials that are specifically designed for teachers' training and educational programmes. More studies should be undertaken to align the skills and competencies of teachers with the learning outcomes achievable through micro-credentialing. This provides teachers with more flexibility when engaging with the evolving learner generation, which is closely shaped by the latest technological trends.

Gap 4: Lack of Studies That Research Equity and Inclusivity of Open Education

Few research articles specifically tapped into the issues of equity and inclusivity of open education. To date, much attention has been paid to the role of OER in achieving SDGs (Ossiannilsson, 2023), recommendations for universities, colleges, and credentialing agencies to rethink credentials by focusing on open education and micro-credentials (McGreal et al., 2022), and cost-effective strategies in the implementation of open-source technologies (Lane & Goode, 2021). Insights from the operationality of micro-credentials in actual implementation have yet to be understood, particularly in developing countries where access to education is not always ideal.

Gap 5: Lack of Research in the Actual Integration of AI into Micro-credentials within ODL Settings

Despite its benefits, implementing micro-credentials faces challenges, such as ensuring quality assurance, integrating them into existing educational frameworks, and gaining recognition from employers. Addressing these challenges is crucial for the widespread adoption and success of micro-credentials in higher education. Although it is acknowledged that new instructional technologies, such as smartphones, cloud computing, AI, 3D printing, virtual reality, and augmented reality, are transforming chemistry education by extending learning beyond the classroom (Pence, 2020), these technologies can lead to student isolation and pose challenges for faculty in fostering essential social skills and managing individualised learning. Future research may delve into smoothening the impact of using AI on micro-credentials within the ODL context.

Gap 6: Lack of Research on the Ethical and Effective Use of AI in the Implementation of Micro-credentials in ODL Settings

Data privacy, ethical considerations, and the digital divide pose significant barriers to the widespread adoption of AI in education. Although there are concerns regarding the quality assurance and recognition of AI-enhanced micro-credentials, which are crucial for their acceptance and value in the job market, studies to date have yet to delve into these aspects, highlighting the importance of developing robust frameworks and standards to ensure the ethical and effective use of AI in the implementation of micro-credentials in ODL settings.

DISCUSSIONS AND CONCLUSION

Micro-credentials represent a significant innovation in education, offering flexible, accessible, and targeted learning opportunities that cater to the needs of modern learners and employers. While challenges remain, their potential to complement and enhance traditional education systems is substantial. The integration of AI in micro-credentials within ODL is deemed to significantly enhance the learning experience by providing personalised education, automating support systems, and improving accessibility. AI technologies make it possible to offer more flexible, efficient, and tailored learning experiences, thus meeting the diverse needs of learners in an ODL environment.

This review presents the trends of publications in the domains of AI integration into micro-credentials in the ODL context, namely publication years and countries, authors' affiliations, domain subtopics, and citation numbers over time. Major thematic clusters based on keyword co-occurrences and bibliographic coupling of research topics were also generated. The keyword co-occurrence analysis produced six thematic clusters on the integration of AI into micro-credentials in ODL. These clusters were well triangulated using two

bibliometric information sources, i.e. keywords and publication citations, which comprise motivational drives underlying micro-credentials (Cluster 1), alternative aspects of micro-credentials (Cluster 2), motives underlying lifelong learning (Cluster 3), AI-based learning (Cluster 4), micro-credentials for teacher education (Cluster 5), and SDGs' equity and inclusivity of open education (Cluster 6). A reflection on this bibliometric review reveals notable gaps that can be addressed in the current literature and makes suggestions for future research. The review provides a theoretical understanding for advancing the subject area while addressing its practical applications for future researchers, scholars, and practitioners. It also serves as a key and quick reference in providing state-of-the-art literature, while enabling industry practitioners to harness the full benefits of bridging the theoretical and practical gap.

Integrating AI into micro-credentials is crucial in advancing lifelong learning, particularly within the framework of SDGs aimed at equity and inclusivity in education. Micro-credentials provide an alternative to traditional degrees by offering flexible, competency-based certifications that address the diverse needs and motivations of learners. For educators, micro-credentials facilitate continuous professional development, ensuring that teaching practices evolve to meet the demands of modern education systems. Through micro-credentials and the booming of AI, a progressive education system should offer meaningful qualifications valued in both labour markets and society, made possible via ODL settings.

Motivational drives for micro-credentials stem from the need for accessible, personalised learning paths that accommodate the varying schedules and learning preferences of students. AI-enhanced learning systems offer tailored educational experiences, providing real-time feedback and adaptive learning pathways that support individual progress. This approach not only enhances the learning experience but also ensures that education is inclusive, catering to all learners regardless of their socio-economic background or geographic location.

Micro-credentials play a significant role in teacher education. By leveraging AI, educators can engage in ongoing professional development, acquiring new skills and knowledge that are immediately applicable in the classroom. This continuous learning process is essential for maintaining high educational standards and adapting to new teaching methodologies. Furthermore, the focus on equity and inclusivity aligns with SDGs by removing traditional barriers to education, such as cost and accessibility. Open education initiatives supported by AI-driven micro-credentials provide flexible learning opportunities that are crucial for fostering a more equitable global education landscape.

In summary, the integration of AI in micro-credentials enhances lifelong learning, supports teacher education, and promotes the SDGs' goals of equity and inclusivity in open education. This comprehensive approach ensures that all learners have the opportunity to succeed in an increasingly digital and interconnected world. Despite its contributions and insights, the review has several methodological limitations. First, only articles published in the WoS and Scopus databases were considered. Second, other possible and relevant studies that are searchable using the same search query may have been overlooked. This may limit the scope of the insights provided by the review. Third, the review also included only articles strictly related to the integrated domains of AI, micro-credentials, and ODL. Other articles related to the domains might have been missed because of misalignment with the keyword entry or other technical aspects related to the metadata of the listings. New reviews that capture these alternative domains are welcome.

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LEADING FROM AFAR: NAVIGATING THE CHALLENGES AND STRATEGIES OF DISTANCE MANAGEMENT IN EDUCATION

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ABSTRACT

The use of technology to enhance distance learning has become more prevalent in recent years, and the COVID-19 pandemic has made distance learning an essential part of education. However, the management of distance learning, where students and trainers are physically separated, has not received as much attention as the practice of distance learning itself. For this reason, the investigation of how management issues and school leadership are carried out at a distance as an alternative in educational management processes has been conducted. It is a fact that teaching and learning practices in different places and times have advantages, but also some disadvantages. Therefore, it is important to consider how these processes are managed at a distance. The research investigates whether behaviours such as effective interpersonal communication, planning and monitoring educational processes, and providing effective leadership change as physical distance increases. The study involved interviews with both teachers and administrators. The findings suggest that principals faced difficulties in establishing good interaction with stakeholders. The school leaders aimed to maintain leadership from within the school, while teachers argued that principals were too controlling in administrative processes and questioned the necessity of an administrator in distance education. In conclusion, I argue that principals should display different characteristics in distance management processes compared to the leadership behaviours they exhibit in school.

Keywords: Challenges, distance, leadership, remotely, strategies.

INTRODUCTION

From the effective leadership approaches that have been acquired thus far, it is evident that management must involve people, including interaction and open communication. However, the pandemic has demonstrated the necessity for transformation in managerial processes due to the accelerated pace of technological advancement and the evolving landscape across all domains. Although the necessity for change has primarily manifested itself in the form of distance learning, it has also rendered distance management a necessity. Nevertheless, this matter has not been accorded the same degree of importance as distance education itself. In summary, the concept of distance management, which can be defined as the ability to oversee work activities from a distance, also necessitates the capacity to facilitate educational processes from a distance.

The concept of distance management has had a significant impact on the way in which leadership is perceived. It is becoming increasingly clear that leaders may need to develop a range of additional skills beyond their well-developed social skills in face-to-face communication. Zieke et al. (2019) highlight the fact that interactions between individuals depend on the ability to adapt to the constant technological changes that are taking place. This topic has also been discussed in the context of e-leadership, remote leadership, or digital leadership, and it is becoming increasingly evident that it is a crucial aspect that requires emphasis in both new and existing circumstances. In order to guarantee the success of distance learning programmes, it is of the utmost importance to pay meticulous attention to detail and to proactively manage those (Harper et al., 2004). It is therefore important to identify how school administrators develop their behaviours and responses in the delivery of distance education. This study examines the ways in which leaders interact with colleagues and stakeholders in a virtual environment, with a particular emphasis on their conduct during periods of crisis. The objective is to ensure the continuity of learning and teaching.

LITERATURE REVIEW

The term “distance or remote management,” also known as “virtual management,” is used to describe the supervision of individuals or teams who are working in different physical locations. This form of management has become increasingly prevalent as a consequence of the growth in remote working and the advent of technology that facilitates effective communication and collaboration over long distances. The increasing demand for technology-enabled distance learning alternatives and services presents significant challenges for academic leaders, administrators, and support staff. While technological advancement is a pivotal factor in all aspects of education, those in administrative roles are among the most significantly impacted (Schauer et al., 2005). The responsibility for the management of educational policies in a remote capacity fall upon the shoulders of school administrators. However, the extensive implementation of distance learning and online training as a consequence of the global pandemic has positioned school management in a distinctive position. This offers a chance to assess the viability of remote leadership. The guidance of teachers and the assurance of effective planning and programming of distance learning processes in such novel situations necessitate the utilisation of a distinct skill set.

Distance management in schools is an innovative approach to managing educational institutions effectively and efficiently from a remote location. This approach allows administrators and teachers to supervise and perform various tasks without the need for their physical presence in school buildings (Shah, 2014). The use of technology and specialised information systems allows for remote management in schools, providing benefits such as real-time monitoring of student attendance, academic performance, and disciplinary issues (Khamdamov et al., 2020). Furthermore, it facilitates seamless communication and collaboration among stakeholders, thereby enabling them to make data-driven decisions and implement strategies to improve teaching and learning outcomes (Balcita & Palaoag, 2020; Zulfikar & Mirfani, 2020). Moreover, distance management enables educational institutions to automate administrative processes, reduce the volume of paperwork, and enhance operational efficiency. This approach effectively addresses challenges associated with limited resources, geographical barriers, and the necessity for flexible learning options.

The concept of remote management is increasingly regarded as a transformative approach in the field of education. The pandemic has presented numerous challenges to educational institutions and their leaders, necessitating alterations in leadership practices and roles (Schechter et al., 2022). The international evidence base on school leadership during the pandemic is still emerging. Overall, it emphasises the unpredictable and unrelenting demands on school leaders. The available evidence suggests that the personal burden on school leaders is significant, negatively impacting their wellbeing and mental health. In addition, the evidence indicates that school leaders play a critical role in supporting continuity of learning during the pandemic (Harris & Jones, 2022).

The term “remote management” is used to describe the practice of supervising and managing individuals or teams in different physical locations. This approach has become increasingly prevalent in response to the growth of remote workforces and the emergence of global teams. Effective communication and collaboration tools are essential for ensuring seamless coordination among team members. Kowalski and Slebarska (2022) posit that remote management is a challenging undertaking that necessitates meticulous planning and implementation. It is incumbent upon managers to adapt their management style to the specific challenges inherent to remote teams. This necessitates an enhanced capacity for autonomy and self-motivation among team members (Kalemba et al., 2021). In order to combat the effects of isolation in the workplace, it is essential that managers prioritise the development of relationships and the fostering of a sense of belonging within the virtual team. Moreover, the management of remote teams can prove challenging due to the existence of cultural differences. Individuals from disparate backgrounds may exhibit disparate communication styles and expectations (Cai, 2023). To this end, it is incumbent upon managers to establish transparent expectations and objectives for remote teams, and to facilitate comprehension of the specific roles and responsibilities of individual team members, as well as the collective team goals. Furthermore, regular check-ins and feedback sessions are essential for ensuring that remote workers feel supported and have the opportunity to address any challenges they may encounter (Wittmer & Hopkins, 2021).

The effective management of distance is a crucial element in the successful implementation and operation of distance education programmes. The process of curriculum development necessitates meticulous planning

and organisation of the diverse elements inherent to distance education, including the training of instructors, the provision of student support, and the establishment of an appropriate technological infrastructure. The development of a curriculum in a distance education environment requires a meticulous consideration of the learning objectives, instructional materials and assessment methods to be employed. Furthermore, comprehensive student support entails addressing individual learning needs, encouraging participation and fostering a sense of community within the virtual classroom. Furthermore, the technological infrastructure must be robust and reliable to guarantee a seamless learning experience and equal access for all students (Ferdiana, 2013; Leontyeva, 2018; Salas et al., 2002).

It is especially important that all stakeholders engaged in distance education adopt an open and cooperative approach to facilitate the smooth functioning of the programme. The regular provision of feedback, data evaluation and continuous support are essential components of effective distance education management. By prioritising these elements, educational institutions can establish a dynamic and inclusive learning environment that transcends physical barriers (Anderson, 2003). Furthermore, it is especially important to cultivate trust and a sense of community among remote team members in order to foster a positive and productive working environment. This can be achieved through deliberate efforts such as organising team building activities in a virtual environment, providing opportunities for informal interactions and valuing individual contributions (Malhotra et al., 2007; Turesky et al., 2020). Moreover, a proactive approach is essential to address potential impediments to remote working, such as feelings of isolation and disconnection. It is recommended that virtual team leaders communicate frequently with team members, establish channels for open discussion of concerns, and provide appropriate support to meet individual needs (Holton, 2001).

A further crucial element of distance management is the establishment of trust within the team. It is incumbent upon managers to cultivate trust through transparent communication, reliability, and accountability. Trust is of particular importance in remote teams, where direct supervision is limited, as it has a positive effect on team dynamics and overall productivity (Soomar, 2020). Furthermore, managers should consider the implications of different time zones and work schedules among support team units. The flexibility of scheduling meetings and deadlines can foster an inclusive team environment that accommodates different working hours (Newman et al., 2019). The promotion of a clear distinction between work and personal time, the provision of support for wellness initiatives and the facilitation of access to mental health resources can collectively contribute to the overall well-being of remote workers (Franken et al., 2021).

The advent of the SARS-CoV-2 pandemic has precipitated a period of rapid change and presented leaders with a series of additional challenges. The long-term sustainability of these roles is open to question (Contreras et al., 2020). As we progress in this novel working environment, those in leadership positions will encounter new challenges that necessitate adaptation for optimal success. It may be hypothesised that new approaches to leadership will be required in order to overcome these challenges (Olofsson & Karlsson, 2021). In conclusion, effective remote management requires a more nuanced understanding of team dynamics and individual competencies than is typically assumed. It necessitates the establishment of a unified and communicative virtual team culture, the cultivation of trust and community, and the proactive resolution of the distinctive challenges inherent to remote work environments.

METHOD

In order to gain insight into the implementation and significance of distance management, a data triangulation approach was employed. The study employed semi-structured interviews with nine principals and focus group discussions with five teachers as a means of collecting qualitative data. This approach was designed to cross-check sources and enhance the credibility and authenticity of the qualitative findings (Fraenkel & Wallen, 2012; Patton, 2014). There are several reasons for using qualitative research in this study. One such reason is to gain insight into the lived experiences of educators and administrators who oversee distance management by conducting direct feedback interviews. Another reason is to gain rich details about distance management through participants' experiences and perspectives and to gain in-depth understanding of the challenges and strategies related to distance management in education. Another crucial reason is that distance management in education is a dynamic and evolving field. This led to the conclusion that qualitative methodology should be used initially in order to understand the training and attitudes towards this relatively

new research topic. To achieve this objective, individual interviews were conducted with school principals and a focus group study was undertaken with teachers. The objective was to gather a diverse range of data on the applicability of distance management by working with different study groups, namely principals and teachers. This approach enabled the formation of comprehensive views on the functioning and applicability of distance management. The following topics were investigated:

- The role of principals in distance management
- School leaders' communication and interactions with others (such as teachers and students)
- The challenges and strategies involved in distance management

Participants

The research was conducted with nine principals and five teachers employed at public schools in Van, a province of Türkiye. Individual interviews were conducted with the principals, while focus group interviews were conducted with the teachers. As Charmaz (2006) notes, it is not appropriate to cite a specific sample size in qualitative research if the researcher deems the data sufficient. Accordingly, the number of participants was deemed sufficient to yield satisfactory research data and to draw conclusions about the entire research project. The study was conducted in accordance with the ethical standards set forth by the relevant institutional review board and all participants provided informed consent. The school principals were assigned the codes P1 and P2, while the teachers were designated as T1, T2, and T3. Table 1 presents a summary of the demographic characteristics of the school principals.

Table 1. The profile of the school principals.

Participant Code	School type	Gender	Seniority as a manager	Educational background
P1	Primary	Female	2	Master's degree
P2	Primary	Male	3	Bachelor's degree
P3	Primary	Male	5	Bachelor's degree
P4	Middle school	Male	3	Bachelor's degree
P5	Middle school	Female	6	Bachelor's degree
P6	Middle school	Female	3	Bachelor's degree
P7	High school	Male	6	Master's degree
P8	High school	Male	4	Bachelor's degree
P9	High school	Male	7	Master's degree

Table 2 presents the demographic profile of the teachers who took part in the study and were included in the focus group.

Table 2. The profile of the teachers.

Participant Code	School type	Gender	Branch	Educational background
T1	Primary	Female	Elementary	Master's degree
T2	Middle school	Female	English	Bachelor's degree
T3	High school	Male	Math	Bachelor's degree
T4	Middle school	Male	Turkish	Bachelor's degree
T5	Primary	Female	Elementary	Bachelor's degree

Validity and Reliability

The interviews were subjected to analysis according to two distinct categories: those conducted with principals and those conducted with teachers. The data was presented in the form of figures to reveal the basic issues and themes, with direct quotes included to illustrate these issues. To ensure the credibility of the findings, the researcher maintained prolonged engagement with the participants over an extended period of time. The transcripts were subsequently forwarded to the participants for their confirmation. At the conclusion of the focus group interview, one participant was requested to confirm the veracity of the research report. To guarantee the veracity and dependability of the researcher's assertions, an external audit was conducted (consistency) in accordance with the recommendations of Lincoln and Guba (1985, as cited in Merriam, 2013). In other words the research process was meticulously documented, encompassing all interview guides, transcription procedures, and coding frameworks. To guarantee transparency in the methodology, an external audit trail was maintained. Direct quotations were employed with regularity in order to substantiate the research findings in order to ensure confirmability.

FINDINGS

The study presents its findings in two distinct categories: school principals and teachers.

School Principals

The principals interpreted distance management in two distinct ways, as shown in Figure 1.



Figure 1. Principals' Perspective on Distance Management

The study revealed that all of the principals expressed scepticism regarding the distance learning process, with a significant proportion of respondents (n:9) indicating that they believed it undermined their authority. The opinions expressed on this matter were analysed according to two distinct subheadings.

The Absence of Control Mechanisms Renders Management Ineffectual.

The majority of principals (n = 7) reported a reduction in the extent of their controlling behaviour in management practices. The presence of administrators in schools is perceived as a means of exerting control over teachers, pupils and the educational process. The following direct quotations from the principals are presented herewith:

"Even our presence in the school could contribute to the control and spontaneity of the school. How can we understand what is being done correctly in a place where we are not physically present? Why do we exist only for paperwork?" (P6)

"I think it's always better to be physically present at the school. The same goes for the management. To be honest, managing the school feels more meaningful when you are there. Otherwise, there were moments when I did not feel like an administrator. It was as if we were like someone who only checked whether things were working or not and had no other job. The burden on us was very different and made us feel insecure." (P4)

“Distance learning definitely leads to a loss of control. In digital environments, everything can be seen; the whole process can be monitored. But nothing really inspires trust like face-to-face. As a manager, I don’t really feel like a leader in these times.” (P9)

A Decline in the Efficacy of Regulatory Mechanisms

One of the pivotal findings regarding distance management is the dearth of trust that principals have in the process and educational practices. All participants (n=9) expressed skepticism regarding the efficacy of remote education and management practices, as compared to their in-person counterparts. Those in administrative roles tend to hold negative views of classroom environments and educational practices that they are unable to physically observe or access.

“Frankly, distance management has become a very dull and bland subject, as if it were an automated mechanism. I mean, frankly, even training can be done remotely in some way, but I think management cannot be done without face-to-face. It was very difficult for me to follow up and trust the training practices.” (P1)

“As an administrator, the dynamics of management change if you don’t interact with people on a daily basis. You cannot easily perceive their concerns; you cannot be with them and help them with a particular problem.” (P8)

“What we are doing is not really running education, but managing it. Obviously, the state’s decision in these difficult times is intended to prevent a setback in education. This is actually the right way to go, instead of taking a long break. But I am not sure how effective it will be. Although we administrators were not ready for it at first, we have somehow got used to it, but it is not something I would prefer. It makes me feel inadequate to meet the needs. It is not something I really believe in.” (P5)

The Advantages and Disadvantages of Distance Management

As illustrated in Figure 2, the principals have identified a number of advantages associated with distance management.

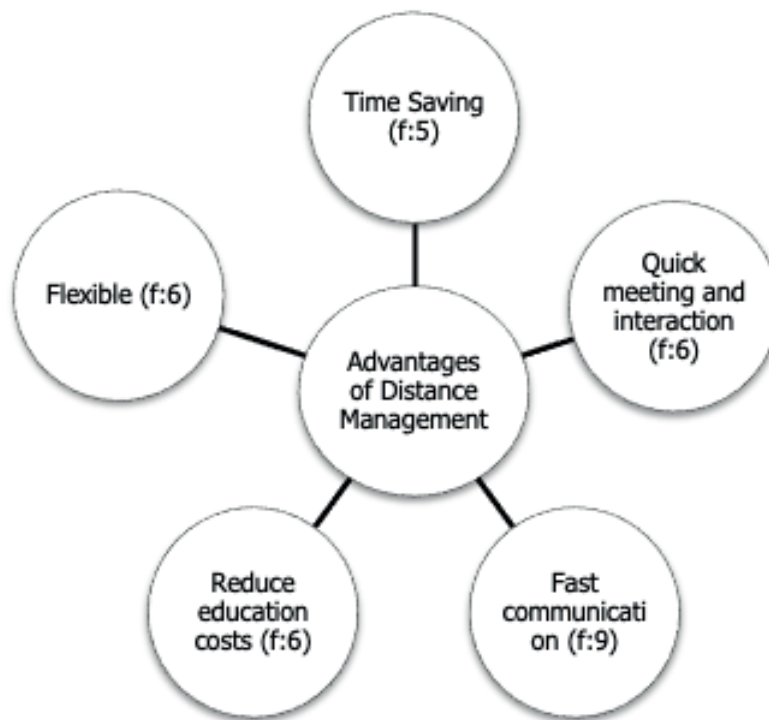


Figure 2. The Advantages of Distance Management

All participants indicated that distance school management facilitates straightforward and expedient communication, which they perceive as a key advantage. Moreover, distance management provides advantages such as expedient and adaptable interaction, diminished educational expenses, and time savings. The following direct quotations from participants are provided below for illustrative purposes:

“There are some comforts that remote management provides; you certainly do not feel like you have to do a very formal preparation. The communication is easy and rapid. This saves time.” (P2)

“This has the advantage of being able to communicate quickly. Because we interact quickly, we can ignore many of the details that are required to physically hold a meeting somewhere. It definitely provides flexibility and I can say that it also reduces the overall cost of training.” (P4)

“As a school principal, I firmly believe that distance management offers numerous advantages for our educational institution. By leveraging technology and embracing distance management practices, we can enhance efficiency, flexibility, and collaboration among our staff. Distance management allows us to streamline administrative tasks, such as scheduling, communication, and resource allocation, enabling us to focus more time and energy on supporting student learning and engagement. Additionally, distance management empowers our educators to work from anywhere, facilitating a healthy work-life balance and fostering a culture of trust and autonomy.” (P9)

Figure 3 illustrates the disadvantages of distance management as identified by the participants.

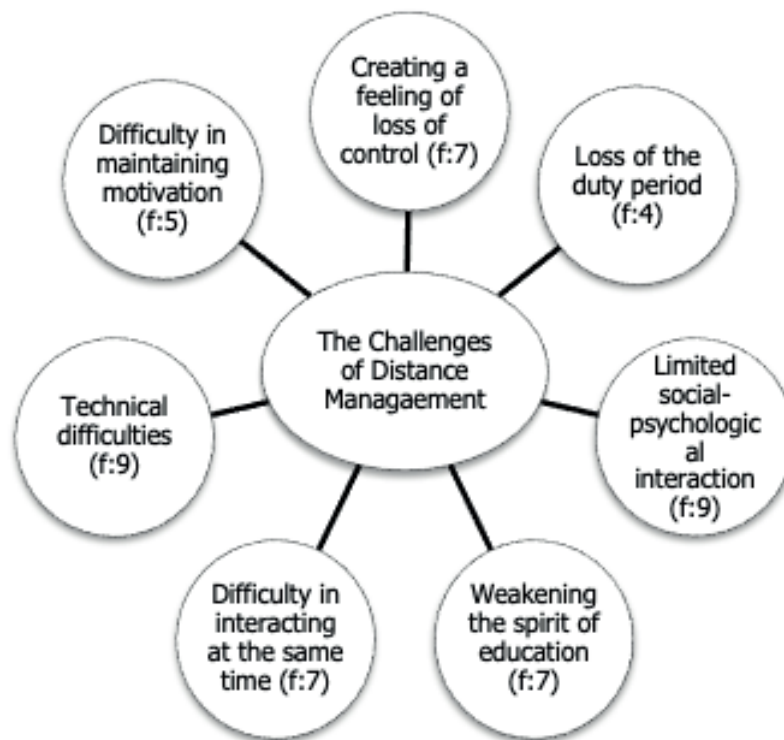


Figure 3. The Disadvantages of Distance Management

In the course of discussing the challenges of distance management, the majority of principals identified limitations in sociopsychological interactions and the emergence of technical issues as the most significant obstacles. Additional challenges include the perception of diminished control in distance management, the potential for the educational spirit to be compromised, and the challenge of interacting with stakeholders simultaneously. The following direct quotations are included below for reference:

“While I recognize the benefits of distance management, it’s important to acknowledge its drawbacks as well. One significant disadvantage is the potential for decreased interpersonal connection and collaboration among staff members. Distance management could sometimes lead to feelings of isolation

and disconnection, making it challenging to maintain a cohesive team environment. Additionally, sometimes there was technical challenges and limitations associated with remote communication and access to resources, which hindered productivity and efficiency. Furthermore, distance management sometimes posed challenges in effectively monitoring and supporting the well-being and professional development of our educators. While distance management offers flexibility, we must also be mindful of its impact on our school community's social dynamics and overall sense of belonging.” (P8)

“Distance management may exacerbate disparities in access to technology and resources among students and staff, widening the digital divide and inequities in education. For example, there were some challenges in effectively implementing certain educational strategies and interventions that rely on in-person interaction and hands-on activities in pandemic. Additionally, I had concerns about maintaining data security and privacy when managing sensitive information remotely.” (P4)

“A major concern with distance management is its impact on limiting social-psychological interaction within our school community. Whilst technology enables us to connect virtually, it cannot fully replicate the richness of face-to-face interactions. Remote management has sometimes led to feelings of isolation, loneliness and disconnection among staff and students, which are crucial for fostering a sense of belonging and well-being. Without the opportunity for spontaneous conversations, collaborative problem solving and informal support networks that often occur in physical spaces, we risk losing valuable social and psychological connections that contribute to a vibrant and cohesive school culture. It is crucial that we find ways to mitigate these challenges and prioritise opportunities for meaningful interpersonal interaction, even in a remote setting, to ensure the holistic development and emotional health of our school community.” (P1)

“As a school principal, I am deeply concerned about the impact of distance management on the spirit of education. While technology has enabled us to continue teaching and learning remotely, it cannot fully replicate the vibrant and dynamic atmosphere of a traditional classroom setting. I think distance management diminished the sense of excitement, energy, and human connection that were integral to the educational experience. Without the daily interactions, shared experiences, and personal connections that occur in a physical school environment, we risk losing the essence of what makes education truly transformative. It's essential that we find ways to preserve the spirit of education, fostering creativity, curiosity, and passion for learning, even in the face of remote management challenges.” (P5)

Communication and Interaction

In relation to distance management processes, the participating principals were invited to share their experiences of communication and interaction with teaching staff, students and other key stakeholders. The methods employed by school leaders to oversee the operation of the school in a distance learning environment were as follows:

- *Social Media and Messaging Apps:* Social media platforms and messaging apps, including WhatsApp, Facebook and Remind, are utilised by educational establishments to facilitate communication with parents, disseminate information regarding school events and encourage community engagement. These channels offer an informal and accessible method of communication, facilitating the dissemination of information and the establishment of relationships.
- *Virtual Meetings:* video conferencing platforms such as Zoom, Google Meet, or Microsoft Teams to conduct virtual meetings with teachers, staff, and stakeholders.
- *EBA* (Education Informatics Network - a platform created by the Ministry of National Education in Türkiye)
- *Phone Calls:* Another effective method for maintaining communication and connection with teachers, students, and parents is through personal phone calls.

Teachers

Following the focus group interviews, teachers expressed different views on the distance management of school leaders. Teachers' perspectives on principals' distance management are presented below.

Is There a Requirement for an Administrator in Distance Education?

In the context of the pandemic and the subsequent shift to distance learning, teachers have highlighted that they were largely responsible for the majority of the work, while the administration was primarily involved in document control. This has led to a re-evaluation of the role of the administrator in distance learning. The teachers' opinions on this matter are as follows:

"In fact, I believe that distance learning has made the administrators' job easier. They no longer have to deal with physical problems, maintain school organization, or handle discipline issues. This has significantly reduced their responsibilities. They can now follow up on work electronically, which is something we can also do. In summary, if there is a combination of face-to-face and online education, administrators will have additional planning responsibilities. However, if we are solely discussing distance education, school administration is not a significant concern." (T2)

"In distance learning, the burden of responsibility falls primarily on the teachers. Administrators have a minimal role in the process, with most of the planning and changes being the responsibility of the teachers. Administrators have a minimal role in the process, with most of the planning and changes being the responsibility of the teachers. While distance learning can be done by teachers alone, it is important to acknowledge the additional workload and support them accordingly. At the start of the pandemic, we all experienced uncertainty and panic regarding the use of certain platforms and tasks. During this time, the guidance and assistance of administrators were greatly appreciated. However, they too were experiencing the same level of panic as us. Ultimately, we had to learn the job independently, as they were in the same position as us." (T5)

"While it is important to consult with administrators on certain issues, it is clear that the majority of the responsibility for distance learning falls on the teachers! Let's give them the recognition they deserve! Teachers are doing an amazing job adapting to this new way of teaching and ensuring that students receive a quality education." (T1)

"I am now questioning whether school administrators are necessary if only distance learning is taking place. In my opinion, teachers are the main actors in the process of continuing, planning, and coordinating education. Everything is already monitored electronically, and MoNE officials can oversee this process without the need for administrators." (T4)

"However, there was always the expectation that we would eventually return to traditional face-to-face education, and fortunately, that is precisely what happened. In such circumstances, it is not always possible to immediately blame the administration. Nevertheless, I believe that the school administrators did not effectively lead this process." (T3)

The Role of the School Principal as a Planner and Mentor in the Operation of Distance Management

All teachers indicated that principals should be more involved in the planning phase of distance management, which is essential for the smooth and systematic running of the course. Furthermore, the mentoring role of the principal is especially important in distance education. School administrators should adopt the role of a psychologist who can assuage teachers' concerns and provide counsel, even from a distance. Teachers' opinions on these issues are as follows:

"To be frank, my views on the pandemic have evolved over time. In the early stages, when none of us knew what to do, the presence and guidance of managers could have been a great comfort. However, they were just as worried as we were and did not know how to guide us. Although school had already stopped, the headmaster was still the first person we turned to for information. Once we became accustomed to our new situation, we all knew what was expected of us. However, I had to rely on my own efforts to figure out what was required, as the headmaster was not very helpful

in this regard. Subsequently, we only communicated with the headmaster and deputy headmasters when it was necessary. In my experience, our culture tends to view management as something that only works when people are physically present. Therefore, I believe that remote management was not very successful in this case.” (T8)

“I agree. In general, leadership refers to the relationship between subordinates and superiors within an organization. I believe this is why they failed to lead.” (T2)

“In situations where physical distance is a challenge, some may doubt the effectiveness of remote leadership! However, it is important to note that leadership, not just management, is crucial in these scenarios. Perhaps collaboration with teachers could enhance leadership in these situations and teachers should be involved in leadership.” (T3)

“It’s completely understandable that school principals may experience worry and stress, but it’s important for them to adopt a different approach for the benefit of both us and the students. While I’m personally a bit sceptical about the effectiveness of distance learning, I do believe in distance education to some extent. While I’m personally a bit sceptical about the effectiveness of distance learning, I do believe in distance education to some extent. However, I don’t think distance management is necessary. Hey there! With guidance and digital information available, there’s no need for a manager. I had to learn everything myself, but I was able to do so.” (T5)

“Administrators should definitely have a guiding and psychologically comforting attitude during distance learning periods.” (T1)

Recommendations/Strategies for Distance Management

This section presents recommendations from both administrative and teaching staff regarding the management of distance learning. The following suggestions are those put forth by teachers:

- To establish relationships based on trust,
- To enhance supportive behaviours and develop virtual communication skills,
- School administrators should possess psychological leadership skills,
- It is imperative that there is a conscious acceptance and transformation of managerial attitudes in order to effectively lead in digital or electronic fields. The feedback received from teachers consists of statements that are generally agreed upon and expected.

The recommendations put forth by the administrators are presented in the following section.

- In-service training (f:7)
- Differentiation of distance learning, where a certain proportion of teachers and students come to the school alternately (f:5)
- Continuation of activities such as meetings in a hybrid form (f:8)

The majority of administrators (f:7) acknowledged their lack of information regarding this process and expressed a need for training on certain issues. They suggested that some meetings should be conducted in person. Furthermore, some administrators who do not support the idea of fully remote education and management put forward suggestions on this matter, stating that it would enable them to work physically as administrators in the school. The following are some of the administrators’ views:

“There should be a camera in every classroom and the teacher should come to the school (maybe 30-40% of the class can come alternately) and enter the classroom and explain and record the lesson as if there were students in front of him/her and upload it to the youtube channel and it should be compulsory for the students to watch it within that week. In the comments section, students can indicate the parts they did not understand and the teacher should give another lecture accordingly.” (P6)

“Even in the most difficult times, at least in certain groups, students and teachers can come and continue their education. In this way we can provide both distance and face-to-face leadership.” (P3)

CONCLUSIONS AND IMPLICATIONS

The management of distance in the context of school leadership presents a duality of opportunity and challenge, particularly in the context of distance learning or extended school closures. The results of the research indicate that school leaders perceive distance education to be less efficient and effective than face-to-face education in schools. In conclusion, the negative opinions expressed by principals were limited to aspects of the classroom environment or educational processes that they were unable to physically observe or access. Consequently, their scepticism of the educational process is also reflected in their management style. Those in administrative roles hold the view that the management of schools via online platforms is neither appropriate nor effective. It is evident that the control mechanisms of school principals are diminished in distance management, which they perceive as an issue. The presence of administrators in the school setting has been observed to engender a sense of comfort and control, despite their existing authority to monitor teachers and students at any given time. However, they may lack confidence in the processes that they are unable to directly observe or participate in. This observation may indicate a desire for control on the part of the administrators involved in the research. As Pelaez et al. (2021) observe, remote work can present managers with significant challenges in promoting camaraderie, teamwork, and effective communication among their staff. Furthermore, Vo et al. (2022) noted that managers who are not physically present may encounter difficulties in trusting that their employees will work consistently and meet deadlines without direct supervision. The authors posit that there is a considerable degree of mistrust between managers and employees. Consequently, the necessity for control may have been diminished as a consequence of the principals' lack of confidence in the efficacy of training and development procedures in distance management.

The advent of the Coronavirus Disease 2019 (Covid-19) pandemic has resulted in significant alterations to leadership roles and practices, giving rise to a multitude of challenges, including the necessity for remote and limited face-to-face school management (Schechter et al., 2022). The abrupt alterations in managerial and leadership roles may have precipitated elevated stress levels among school principals. Stasel (2020) and Huber (2021) have highlighted the stress experienced by school principals during the pandemic, elucidating the gravity of the situation. The process of remote management may have caused school leaders to feel insecure, as it represented a departure from their previous comfort zone and a weakening of their control mechanisms. It is possible that this has resulted in a lack of trust or adoption of the remote management approach that was created as a consequence of the pandemic. Moreover, a dearth of confidence in the efficacy of processes and the reliability of subordinates or teachers can impede the exemplification of leadership attributes. Headteachers who prioritise physical presence and discourage delegation may adopt a bureaucratic approach to organisational and management structures.

School principals are confronted with significant challenges pertaining to infrastructure and management skills, particularly in the context of distance learning, which was introduced as a consequence of the pandemic. Consequently, they may lack the requisite skills to adequately support teachers and students in the delivery of online education. Similarly, teachers have also been found to lack the requisite preparation. The absence of guidance from administrative authorities represents a significant concern. In their study, conducted during the pandemic, Jusas et al. (2021) identified a number of challenges faced by educators in the delivery of distance education. These included a lack of clear guidelines on conducting distance education, difficulties in ensuring the necessary infrastructure, concerns about competence, and security issues.

Limited communication is an important disadvantage in distance management. Managers who have difficulty in establishing interaction argue that the lack of a realistic training environment weakens the spirit of education. Some administrators also see difficulties in ensuring motivation and the disappearance of the concept of working hours as a problem. It may not be correct for teachers to perceive this limited communication as a lack of leadership by school administrators. As posited by Nunamaker et al. (2009), deficiencies in psychological and social communication in distance management can impede the efficacy of collaboration and team dynamics. In order to surmount the obstacles posed by the limitations of psychological and social communication in remote management, it is imperative to implement strategies that foster effective collaboration and team dynamics. One effective approach is the utilisation of technology platforms and tools that facilitate real-time communication and interaction among team members. The promotion of regular video conferences, virtual team-building activities and open communication channels can assist in the mitigation of the challenges posed by physical distance (Lyons et al., 2009). Moreover, the cultivation of a culture of transparency, empathy, and

active listening within a remote team can serve to reinforce interpersonal bonds and enhance the overall efficacy of communication (Nunamaker et al., 2009). This can assist in the development of the supportive behaviours and trusting relationships that teachers require.

In the context of distance learning, the role of the administrator has been called into question by teachers. It is essential that administrators provide the necessary support to guarantee a successful distance learning experience for all stakeholders. While it is evident that this is a novel and distinct process for all members of the educational institution, teachers have expressed feelings of vulnerability. However, they have also stated that administrators have not provided enough support and were not equipped to manage the process. As a result, teachers have had to solve all educational issues by themselves. However, it is becoming increasingly clear that school administrators should provide psychological support and guidance to teachers in online educational processes. It would be erroneous, therefore, to underestimate the importance of their presence in the online educational process. It is imperative that a change in leadership roles is implemented, with a particular focus on the exploration of issues pertaining to digital or electronic leadership. As posited by Zeike et al. (2019), those in leadership roles must possess a range of competencies to prevent the introduction of new technologies from adding to the pressures faced by staff.

It appears that remote management can offer many advantages such as flexibility, time saving, fast communication and fast information transfer (Sikes, 2011). The flexibility afforded by distance management allows work to be completed at a time and place that suits the individual. The flexibility afforded by remote management allows work to be completed at a time and place that suits the individual. Once employees are used to working remotely, the organisation can adapt more quickly to disruptions without compromising productivity. Such circumstances may offer a valuable chance to persevere in the organisation, despite the difficulties (Aczel et al., 2021; Mishra & Sharma, 2022).

The study revealed some disadvantages of distance education. These factors include difficulty in maintaining motivation, a sense of loss of control, technical problems, loss of regular working hours and a weakening of the spirit of education. While distance learning offers flexibility, it can also disrupt the perception of regular working hours. Participants see the flexibility to complete task-related work at any time as an advantage. However, they also point out the difficulty of having to complete their work unexpectedly, which can negatively affect their work-life balance. While some studies suggest that remote management can help employees achieve a better work-life balance (Mishra and Sharma, 2023; Mulki et al., 2009), others argue that deviating from traditional working hours can disrupt this balance (Muldoon, 2014; Ljungkvist and Moore, 2023). Maintaining a traditional working style is important to achieve a healthy work-life balance.

The study revealed some disadvantages of distance learning. These factors include difficulty maintaining motivation, a sense of loss of control, technical issues, loss of regular study hours, and a weakening of the educational spirit. While distance learning offers flexibility, it can also disrupt the perception of regular study hours. Participants see the flexibility to complete task-related work at any time as an advantage. However, they also point out the difficulty of having to complete their work unexpectedly, which can negatively affect their work-life balance. While some studies suggest that distance management can help employees achieve a better work-life balance (Mishra and Sharma, 2023; Mulki et al., 2009), others argue that deviating from traditional working hours can disrupt this balance (Muldoon, 2014; Ljungkvist and Moore, 2023). Maintaining a traditional working style is important to achieve a healthy work-life balance.

A disadvantage of remote management is that managers may feel that they are losing control, which can make it difficult to maintain motivation. This feeling may be due to the difficulty of accurately assessing and monitoring the productivity of remote employees. Managers who are not physically present in the organisation may find it difficult to measure the progress and service outcomes of members of the organisation. Furthermore, it can be argued that distance management requires a high level of trust between managers and employees (Vo et al., 2022). In summary, with distance education, school leaders may need to change their leadership styles, increase their technological literacy, and revisit various aspects of educational leadership to effectively implement online learning. This requires an effective transformation and often a proactive and feasible approach in the educational environment.

Undoubtedly, managing a school remotely presents both challenges and opportunities for a school leader. School principals must be able to balance their capacity for empathy, adaptability and flexibility in uncertain

times. This is because it is important to have a high level of adaptability in order to cope with changing circumstances and untimely emerging challenges. This skill can also encourage the generation of alternative solutions.

Leading schools remotely can be more challenging than in many other organisations. Therefore, it requires a deep understanding of the needs, expectations and concerns of school stakeholders (teachers, students and parents). In online environments, effective communication, listening, understanding the message or concerns presented and offering support become important. Even in the absence of physical contact, trust within the school can be established through warm, sincere and empathetic communication with other stakeholders.

The welfare of everyone is important in conducting educational processes remotely. For this reason, school leaders should be able to provide solutions that can enable each stakeholder, especially teachers and students, to manage their energy correctly and to build resilience against the difficulties that the virtual environment may create. It is also important to monitor and track these well-being and well-being states. In order for remote management to be effective, organisational loyalties based on real cooperation between all stakeholders must be created. Exchange of ideas and dialogue can help to make things easier in this sense.

In conclusion, distance management requires skills and competences such as adaptability, empathy and flexibility. In this respect, school leaders need to embrace flexibility, celebrate and recognise successes, collaborate and encourage collaboration, and remain optimistic in order to overcome the difficulties that may be experienced in distance management processes. In addition, maintaining motivation in distance education business and recognising achievements in this context will be useful for effective management. Recognising or rewarding teachers who exhibit innovative behaviours and students who show success can help stakeholders to maintain their hope and beliefs.

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FACULTY VOICES EXPLORED: A MIXED-METHOD RESEARCH ON ATTITUDE TOWARDS OER ADOPTION IN CENTRAL UNIVERSITIES OF NORTH EAST INDIA

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ABSTRACT

The advent of OERs signifies a major overhaul in education, driven by the opportunities offered by ICT and an ongoing commitment to openness and collaboration. The present innovative approach for educational resources not only tackles the issues concerning copyright, but also adheres to the values of inclusion, accessibility, and the dissemination of global knowledge. With their increasing popularity, OERs have the potential to change education into a more open collaborative, democratic, and equitable process. Prior studies have predominantly concentrated on faculty members from fields such as engineering, arts, and science, resulting in a scarcity of studies on faculty members in the discipline of Humanities and Social Sciences. Consequently, there is a dearth of holistic perspectives that encompass the perspectives of both users and creators of OER. Putting a focus on faculty members' attitudes and the perspectives of OER users and creators, this study investigates the adoption of OER in the higher educational institutes of North East India. To address this gap, a mixed-method research design with a convergent parallel approach was employed to gather both qualitative and quantitative data. A descriptive survey method was used to collect data from faculty members in the Humanities and Social Science disciplines across eight central universities of North-East India. The sample size consisted of 221 faculty members from the departments of Humanities and Social Sciences – Education, Sociology, Political Science, Mass Communication, History, English, and Hindi. The findings revealed that faculty members exhibited a moderate level of attitude towards OER adoption. The qualitative analysis further supported this, indicating that faculty (OER users and OER creators) generally hold a moderately positive perception towards OER adoption.

Keywords: OER adoption, attitude, faculty members, OER users, OER creators, central universities.

INTRODUCTION

The dynamic nature of education in the digital era has resulted in a profusion of educational resources, ranging from lesson plans and assignments to lecture notes and presentations. The availability of these materials on internet platforms has led to a paradigm shift in the creation, distribution, and utilisation of educational content. The rise of digital tools and platforms has facilitated the spread of these materials, providing faculty members and learners with a rich reservoir of resources to enhance the teaching and learning experience.

However, many of these educational resources fall under the purview of copyright laws, demanding approval from the copyright holder or adherence to other authorized principles or provisions (Cronin, 2017; Fitzgerald, et al., 2008). This signifies that unless the author (the copyright holder) grants permission or

makes the content publicly available, no one else will be able to share or alter it in any manner. Many scholars (OECD, 2007; Meinke, 2020) have highlighted the violation of copyright law, which includes acts such as replication, modification, public display, and distribution without the authors' permission. This confirms that educational resources are "locked" or "restricted" to a great extent (Prabhala, 2010), thereby making it complicated to use, reuse, and modify them in an open and free manner. Consequently, this restriction impedes open knowledge sharing, the exchange of ideas and resources, and the accessibility of educational materials to a wider audience. Recognizing this challenge, a viable alternative has been promoted – Open Educational Resources (OER) - that fosters openness and accessibility in the educational field. Putting forward by the United Nations Educational, Scientific, and Cultural Organization (2002), OERs represent a groundbreaking innovative approach that addresses the constraints of traditional copyright, seeking to facilitate unrestricted access to knowledge and bridge the global knowledge gap (Nasongkhla et al., 2014).

With the revolutionary power of OER, the educational landscape is currently undergoing a profound paradigm shift. This change is particularly noticeable in the field of higher education, where it signifies a break from traditional approaches to education and an embrace of a more innovative, accessible and inclusive approach to education. OER, at its heart, is fundamentally based on the notions of openness; it provides educational resources that are publicly available and openly licensed, allowing them to be used, modified, and shared without any financial or legal obstacles.

LITERATURE REVIEW

Concept of OER Adoption

The rise of technological innovations and the ubiquitous nature of the Internet have facilitated the democratization of knowledge sharing, use and re-use, enabling universal access to this valuable resource. Atkins, Brown, and Hammond (2007) articulated the concept of OER as a groundbreaking and powerful phenomenon, recognizing the global knowledge reservoir as a communal asset open to all. The core principles of open education are encapsulated in OER, advocating knowledge as a public good, and that everyone has the freedom to access, alter, and redistribute digital materials for education and research purposes without constraints (Misra, 2013).

The understanding of OER adoption is pivotal in higher education, which has been perused as a continuum extending from passive adoption (use) to active involvement (creation). The adoption of OER represents a shift in higher education in the digital age when viewed through the dual lenses of use and creation. This continuum includes different levels of involvement, such as utilizing pre-existing OER, generating new resources or adapting existing ones and then sharing such creations with the broader educational community, as emphasized by DeVries (2013). The 5R's OER framework of Wiley (2014) signifies a progression from passive stages such as retention and reuse to more active stages involving revision, remixing, and redistribution. The use and creation of OER are integral facets of adoption, essential for realizing the perks of OER (McKerlich, Ives and McGreal, 2013; Hodgkinson-Williams, Arinto, Cartmill, and King, 2017).

Faculty Attitude towards OER Adoption

Faculty members' attitudes towards OER have been the subject of several research investigations.

Prior research studies have extensively investigated faculty members' attitudes, beliefs, and perceptions on the use, creation, and integration of OER in various educational settings. A focus on relevance, quality, and accessibility has also been placed on how faculty perceive OER in comparison to traditional teaching materials. Alkhasawneh (2020); Okwu, Ogunbodede, and Suleiman (2023) Rolfe (2012) came to the conclusion that the faculty possesses a favorable academic culture, showing optimism about its benefits and a willingness to create and share resources to enhance the interactive and efficient nature of teaching and learning. Hussain, Chandio, and Khan Sindher (2013) observed that academics acknowledge the significance of OERs in promoting higher education, by granting access to a wide range of knowledge, facilitating innovative research practices and instructional experiences. Bond, Huddleston and Sapp (2021); Zhang and Li (2017) have noted that OER offers relative benefits and compatibility with other resources, having

intellectual depth similar to conventional textbooks, and as Kimmons (2015) highlighted their enhanced value in addressing specific contextual demands through adaptability, remixability, and modifiability. In addition to being helpful and sustainable, OERs are efficient in terms of cost and focus on improving student learning and achievement (Prisco, 2016). Studies have demonstrated that the integration of OER into teaching practices has resulted in enhanced learning outcomes for students and increased efficacy for teachers (Jhangiani et al., 2016; Ozdemir and Bonk, 2017). Kugamoorthy and Rajini (2017) observed that the use of ICT and OER in pedagogical strategies boosted instructors' ability to deliver more efficient higher learning, facilitate better collaboration with colleagues, and exchange more efficient lesson plans and resources. Forgette (2020) indicated that even while teachers were making use of OER in their courses as supplementary materials, they perceived OER as increasing classroom flexibility and student engagement when combined with technology.

Critical Analysis

The aforementioned literature reviews explored the adoption of OER in higher education, emphasizing its rise as a global research area, and paving the way for promising new avenues of inquiry. While several research has been conducted on the topic of OER adoption in developed nations, each study focuses on a distinct aspect of the phenomena. Previous studies in India predominantly examine OER adoption among faculty from the fields of engineering, arts, and science fields (Karalmarx and Lakshmi, 2021; Munisamy and Sivaraman, 2017), overlooking faculty members from social science backgrounds (Kumar, Baishya and Deka, 2021). Concerning the faculty of Humanities and Social Sciences, there is a paucity of research available in the North-East region of India. The cornerstone that supports the success of OER is how faculty perceive it. However, none of the existing studies is comprehensive enough to take into account the perspectives of both OER users and OER creators. Hence, this study endeavored to reduce this gap by taking into account the viewpoints of OER developers and users. The adoption of OER in Indian higher education institutions is still not well understood in light of all these shortcomings. If this is true, it is necessary to overcome the limitations that have been identified; otherwise, the effective adoption and long-term sustainability of OER will not be attainable.

Objective of the Research

To study the faculty attitude towards the adoption of OER in the higher educational institutes of North East India.

To delve into the perceptions of OER users and OER creators regarding the adoption of OERs in higher education settings.

METHOD

Research Design and Method

Using a mixed-method research design, this study set out to investigate the attitude of faculty members towards the adoption of OER in higher education institutions across North-East India. The study employed a convergent parallel mixed research design, which involved the integration of quantitative and qualitative data-gathering methods to conduct an extensive investigation of the phenomenon (Creswell & Plano Clark, 2017). Subsequent to these, a descriptive survey method has been adopted to gather data from faculty members in an effort to precisely and accurately determine the current status of the phenomenon.

Participants

The research population consisted of 442 faculty members (holding the positions of Professors, Associate Professors, and Assistant Professors) from the Humanities and Social Science disciplines at 8 central universities of North-East India, during the year 2022. Using stratified random sampling based on uniformity of department and academic rank, a sample of 221 faculty members had been selected, representing 50% of

the entire population. It includes faculty members from departments such as Education, Sociology, Political Science, Mass Communication, History, English, and Hindi across all 8 central universities of North-East India. Table 1 provides an overview of the overall characteristics of the research sample.

Table 1. Demographic Profile of the Sample

Sample Description based on Gender	
Male	128
Female	93
Total	221
Sample Description based on Academic Rank	
Professor	43
Associate professor	44
Assistant professor	134
Total	221
Sample Description based on Teaching Experience	
1-5 year	43
6-10 year	77
More than 10 year	101
Total	221

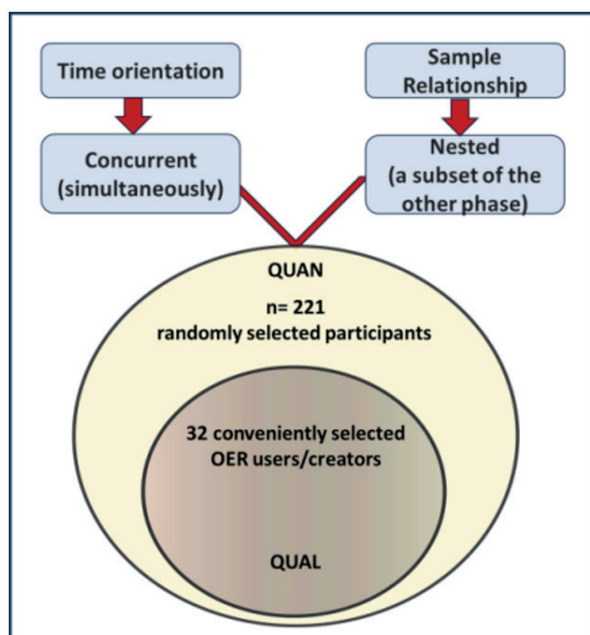


Figure 1. Mixed Method Sampling Design

Concurrent nested sampling has been applied, wherein the quantitative and qualitative stages were carried out concurrently (shown in Figure 1). In this design, the samples for the qualitative phase are nested within the quantitative phase of the investigation (Mertens, 2010; Onwuegbuzie and Collins, 2007).

For the quantitative phase, a multistage sampling technique has been adopted dividing the population into two strata based on department homogeneity and faculty academic rank. For the second phase which is the qualitative phase of the study, the researcher conveniently selected those OER users and OER creators who consented to take part in the interview session. Figure 2 and 3 present a complete overview of the sample design.

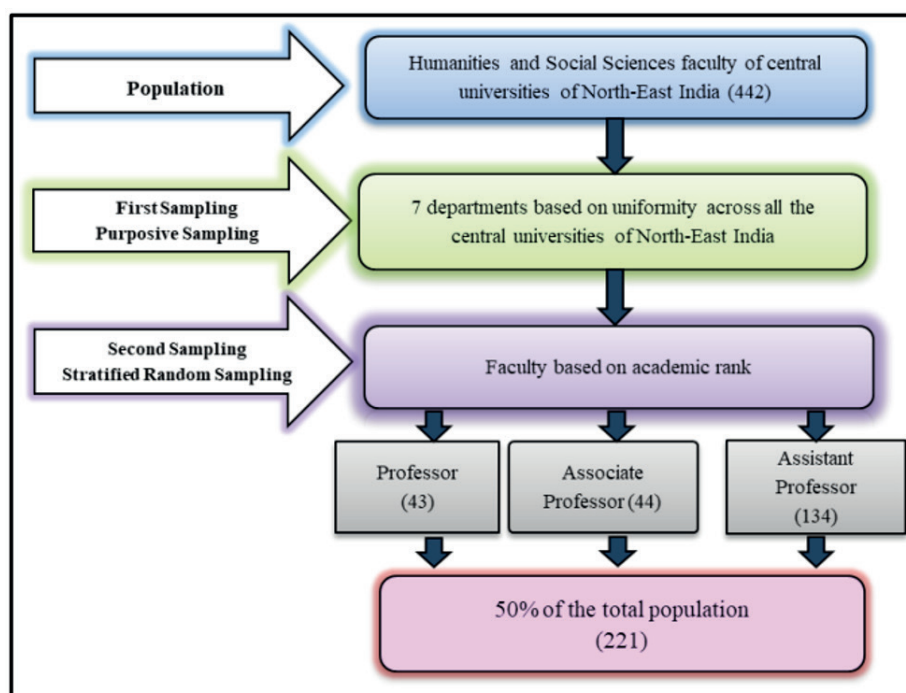


Figure 2. Sampling design for the Quantitative phase of the study

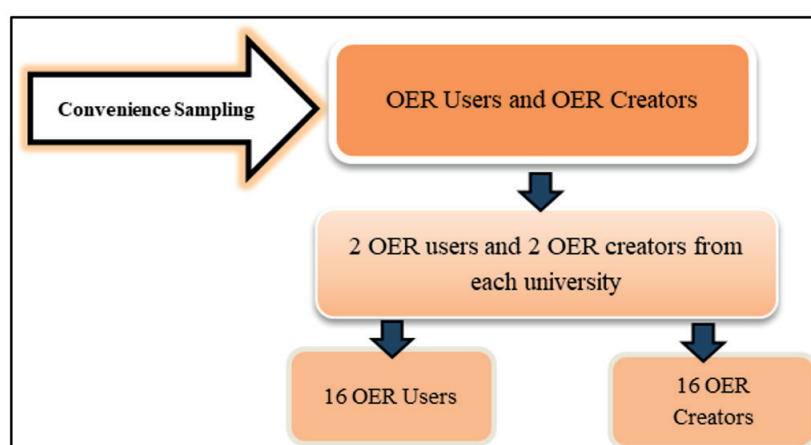


Figure 3. Sampling design for the Qualitative phase of the study

Instruments and Procedures

A self-constructed 5-point Likert scale, Teacher OER Attitude Scale with scores ranging from “Strongly Agree” to “Strongly Disagree” from 5 to 1 for positive items and from 1 to 5 respectively for negative items to measure the attitudes of university faculty toward the adoption of OER has been used to collect data for quantitative phase. Initially, the Teacher OER Attitude Scale, comprising 49 statements, was pilot-tested with 30 faculty members from the Humanities and Social Science disciplines at Tezpur Central University. Responses were categorized into high and low scorers, and items with a point-biserial correlation coefficient (Rpbi) and discrimination index (DI) higher than 0.20 were retained, following guidelines from Ebel and Frisbie (1991) and Kimpton and Harnisch (2008). Finally, the scale consists of thirty-seven (37) items categorized into five dimensions: attitude toward the use and creation of OERs, attitude towards sharing of OERs, attitude towards the use of OER for professional development, attitude towards open licenses and CC licenses and attitude toward accessibility of OERs. The scale underwent thorough validation procedures, involving expert evaluation to ascertain face validity and the use of Lawshe’s CVR formula to establish content validity, yielding a notable CVI (Content Validity Index) value of 0.93, thereby confirming its

validity. The Cronbach's alpha and Split-half correlation coefficient values for the scale are 0.89 and 0.88, which indicates that it is highly consistent and reliable. Standardised criteria for assessing attitudes towards OER adoption were established using Z-scores. The interpretation intervals are as outlined below: Z-scores ranging from +1.77 and above indicate "Extremely High Positive"; +0.59 to +1.76 as "Highly Positive"; -0.58 to +0.58 indicate a moderate or neutral attitude; -0.59 to -1.76 indicate as low negative attitude, and -1.77 and below indicate an extremely low negative attitude.

In order to gain deeper insights into OER users and OER creators perspectives on OER adoption, a semi-structured interview schedule was prepared with expert feedback incorporated for clarity and validity. One of the key questions, *"How do you perceive the use of OERs in the higher education sector? Please explain"* seeks to assess their perception towards OER adoption.

Data Collection and Analysis

From March to November 2022, the researcher carried out the data collection process in two distinct phases across the eight central universities of North-East India. These phases involved both quantitative and qualitative data collection as part of a concurrent nested sampling design.

Stage 1: Quantitative Data Collection and Analysis

For the quantitative phase of data collection, the OER teacher attitude scale was distributed to all the samples of the study. After collecting the responses, data was analyzed using the Excel software package. In addition to descriptive statistics, Percentages, Frequency, Mean, and Standard Deviation (S.D.) have been used for analyzing quantitative data therein.

Stage 2: Qualitative Data Collection and Analysis

The qualitative phase involved conducting interviews exclusively with faculty members who voluntarily agreed to participate with each session lasting between 20 to 30 minutes. Using the NVivo software, the researchers used the six-step framework proposed by Braun and Clarke (2006) for thematic analysis the widely used qualitative data analysis approach. The first step is a thorough review of the transcripts to understand participants' perspectives. Next, codes were created to denote important passages, which allowed for the identification of broad themes and subthemes. All themes were carefully reviewed and refined to ensure they were in accordance with the research objectives. Lastly, the researchers presented a clear and precise summary of the themes, supported by evidence from the data.

Ethical Considerations

To ensure ethical standards and maintain the integrity of the research, the researchers obtained informed consent from the participants prior to data collection and recorded interviews only after prior approval. To ensure the anonymity of participants, the participants involved in the interview session were assigned pseudonyms (P1, P2, P3....), upholding privacy and confidentiality guidelines (Marshall and Rossman, 2016).

FINDINGS

Descriptive Statistics

The descriptive statistics provided in this section provide significant insights into the prevalent attitudes among faculty members toward OER adoption. According to the data presented in Table 2, it is apparent that among the 221 faculty members from higher educational institutions in North-East India, a significant proportion of the faculty members, specifically 49% (N=109), exhibit a moderate level of attitude towards the adoption of OER. Subsequently, the study revealed that 23% (N=51) of the faculty members display a highly positive attitude towards the adoption of OER, whilst 19% (N=42) demonstrate a low negative

attitude towards the adoption of OER. However, a few 5% of participants (N=11) possess an extremely high positive attitude towards the adoption of OER and a mere 4% of participants (N=08) show an extremely low negative attitude towards the adoption of OER.

Table 2. Showing the Level of attitude towards the adoption of OER

Range of z-Scores	F	%	Interpretation
+1.77 and above	11	5%	Extremely High Positive
+0.59 to +1.76	51	23%	Highly Positive
-0.58 to +0.58	109	49%	Moderate or Neutral
-0.59 to -1.76	42	19%	Low Negative
-1.77 and below	08	4%	Extremely Low Negative
TOTAL	221	100%	

Despite the general observation of a moderate attitude towards OER adoption among faculty, it is important to gain further insight into dimension-wise item analysis of faculty members' attitudes towards the adoption of OER. For this, each statement's mean and standard deviation were calculated. The interpretation of the mean score is guided based on criteria laid down by earlier studies (Alston and Miller, 2001; Kotrlik and Redmann, 2009; Veatch, 2021) as shown in Table 3:

Table 3. Level of Mean Score Interpretation

Range of mean Score	Descriptive Equivalent	Interpretation
4.50 - 5.00	Strongly Agree	Extremely High Positive Attitude
3.50 - 4.49	Agree	Highly Positive
2.50 - 3.49	Neutral	Moderate attitude
1.50 - 2.49	Disagree	Low Negative
1.00 - 1.49	Strongly Disagree	Extremely Low Negative Attitude

Dimension 1: Attitude toward the use and creation of OER

Table 4. Dimension 1: Attitude toward the use and creation of OER

Statements	Weighted Mean	S.D.	Interpretation
I believe the creation of OER will help me in the process of promotion.	3.76	3.37	Highly Positive
I believe by creating OER, will raise my reputation.	3.55	3.17	Highly Positive
I am hesitant about using others' materials.	3.73	3.31	Highly Positive
I may not be happy or satisfied with the way others modify my contents and would prefer others to use as it is.	3.66	3.28	Highly Positive
I prefer to use only such resources that were recommended to me by others.	2.79	2.50	Moderate
The use of OER can improve class interactivity and enhancement.	3.88	3.48	Highly Positive
OER can promote inclusiveness and equity in learning.	4.05	3.61	Highly Positive
I believe the use of OER textbooks is more beneficial than traditional textbooks.	3.12	2.81	Moderate
I do not want others to make money from my original works.	2.62	2.36	Moderate
OVERALL TOTAL	3.46	3.10	Moderate

Table 4 presents the analysis of faculty attitudes regarding the adoption of OER, focusing on the dimension labeled “Attitude towards the use and creation of OER”. The overall weighted mean of 3.46 and a standard deviation of 3.10 suggest that faculty members have a moderate level of attitude towards the use and creation of OER. Significantly, respondents acknowledged that the creation of OER has the potential to support career growth (M=3.76, S.D. = 3.37) and improve their reputation (M=3.55, S.D. = 3.17); displayed no hesitation in using the material created by others (M=3.73, S.D. = 3.31) and disagreed of being dissatisfied with the adaptations of their content (M=3.66, S.D. = 3.28). Interestingly, respondents disagreed with the idea of relying entirely on recommended materials and expressed a moderate preference for autonomy in resource selection (M=2.79, S.D. = 2.5). However, faculty believed that the use of OER can improve class interactivity and enhancement (M=3.88, S.D. = 3.48); promote inclusivity and equity in learning (M= 4.05, S.D. = 3.61); perceived OER textbooks as potentially more beneficial than traditional ones (M=3.12, S.D. = 2.81) and only a few expressed their reluctance to allow others to gain profit from their work (M= 2.62, S.D. = 2.36).

Dimension 2: Attitude towards Sharing of OERs

Table 5. Dimension 2: Attitude towards Sharing of OERs

Statements	Weighted Mean	S.D.	Interpretation
I believe that educational resources should be a public good open and free to all.	4.31	3.86	Highly Positive
Sharing resources with colleagues is important in teaching and research.	4.43	3.95	Highly Positive
I believe sharing resources leads to learning new knowledge, new ideas and the production of new resources.	4.48	4.00	Highly Positive
Sharing of resources brings achievement and success in outcomes.	4.20	3.73	Highly Positive
Sharing resources makes me feel more confident.	4.09	3.65	Highly Positive
Sharing resources improve my expertise in that field.	4.07	3.63	Highly Positive
OVERALL TOTAL	4.26	3.80	Highly Positive

Table 5 presents faculty attitude in terms of the second dimension “Attitude towards Sharing of OERs”; revealing an overall weighted mean of 4.26 and a standard deviation of 3.80 which indicates faculty having a highly positive attitude towards OER sharing. Notably, faculty members exhibit a strong belief that educational resources are a public good, open and free for all (M=4.31, S.D. = 3.86) and view sharing of resources with colleagues as an important task in teaching and research (M = 4.34, S.D. = 3.95). They strongly agreed that resource sharing fosters new knowledge, and new ideas and creates new resources (M= 4.48, S.D.= 4.00); contributes to achievement and success (M= 4.20, S.D. = 3.73); boosts confidence among them (M= 4.09, S.D. = 3.65) and improves professional expertise (M=4.07, S.D. = 3.63).

Dimension 3: Attitude towards the Use of OER for Professional Development

Table 6. Dimension 3: Attitude towards the use of OER for professional development

Statements	Weighted Mean	S.D.	Interpretation
OER can give me global recognition.	3.71	3.30	Highly Positive
I believe OER can help me in connecting with other colleagues around the world.	4.11	3.66	Highly Positive
OER is a good way of disseminating my work to the research community and beyond.	4.18	3.69	Highly Positive
OER saves my time and effort in resource development.	3.80	3.35	Highly Positive

OER encourages me to reflect on my teaching practices.	3.92	3.47	Highly Positive
OER provides me an opportunity to improve my work by receiving feedback from others.	3.98	3.53	Highly Positive
OER will increase my citation rates.	3.95	3.50	Highly Positive
OER will improve my pedagogical practice.	3.98	3.51	Highly Positive
OER will increase my efficiency in content production.	4.03	3.56	Highly Positive
OVERALL TOTAL	3.96	3.51	Highly Positive

Table 6 elucidates faculty attitudes towards the use of OER for professional development with an overall weighted mean of 3.96, and a standard deviation of 3.51, which results in faculty having a highly positive attitude towards the use of OER for professional development. They generally agreed to the fact that OER can give them global recognition in their respective fields ($M = 3.71$, $S.D. = 3.30$); facilitate in establishing connections with faculty worldwide ($M = 4.11$, $S.D. = 3.66$) and serve as a good way of disseminating their work to the research community ($M = 4.18$, $S.D. = 3.69$). Moreover, they believe that OER saves time and effort in resource development ($M = 3.80$, $S.D. = 3.35$); encourages reflective teaching practices ($M = 3.92$, $S.D. = 3.47$); provides an opportunity to improve work by receiving feedback from others ($M = 3.98$, $S.D. = 3.53$) and enable an increase in citation rates ($M = 3.95$, $S.D. = 3.50$); improve pedagogical practice ($M = 3.98$, $S.D. = 3.51$) and boost efficiency in content production ($M = 4.03$, $S.D. = 3.56$).

Dimension 4: Attitude towards Open Licenses and Creative Commons Licenses

Table 7. Dimension 4: Attitude towards open licenses and Creative Commons Licenses

Statements	Weighted Mean	S.D.	Interpretation
I believe open licenses require knowledge of technical skills.	3.74	3.31	Highly Positive
I believe open licenses enable me to customize the contents as per my needs.	3.68	3.24	Highly Positive
I prefer the use of Creative Commons licenses in addition to my copyright license.	3.72	3.29	Highly Positive
I think academicians should publish their works under Creative Commons licenses as teaching is a give-and-take process.	3.88	3.46	Highly Positive
Creative Commons Licenses help in creating an online community of sharing and reusing.	3.99	3.54	Highly Positive
Compared to traditional copyright, Creative Commons Licenses have made it easier to grant permission to all automatically rather than granting permission to each person individually.	3.84	3.40	Highly Positive
I think Creative Commons licenses remove my creditability and acknowledgement.	3.04	2.69	Moderate
I think Creative Commons licenses will increase the rate of Plagiarism.	3.14	2.81	Moderate
OVERALL TOTAL	3.63	3.22	Highly Positive

Concerning the fourth dimension, the results shown in Table 7 illustrate faculty attitudes towards open licenses and Creative Commons Licenses, indicating an overall weighted mean of 3.63 and standard deviation of 3.22, underscoring a highly positive attitude towards open licenses and Creative Commons Licenses. Faculty agreed that open licenses require knowledge of technical skills ($M = 3.74$, $S.D. = 3.31$) and enable them to customize the contents as per their needs ($M = 3.68$, $S.D. = 3.24$). However, it has been reflected that a substantial proportion prefer the use of Creative Commons licenses alongside traditional copyright licenses ($M = 3.72$, $S.D. = 3.29$) and considered that they should publish their works under Creative Commons licenses ($M = 3.84$, $S.D. = 3.41$). Faculty believe that Creative Commons licenses help in creating

an online community of sharing and reusing ($M = 3.99$, $S.D. = 3.54$) and make it easier to grant permission without asking as compared to traditional copyright ($M = 3.84$, $S.D. = 3.40$). Despite this, faculty members were concerned about whether Creative Commons licenses remove their creditability and acknowledgement ($M = 3.04$, $S.D. = 2.69$) and increase plagiarism rates ($M = 3.14$, $S.D. = 2.81$).

Dimension 5: Attitude toward Accessibility of Open Educational Resources

Table 8. Dimension 5: Attitude toward accessibility of Open Educational Resources

Statements	Weighted Mean	S.D.	Interpretation
Searching for OER is a time-consuming activity	2.88	2.55	Moderate
OER can be accessed from anywhere.	3.85	3.41	Highly Positive
The use of OER does not fit my course.	3.81	3.37	Highly Positive
OER are easy to download.	3.74	3.31	Highly Positive
OER can be easily revised and remixed.	3.41	3.01	Moderate
OVERALL TOTAL	3.54	3.13	Highly Positive

The result of the fifth dimension ‘Attitude toward accessibility of Open Educational Resources’, as presented in Table 8 illustrated that the overall weighted mean is 3.54 and the standard deviation is 3.13, suggesting faculty members have a highly positive attitude towards the accessibility of Open Educational Resources. They showed a moderate attitude toward searching for relevant OER as a time-consuming activity ($M = 2.88$, $S.D. = 2.55$); in contrast, they accepted that OER can be accessed from anywhere ($M = 3.85$, $S.D. = 3.41$) and can be easily downloaded ($M = 3.74$, $S.D. = 3.31$). Furthermore, faculty disagreed that the use of OER may not fit their course curriculum ($M = 3.81$, $S.D. = 3.37$) and moderately agreed with the opinion that OER can be easily revised and remixed ($M = 3.41$, $S.D. = 3.01$).

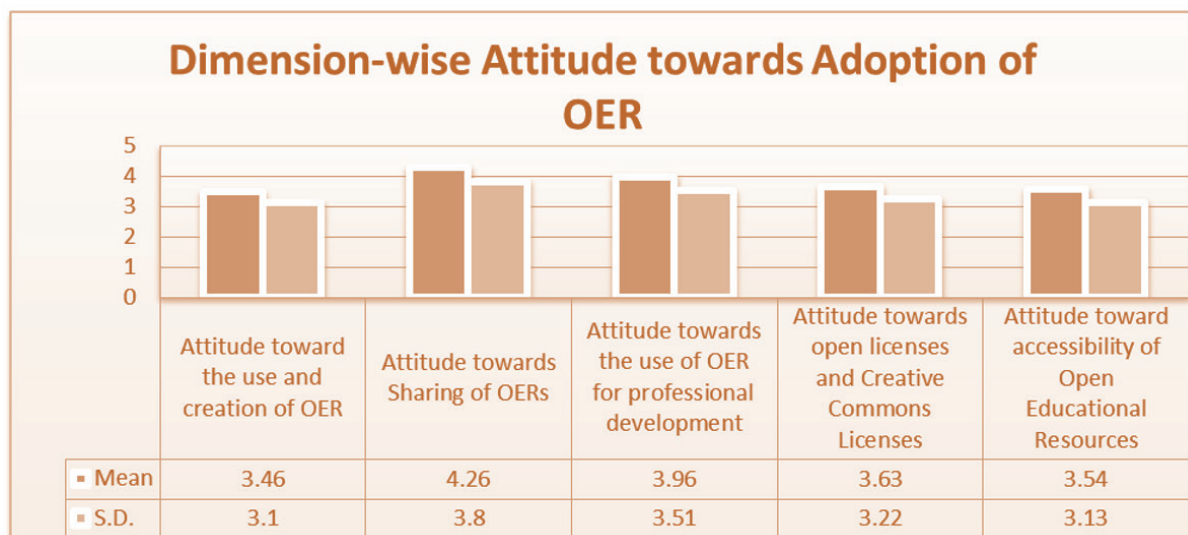
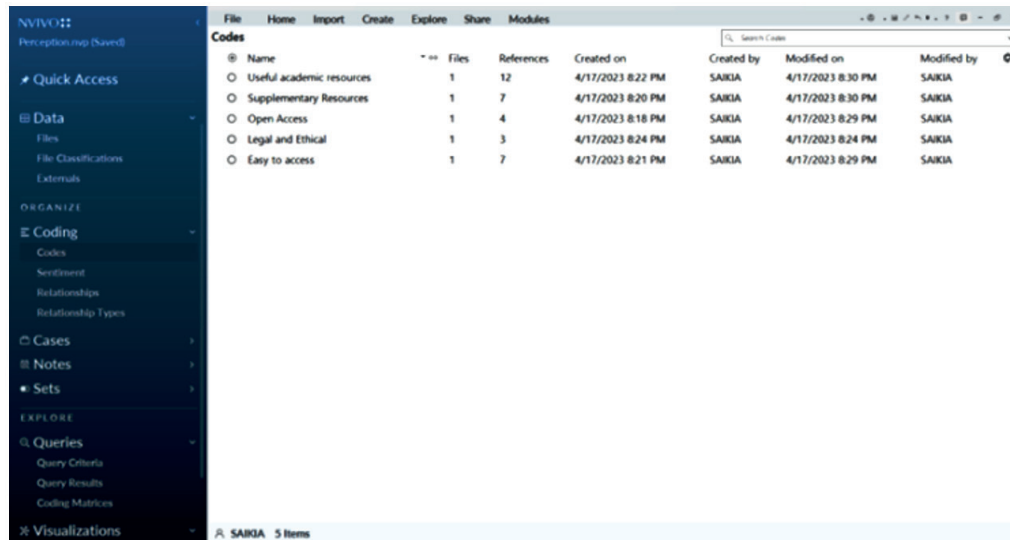


Figure 4. Summary of the overall Means and Standard Deviation of the dimensions of attitude towards the adoption of OER

Thematic Analysis

This section has explored the perspectives of OER users and creators regarding OER adoption in higher education. Using the NVivo software, the interviews have been evaluated. The analysis centred on the

overarching theme of perception, as well as several sub-codes derived from the transcribed data. A total of five categories (sub-codes) have been derived from the key concepts that surfaced. These are (a) useful academic resources (b) supplementary resources (c) open access (d) legal and ethical and (e) easy to access. Figure 5 shows how these codes helped us visualize the interviewees' (the OER users and OER creators) perspectives on the adoption of OER.



Name	Files	References	Created on	Created by	Modified on	Modified by
Useful academic resources	1	12	4/17/2023 8:22 PM	SAIKIA	4/17/2023 8:30 PM	SAIKIA
Supplementary Resources	1	7	4/17/2023 8:20 PM	SAIKIA	4/17/2023 8:30 PM	SAIKIA
Open Access	1	4	4/17/2023 8:18 PM	SAIKIA	4/17/2023 8:29 PM	SAIKIA
Legal and Ethical	1	3	4/17/2023 8:24 PM	SAIKIA	4/17/2023 8:24 PM	SAIKIA
Easy to access	1	7	4/17/2023 8:21 PM	SAIKIA	4/17/2023 8:29 PM	SAIKIA

Figure 5. Subcodes of the main theme “perception” (perception of OER users and creators)

The outputs from the NVivo software indicate that most interviewees had a relatively positive perception of the adoption of OER. Auto-coded sentiment analysis revealed how OER users and creators responded to the adoption of OERs in the higher education sector. This is apparent in Figure 6 below.

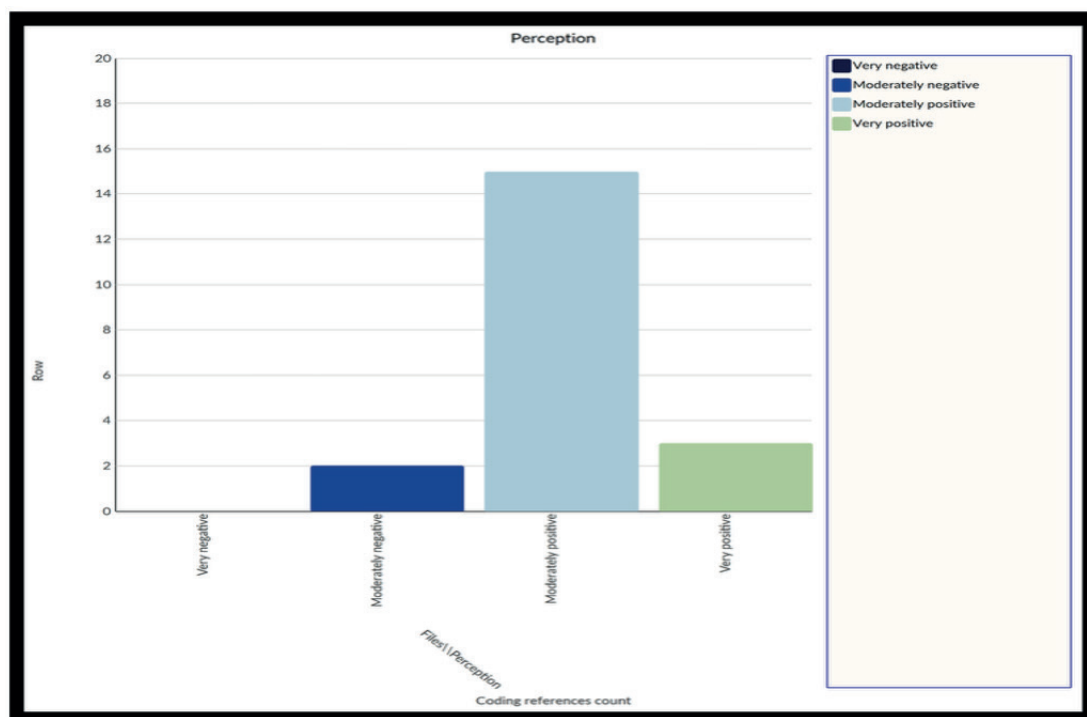


Figure 6. NVivo Auto-coding sentiment analysis of Coding Reference Graph of faculty members' (OER users and OER creators) responses towards OER adoption

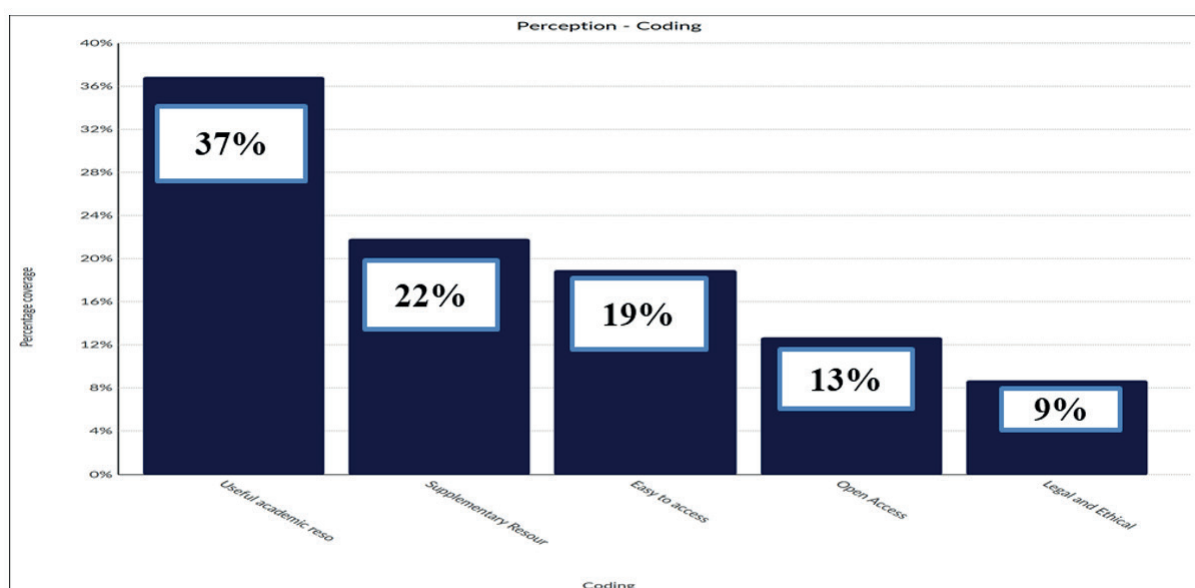


Figure 7. Percentage Coverage of the sub-codes emerged from the main theme “Perception”

A percentage summary of the perspectives of OER users and creators regarding the adoption of OER is presented in Figure 7. Following the results of the interviews, 37% of the participants held the opinion that OER is a valuable academic resource. Some of the remarks that provide support for this argument are as follows:

“In this age of technology, it is not very simple for everyone to gain access to hard print materials, and in the midst of this COVID pandemic, it is obvious that open educational resources are helpful in the teaching and learning process of the institution” (P9).

“Open educational resources are an excellent educational movement. The practice should be encouraged and recognized in the realm of higher education. A culture that encourages the sharing of resources should be present” (P11).

“Teachers have access to a valuable asset in the form of open educational resources. They offer a connection to a network of other professionals who have produced informative information in my area of concern” (P22).

Next, 22 % of interviewed faculty considered OER to be supplemental materials, as seen by their comments:

“I have benefited tremendously from Open educational resources, and I have utilized it by downloading materials and storing them in my repositories, reusing it, and adding it to the stock of study material that I bring to my classroom” (P2).

“If used as supplemental materials, I believe that open educational resources could be something that would make it easier for students to interact in the classroom. Because they are distributed under Creative Commons Licenses, these may be easily and are openly available. Furthermore, no authorization from anyone is required in order to modify them in any way” (P29).

Easy to access OER discovered as another emerging sub-code. 19% of the participants stated they envisioned OER adoption as a way to gain access to resources that were adaptable, flexible and easy to use. This has been addressed in a variety of cases:

“Open educational resources can be easily accessed through various online channels, making it convenient for both students and teachers to use” (P6).

“The idea of open educational resources can be accessed at any time and place. It is not necessary to physically go to a location in order to obtain access to the resources” (P10).

Less than one-fifth of respondents (13%) viewed OER as open access which is openly available in online format. As some of the faculty members commented that-

“Open educational resources are any resources that can be found on a website and that have been made available on the internet for open access” (P1).

“Open educational resources are resources prepared learners. Anyone who wishes to access the materials can utilize them for teaching which is free and open access, as they are protected by Creative Commons License” (P26).

Further, just 9% of interviewed faculty advocated OER adoption because they believe it is legally and ethically acceptable. This is supported by comments like:

“It is a unique opportunity that legally and ethically allows us to adapt other’s resources” (P13).

“When it comes to asking permission to use content protected by intellectual property rights, I find the process rather awkward. In this regard, creative commons and open educational resources have been of great assistance to me in that they enable me to freely, openly, and lawfully adapt the work of others” (P15).

DISCUSSIONS AND CONCLUSION

This research study intends to gauge faculty members’ attitudes toward the adoption of OER in higher educational institutes in North-East India. The descriptive statistics revealed that nearly half of the faculty members (49%) showed a moderate level of attitude towards the adoption of OER. Complementing these quantitative findings, qualitative insights suggest that faculty members harbour a moderately positive outlook regarding OER adoption. They view OER as valuable supplementary academic resources that are readily accessible and openly available, all while adhering to legal and ethical standards. To give a full picture of how faculty perceive OER, Figure 8 is a joint display table that combines quantitative and qualitative results:



Figure 8. Joint Display Table Presenting Quantitative and Qualitative Results

These findings are consistent with prior research suggesting a generally positive stance towards OER adoption (Zaidi, Amir and Bhatia, 2022; Magro and Tabaei, 2019; Madiba, 2018; Mukhopadhyay, Chander and Kumar, 2018). Conversely, it is important to note that there have been very few studies in the literature that have found faculty members to be hostile towards OER use and creation (Akter and Mahbub, 2020). Given that the majority of faculty members' were moderately impressed with the adoption of OER, this could be due to the increasing recognition of the importance of ICT and OER in today's higher education. The use of OER is particularly crucial in response to the challenges presented by the COVID-19 pandemic since it provides an alternative to physical printed resources that may be inaccessible during this era of widespread disease. This came to light through the analysis of qualitative data as well. Supplemental educational resources beyond textbooks are in high demand these days as an avenue for faculty to meet the growing need for instructional support and customizing the content to meet the specific needs of their pupils (Tang, Lin and Qian, 2021).

Furthermore, both quantitative and qualitative findings highlighted OER's role in career advancement and professional networking. OER enables faculty to collaborate and network with other professors or subject matter experts to create excellent materials, leading to academic and professional growth (Joshith and Ashalatha, 2019; Kiran, 2017). They see OER as a 'resource hub or platform' that would allow them to progress professionally (Pande, Singh, Intaratat and Mythili, 2019). OERs provide faculty with a real-world platform to reflect on and improve their teaching methods, create and refine course materials, that encourage a spirit of shared responsibility, and empower themselves professionally (Jose, 2022). It is worth mentioning that when new materials are designated as OER with a focus on varied communities' languages and cultures, it aids faculty in gaining global recognition and establishing a reputable standing for their work (Kumar, Baishya, & Deka, 2021; Mishra & Singh, 2017). Faculty view OER as positively impacting student engagement in the classroom, as well as increasing inclusivity and diversity in the learning environment (McGreal, 2017). It is believed that OER can augment student involvement in the classroom by incorporating digital resources with traditional instructional materials (Tang, 2020).

Faculty members' moderate stance on OER could be explained, by their belief that these materials belong to the public domain and should be made available to all students (Verschraegen and Schiltz, 2007; Tosato, Arranz and Rubia Avi, 2014); emphasizing the importance of sharing knowledge and resources as a shared public knowledge (Yu, Hu, Li and Xiao, 2022). The faculty members firmly believed that the act of sharing resources is a crucial aspect of both teaching and learning, as well as the creation of new resources and the exchange of those resources with others. Torres, Boaron and Kowalski (2017), Cronin (2017), and Santosh (2017) highlighted how sharing OER provides a varied range of knowledge acquisition opportunities and aids them in acquiring new skills and refining existing knowledge (Kim, 2018). Most faculty believe that the academic community should step up and ensure that all students have equal free and open access to educational resources (Krelja Kurelovic, 2016). Faculty stated that they have grown professionally through engaging with and contributing to OER, as it supports them in improving their content knowledge and pedagogical skills. Likewise, Murphy and Wolfenden (2013) and Kanwar, Kodhandaraman and Umar (2010) highlighted OER as a promising 'learning platform', that can enhance the quality of teachers by encouraging pedagogical change (as cited in Cobb, 2018).

While most faculty have a moderate attitude on whether using OER is more beneficial than traditional textbooks, previous research supports the idea that OER is a viable alternative to expensive textbooks for teachers (Jung, Bauer, and Heaps, 2017; Tang and Bao, 2022). Faculty members' moderate attitude towards the adoption of OER might be attributed to the flexibility it offers them in adapting and customizing materials to align with their pedagogical aims and requirements. This aspect has also been addressed in the qualitative data, indicating that the Creative Commons license allows for the reuse of content in a way that is acceptable from a moral and legal standpoint, as well as flexibility and adaption of resources to meet the demands of the intended audience, corroborating the research findings of Lantrip and Ray (2021), Fischer, et al. (2020) and Coleman-Prisco (2017). Based on the 5R's (retain, reuse, revise, remix, redistribute), OER offers teachers greater flexibility in customizing the content to meet the needs of individual students than traditional textbooks (Delimont, Turtle, Bennett, Adhikari, and Lindshield, 2016). On top of that, Nagashima and Hrach (2021) discovered that teachers perceived the adoption of OER as a catalyst for improving their instructional strategies, as it grants them autonomy over the materials and the ability to personalize them.

In conclusion, over the past two decades, the OER movement has experienced substantial growth with a multitude of initiatives and organizations dedicated to its advancement and dissemination. Consequently, the adoption and approval of OER have emerged as an important milestone in the realm of higher education. The present trend of transitioning towards OER adoption has been sparked by the recognition of OER's potential to address important issues such as rising textbook prices, limited access to educational materials, and the need for innovative pedagogical approaches. As a result of this evolution, education may become more inclusive, accessible, and flexible to suit the requirements of both faculty and students (UNESCO, 2019; McGreal, 2017; Kanwar and Mishra, 2018). However, the effective adoption of OER in the higher education system depends upon understanding and addressing the attitudes of faculty members, administrators, policymakers, and universities towards these resources. The present research has ascertained that a significant proportion exhibit a moderate attitude toward the adoption of OER. This has yielded optimistic results, indicating that a great number of faculty have expressed a positive outlook on the adoption of OER in the near future.

RECOMMENDATIONS

For Decision-Makers and Policy-Makers

1. Ensure that universities and academics have the resources they need to successfully adopt OER by establishing clear policies at the national and institutional levels.
2. Take proactive steps to improve the necessary infrastructure and internet service accessibility and this would require a coordinated effort of all stakeholders to identify and address the underlying factors that contribute to poor internet connectivity, such as inadequate bandwidth, outdated equipment, and limited coverage.
3. Provide funding and infrastructure to establish fully equipped recording studios and Educational Multimedia Research Centres (EMRCs) within academic institutions. These facilities will enhance the creation, curation, and distribution of high-quality OER materials. Setting up such infrastructural facilities ought to be considered as a standard structure of educational institutions.
4. Provide financial aid and incentives, such as certificates, National OER awards (similar to National ICT awards for school teachers by the MoE in India) and public recognition, to encourage universities and individuals to contribute to OER creation.

For Academics

1. Need to participate in professional development programs that aim to improve faculty digital competence and in specialized teacher training programs focusing on copyright and open licensing to address faculty concerns related to these matters.
2. Encouraged them to contribute their knowledge to repositories and facilitate international collaboration with other institutions and OER advocacy groups to raise awareness about OER and exchange successful OER strategies.

For Researchers

1. Conduct research to investigate the involvement of educational administrators and librarians in the implementation of OER, as well as the factors that impede or facilitate the integration of OER within academic institutions.
2. Study the long-term effect of OER on teaching-learning environments at different educational levels and fields of study and in developing the professional skills of faculty members.

For OER Creators

1. Prioritize the creation of OER with a focus on quality, use, and adaptability to meet the diverse needs of the learners and academics of various disciplines.
2. Ensure that OERs continue to be a valuable resource for teaching and learning, by incorporating feedback mechanisms from faculty as well as learners to improve the usability, accessibility, and relevance of these materials.

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A GAMIFIED DIGITAL FRAMEWORK IN HIGHER EDUCATION: IMPACT ON LEARNING AND MOTIVATION

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ABSTRACT

The use of gamified digital tools has become a key and dynamic component in the work of educators, playing a crucial role in shaping various educational tasks. These tools offer a more playful, effective, and interactive learning experience aimed at increasing student motivation and providing immediate feedback. Based on these principles, this study proposes to analyze the improvement in student learning and motivation following the application of a didactic experience using gamified digital resources (Nearpod, Genially, Educaplay, Breakout, and Quizizz) in an online university classroom. The implementation was carried out over a five-month period with pre-service teachers (n=147) from the Bachelor's Degree in Early Childhood and Primary Education and the Master's Degree in Secondary Education and Teacher Training at a private Spanish university. A pre-experimental design with pre- and post-intervention measurements was employed. The research results demonstrate that the use of these gamified digital resources enhances students' perceptions of music learning in an online university environment. The findings reveal a positive impact across all evaluated areas following the didactic intervention, with significant improvements ranging from perceptible to moderate in university students' perceptions of learning and motivation. Therefore, the study's findings have practical educational implications, highlighting the appropriateness of using these digital resources not only in music courses but also in other subjects within the curriculum, promoting active learning in the classroom.

Keywords: Gamification, higher education, digital tools, online learning, motivation, music education.

INTRODUCTION

The use of Information and Communication Technologies (ICT) has had a significant impact on all spheres of life—social, political, and economic—over recent years. Naturally, it has also influenced the academic world and the way we currently learn and teach. The use of ICT in education has fundamentally altered the traditional concept of the classroom and its key figures, the teacher and the student (Abendan et al.,

2023; Alnasib, 2023). In this regard, education is immersed in processes of change and innovation, aimed at addressing the needs of 21st-century society. As a result, nearly all countries have implemented extensive reforms in their educational systems, striving to strengthen the synergy between school and society. The challenges posed by the knowledge society require teachers to incorporate new didactic strategies into the teaching-learning processes (Anaktototy, 2023; Angelova & Nikolova, 2024).

Similarly, with the integration of Spanish universities into the European Higher Education Area (EHEA), there is an undeniable need to develop teaching approaches that foster innovation, quality, and the continuous improvement of educational practices. For several decades, educational innovation has been an integral part of institutional policies within universities. Training future educators is a crucial link in aligning teaching practices with these changes and implementing new didactic strategies that adapt to this evolving context. In response to this need, various authors (Basilotta et al., 2022; Deroncel-Acosta et al., 2023) have proposed innovative alternatives for educational settings that aim to transform the learning process through active methodologies. One such approach is gamification, which involves the use of games elements (mechanics, dynamics, and components) in non-game contexts to support learning processes, allowing students to learn through them (Hayak & Avidov-Ungar, 2023; Lei et al., 2022). Gamification has demonstrated to have a positive impact on users' behavior (Anagnostopolou et al., 2018; Koivisto & Hamari, 2019), making students more autonomous, competent and motivated (Sailer et al., 2017). The playful process gamification implies has long been one of the most effective ways to teach and learn (Nadeem et al., 2023).

In this context, we highlight the work and research of several scholars (Kleimola & Leppisaari, 2022; Mojarro, 2019; Mokhtari et al., 2021; Okai-Ugbaje et al., 2022) among others, who argue that significant changes are needed in higher education institutions. Specifically, learner-centered methods must take precedence in order to significantly improve both students' skills and teachers' ability to create a rich and constructive learning environment. This shift encourages student learning through new educational trends that integrate innovative experiences into teaching-learning processes supported by ICT, providing opportunities for students to engage in the process, promoting meaningful learning, autonomy, and metacognitive self-assessment skills. In this model, the teacher becomes a mediator and facilitator of learning environments and experiences, with an emphasis on changes in teaching strategies and the use of new materials that incorporate active and participatory methodologies.

For all these reasons, we contend that the fusion of ICT and gamification in education has undoubtedly opened up significant opportunities for improving teaching-learning processes. Playful processes in the classroom have always been one of the most effective ways to teach and learn, as joyful learning experiences with appropriate didactic parameters can increase students' satisfaction and motivation toward their studies. Numerous studies and research focused on this topic (Torrado & Diaz, 2022; Dahalan et al., 2023; De Carvalho & Coelho, 2022; Ishak, 2023; Wang et al., 2021) emphasize that the adoption of digital educational games, as explored in this work, represents an innovative didactic experience. It offers both students and teachers a different educational practice, promoting digital literacy, participation, and access to information. These competencies enable learning to be not only content-based but also experiential (Greipl et al., 2020; Rodriguez et al., 2023; Saleem et al., 2022).

Likewise, the academic community has increasingly recognized the importance of linking technology with education and has begun to appreciate the potential of gamification to enhance motivation, improve group dynamics, foster reflective thinking, and facilitate meaningful learning in students (Jaaska & Aaltonen, 2022; Wang, 2023; Yanuarta et al., 2023). Among the advantages observed, students show greater interest and improved performance in the subject when this technique is employed, as it stimulates the desire to learn by creating a fun and dynamic classroom environment. Consequently, this study presents a novel educational experience in online higher education by implementing gamified digital learning as a means of instruction and training in musical content, using digital tools such as Nearpod, Genially, Educaplay, Quizizz, and Breakout. The use and practical application of these digital resources aim to enhance and support music teaching-learning processes, demonstrating that these applications can be highly useful in the educational field for driving the methodological renewal that students are calling for (Burton, 2019; Carrion & Roblizo, 2022; Hakami, 2020; Marievyeh et al., 2022).

As we can observe, gamification is an active methodology with great potential that promotes learning and serves as a source of motivation for students. As argued by Khaldi et al. (2023) and Zou et al. (2021), it is a perfect way to breathe life into course content and give students a sense of purpose both in and outside the classroom. In light of the aforementioned points, it is important to add that teachers who employ gamification and ICT in the classroom must also become developers of educational games, general video game developers, and therefore understand their functionality (Maspul, 2024; Mat Dangi et al., 2022). Indeed, as Muammar et al. (2023) and Murillo et al. (2021) suggest, teachers are the main driving force in the application of games in the classroom, serving as promoters, designers, and creators.

Based on the discussion above, we propose the following research question: Can the use of gamified digital resources improve students' motivation and perception of learning music in an online university context? Little research has been conducted on students' perception of their own learning and motivation when being instructed with gamified resources. Chaves-Yuste (2023) conducted a study to analyze students' perception about gamification, with both digital and analogical resources that addressed different issues involved in the didactic intervention. The learning process was one of the issues tackled. This study pinpointed that students felt they learned the curriculum content very successfully while developing their academic interest. Fithriani (2021) argued that university students perceived that learning through mobile-assisted gamification improved their learning outcomes significantly. They also reported being more motivated when using gamified resources to revise content rather than conventional resources. However, these studies focus on English as a foreign language learning and on face-to-face educational contexts. Serrano and Casanova (2022) conducted a longitudinal study in which digital gamified resources were employed to teach music in face-to-face university teaching. Students felt that learning was more personalized, which worked in favor of socio-affective and emotional aspects with positive impact on their learning outcomes, feeling that their learning experience was more inclusive and helped them overcome their learning difficulties. In this regard, Carrion and Roblizo (2022) conducted a study to evaluate the extent to which gamification tools and multimedia resources, such as Cuadernia, Kahoot, Quizizz, and Socrative, can function as learning strategies aimed at improving academic performance, participation, and motivation among future educators in music courses within the context of higher education. The results demonstrated that adequate teacher training in the pedagogical use of ICT can lead to positive educational outcomes, provided that these tools are employed effectively. Similarly, Gomes et al. (2014) highlighted the study *Musical Journey*, an immersive educational experience that leverages a gamified virtual environment to teach music history. The platform recreates various aesthetic periods and musical styles, allowing students to visually and aurally explore the sounds, instruments, and composers representative of each era. By incorporating gamification elements such as rewards, missions, and interactive challenges, the environment seeks to stimulate curiosity, enhance motivation, and maintain students' engagement throughout the learning process. This resource not only offers a more dynamic and participatory approach to studying music but also fosters autonomous and collaborative learning through activities that simulate historical musical discoveries. Finally, Wang (2023) investigates how gamification can enhance learning through the design and use of educational musical games tailored for both adult and young learners. The study examines the effectiveness of these games in terms of motivation, content retention, and the development of musical skills. The findings reveal that gamified resources significantly improve the learning experience by promoting active participation, autonomous learning, and collaborative interaction.

Our main contribution is to analyze whether the implementation of an active methodology based on activities and games supported by technological tools enhances student learning and motivation in various music subjects within an online university context. The article is structured as follows: the following section describes the research model used in this study, as well as an explanation of all the technological tools implemented—Nearpod, Genially, Educaplay, Quizizz, and Breakout. Later on, we will show the results obtained after applying a statistic analysis of the collected data. Then, we will discuss these results and finally, the implications of the findings are discussed, and conclusions and future research directions are drawn.

METHOD

Objetives and Hypotheses

This study aims to contribute to the scientific literature on the use of digital resources in university teaching. The objective is to analyze the improvement in student learning and motivation following the application of a didactic experience involving digital resources (Nearpod, Genially, Educaplay, Breakout, and Quizizz) in an online university classroom. Current research (Pineda et al., 2023; Weisberg et al., 2022; Wilkins et al., 2023; Zhao et al., 2022) has indicated improvements and demonstrated that these tools can effectively promote student participation, interaction, and learning when applied to higher education subjects, both in face-to-face settings (Cabrera-Solano et al., 2022; Erkinovna, 2024; Mohamed & Yousif, 2022) and online environments (Carrion, 2022; De La Pena et al., 2021; Lampropoulos & Sidiropoulos, 2024). In this regard, within the context of online education, the following questions are raised: after the didactic intervention using several digital tools, does the students' perception of their learning improve? And does their level of motivation increase after the intervention?

The proposed objectives (O) in response to these questions are as follows:

- O1. To analyze students' perceptions of learning before and after the didactic experience.
- O2. To examine students' perceptions of motivation before and after the didactic experience.

Based on the objectives, questions, and scientific literature, the following hypotheses are formulated:

- H0: The use of gamified digital resources does not improve students' perceptions of their learning and motivation in an online university classroom.
- H1: The use of gamified digital resources improves students' perceptions of their learning in an online university classroom.
- H2: The use of gamified digital resources improves students' perceptions of their motivation in an online university classroom.

Design

The methodological approach of this research is quantitative, employing a pre-experimental design with two measurements: one before the didactic intervention with digital resources (PRE) and one after the intervention (POST). The graphical representation or nomenclature of this design is as follows: *G O1 A O2*, where *G* represents the group of participants, *O1* the PRE-test measurement, *A* the didactic intervention, and *O2* the POST-test measurement. This design employs a single group of participants selected through non-random sampling, meaning that not all participants share the same initial conditions. Consequently, the group functions as the experimental group, with no control group for comparison. These factors could pose questions regarding the internal validity of the study. Thus, to address potential concerns about internal validity, two measures were adopted. First, variables such as gender, age, and academic degree were controlled. Second, both PRE-test and POST-test measures were utilized to provide a baseline reference for the group's learning and motivation levels prior to the didactic intervention.

There is only one group of students, who undergo the didactic intervention over the course of four online pedagogical practices from February to June in the 2023-2024 academic year. In February, the PRE questionnaire, along with the informed consent form, is administered via Google Forms. From February to June, the didactic intervention is implemented in the online classes using digital resources (Nearpod, Genially, Educaplay, Breakout, and Quizizz). At the end of June, the same Google Forms questionnaire is administered again. This questionnaire aims to assess and analyze whether there is an improvement in students' learning and motivation following the didactic experience with digital resources in an online university context. The POST questionnaire is also administered via Google Forms. Both the PRE and POST questionnaires are identical to avoid bias and to allow for comparison of the results. Additionally, gender, age, and academic degree are controlled variables in this research to avoid biases in the obtained results. Below, in Figure 1, a graphical representation of the steps of the research can be observed:

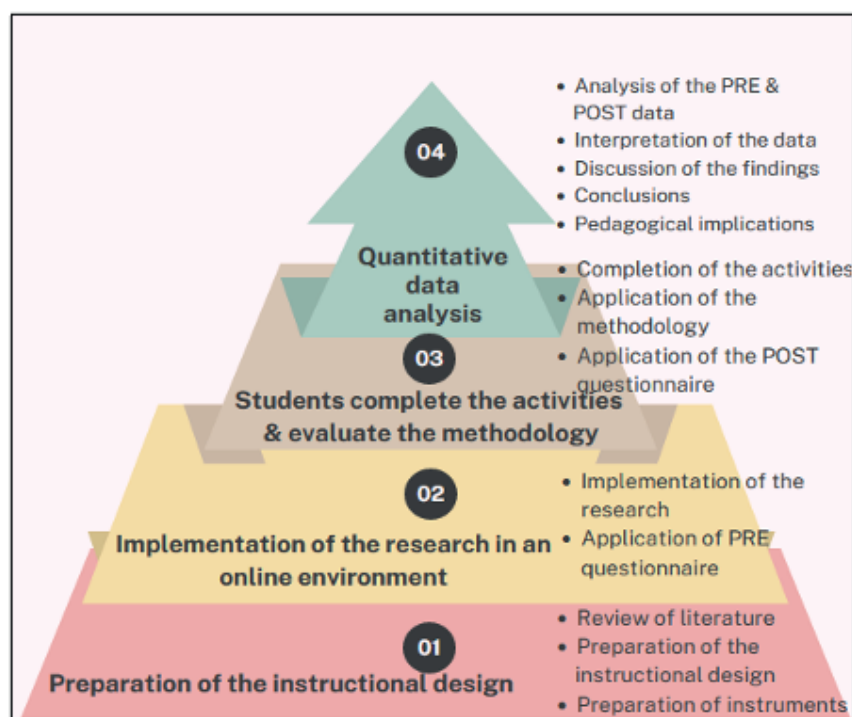


Figure 1. The steps of the research process.

Participants

The initial sample for the PRE questionnaire consists of 168 students, but 21 students are excluded due to missing attendance at some sessions of the intervention. Thus, the final sample comprises 147 students (79% female, 21% male), enrolled in the Bachelor's Degree in Early Childhood and Primary Education, and the Master's in Secondary Education and Teacher Training at an online private university. The subjects in which these digital materials were implemented include Didactics of Musical Expression as a core course in the Bachelor's program, and Music Education as an elective subject in the Master's program. The age distribution of participants is as follows: 41% are between 20 and 30 years old, 31% between 30 and 40, 25% between 40 and 50, and 3% are over 50. Regarding the academic degree distribution, 25% are in the Early Childhood Education degree, 49% in the Primary Education degree, 19% are specializing in Music Education, and 7% are enrolled in the Master's in Secondary Education and Teacher Training. Table 1 presents the distribution of the sample according to age, gender, and academic degree.

Table 1. Sample Distribution Count

	Early Childhood		Primary		Music		Master	
	Male	Female	Male	Female	Male	Female	Male	Female
20-30 years old	4	17	7	21	3	7	0	1
30-40 years old	0	8	5	18	2	6	4	3
40-50 years old	13	7	1	20	4	2	0	1
+50 years old	0	0	0	0	4	4	1	1

All students have Spanish as their mother tongue, and 93% regularly use digital tools for their studies. The sample was selected through non-probabilistic convenience sampling. This approach was used to include students enrolled in the Didactics of Musical Expression course at a private online university who voluntarily agreed to participate, leveraging their accessibility and proximity to the researchers. Inclusion criteria

included attending all sessions of the didactic intervention (including the initial and final questionnaire sessions), providing informed consent, and having no diagnosis of neurological or psychopathological issues. All participants were informed about the study and had to provide consent to participate. Any student was free to withdraw from the didactic intervention at any time. Additionally, all responses were individual and anonymous. The consent process and the research followed the guidelines of the Declaration of Helsinki. The research design and questionnaire were submitted to and approved by the Ethics Committee of the University of the Atlantico Medio (Spain) with the code N.º CEI/01-012.

Research Design

This educational innovation proposal is grounded in the use of gamification using Nearpod, Genially, Educaplay, Quizizz, and Breakout—offering a new approach to university learning contexts by turning learning into a real, dynamic, and meaningful experience. In this sense, we align with the views of numerous authors who justify the benefits of applying digital resources using gamification as a valuable methodology for increasing students' interest, motivation and participation (Dahalan et al., 2023; Subhash & Cudney, 2018).

Below is a description and explanation of the following didactic intervention and proposal, which allows students to work on the music-related content set by the university curriculum. The teaching method employed was a motivational and active approach in which students were involved at all times, enabling them to improve their motivation for learning while the teacher acted as a guide or facilitator throughout the process.

1st and 2nd Workshops: Nearpod Activities

During the first and second workshops, each lasting one hour, we used the Nearpod application, an online platform that supports student concentration and participation by serving as a digital tool for collaborative learning (Armas et al., 2023; Sanmugam et al., 2019). Nearpod offers two usage options: synchronous or asynchronous learning, allowing students to either participate live or student-paced. In our case, we primarily utilized the participate live option, which required each student to have a mobile device and the teacher a tablet or computer. The teacher initiated the lesson presentation by creating a session code, which the students used to join the class. Once all were present, the teacher progressed through the slides, giving students time to respond to the questions posed. The teacher could monitor the students' progress in real-time, identifying activities that required further explanation. The asynchronous option or student-paced was also offered to the students. A code valid for a specific period is shared via email or Google Classroom, enabling students to access the materials asynchronously.

The activities created with Nearpod were varied. The following is an example of one of the musical activities designed and implemented in the classroom using the Nearpod application during these two practical workshops, which can be found at the following web link:

https://app.nearpod.com/?pin=62CADA4BC6AD461766895AD947625B23-1&oc=user-created&utm_source=link

The first activity was a quiz consisting of a multiple-choice test with three questions about the musical language content covered in class. In this case, the video option was used, allowing YouTube or custom videos to be attached, as was done here, and multiple-choice questions were added. This activity aimed to work on active listening, visually and auditorily, to foster student interest and meaningful learning.

The second game involves an activity in which students must complete blank spaces by inserting words or text. This game is an excellent alternative for reflection at the end of class or for assessing prior knowledge at the beginning. In this case, the activity aims to reinforce and work on musical alterations, such as sharp, flat, and natural signs.

The third game, titled “Time to Climb,” (please, see below in Figure 2) is a quiz-based game that takes the form of a survey with questions. Each correct answer allows the player to climb the mountain, competing with other participants. This game consists of six questions on musical language, designed to review and reinforce key concepts such as clefs, American notation, musical notes, time signatures, bar lines, and repeat signs, among others.

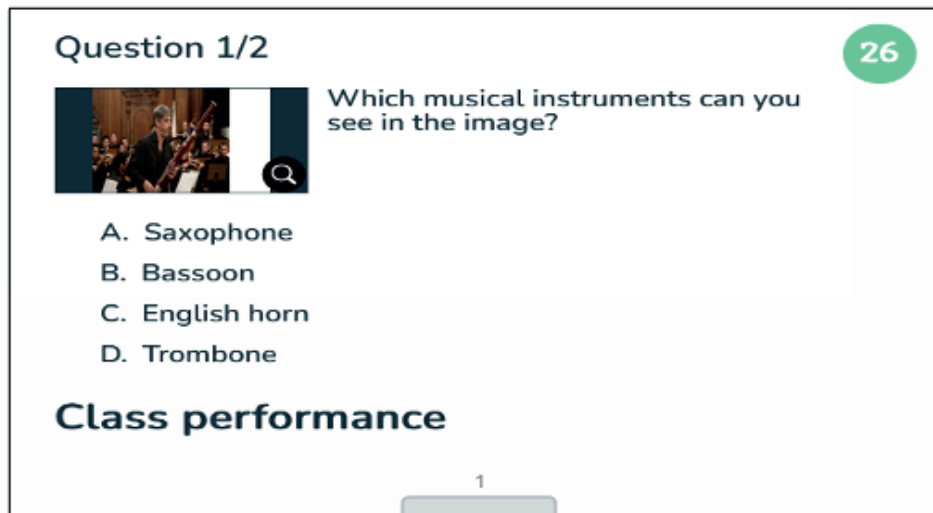


Figure 2. Time to Climb. Question 1. (Own creation)

The fourth type of game consists of a video, with open-ended, questions to enable students to develop their responses, promoting analysis and meaningful learning. This activity focuses on auditory skills and active listening, reviewing and discussing aspects of music history.

The fifth type of game comprises open questions that students can respond via audio, video, or text. In this case, using an image of a musical score, students are asked to identify important aspects of musical language, such as note values, their types and durations, and the time signature shown in the score. Additionally, students are prompted to reflect on how they might modify the tone of the given song.

3rd Workshop: Genially and Educaplay Activities

During the third workshop, two quizzes were created using the Genially application (see an example of one of the quizzes in Figure 3), an online tool that facilitates the easy and rapid creation of all types of visual and interactive content, whether for individual or collaborative use (Dominguez Parrales, 2024; Tapia-Machuca et al., 2020). These games included quizzes that featured interactivity, predefined animations, and sound effects, enabling students to apply and practice the musical language concepts they had learned. In this case, the two digital games were structured as cooperative group activities to review, reinforce, and assess knowledge in the relevant subjects. A time limit of twenty minutes was set for completing each Genially activity, and the instructor supervised the entire process to ensure the task's completion within the allotted time.



Figure 3. Quizizz. Teaching & Music (<https://view.genially.com/66ab6b49bac8d52d3d73bcc0>)

To conclude the third workshop, students participated in a digital game created using the Educaplay application (see Figure 4), with a time limit of ten minutes to view and complete the activity. Throughout the process, the instructor managed the time and supervised the entire task.

Educaplay is a multimedia tool that allows educators to design, develop, implement, and track online learning activities grounded in gamification principles, such as crosswords, word searches, interactive maps, dictations, quizzes, word wheels, matching exercises, and classification and sequencing tasks, among others (Garcia-Martin & Garcia-Martin, 2020). In our case, we used it to present a video with interactive questions that addressed key concepts related to creativity, neuroeducation, and musical creativity, making it an optimal tool for implementation in higher Music Education, fostering active and meaningful learning in students.



Figure 4. Educaplay. Creativity and Neuroeducation. (https://es.educaplay.com/recursos-educativos/18317506-creatividad_y_neuroeducacion.html)

4th Workshop: Breakout and Quizizz Activities

To conclude this instructional experience, during the final workshop, students engaged in a digital Breakout activity using the Genially application, titled “*Protecting the Planet: Learning Music.*” This online game was designed to collectively address musical content through Education for Sustainable Development (ESD). According to various authors (Makri et al., 2021; Moreno-Rodriguez et al., 2023), a breakout’s goal unlock a box secured by locks, inside of which is a reward, after overcoming a series of challenges. In order to obtain the codes to unlock these locks, students must solve problems, answer quizzes, and decipher riddles. The use of this gamified tool in the classroom allows students to: (a) adapt to any curricular content, (b) promote collaboration and teamwork, (c) develop critical thinking and problem-solving skills, (d) improve communicative competence, (e) face challenges that require perseverance, (f) build deductive reasoning, (g) learn to work under pressure, (h) become the protagonists of their own learning, and enjoy a playful component that increases motivation (Fuentes, 2019; Kwong et al., 2022).

In this digital gamified Breakout (see Figure 5), participants faced the narrative of overcoming a series of challenges and missions to unlock locks while learning and reviewing various musical topics. As they successfully completed the assigned challenges in this engaging and meaningful gamified resource, they contributed to planet protection while enhancing the students’ understanding of the seventeen Sustainable Development Goals (SDGs). The activity was designed as a group dynamic to be carried out during a practical session of the course, with a 40-minute time limit for resolving the challenges. The instructor managed the time and supervised the entire process, with students taking on the active role of protagonists in the learning experience.



Figure 5. Breakhout. Protecting the planet: Learning with music. (<https://view.genially.com/66ac01462ed9f7df92501ab8>)

To conclude this fourth workshop, students participated in a digital game using the Quizizz application (see Figure 6). Quizizz is a multiplayer quiz game similar to Kahoot, characterized by active pedagogy under the motto: *Teach with fun, have fun teaching*. This tool allows teachers to create a question-and-answer contest for playful education. The instructor generates the questions, and students access a webpage where they enter a code or PIN that gives them access to the quiz. They input this code using their mobile devices or tablets and register under their chosen alias, which then appears on the screen. Once inside, students answer the questions using their mobile devices as if they were game controllers. Their screens display three colors, each corresponding to a possible answer. The idea is to learn musical content through playing. This social and gamified educational web service rewards progress by granting higher scores to those who answer correctly and more quickly, placing them at the top of the leaderboard (Carrion, 2022; Jones et al., 2018).

This game offers students an interactive way to engage with and review course material, making learning both enjoyable and competitive, thus promoting deeper engagement with musical education.

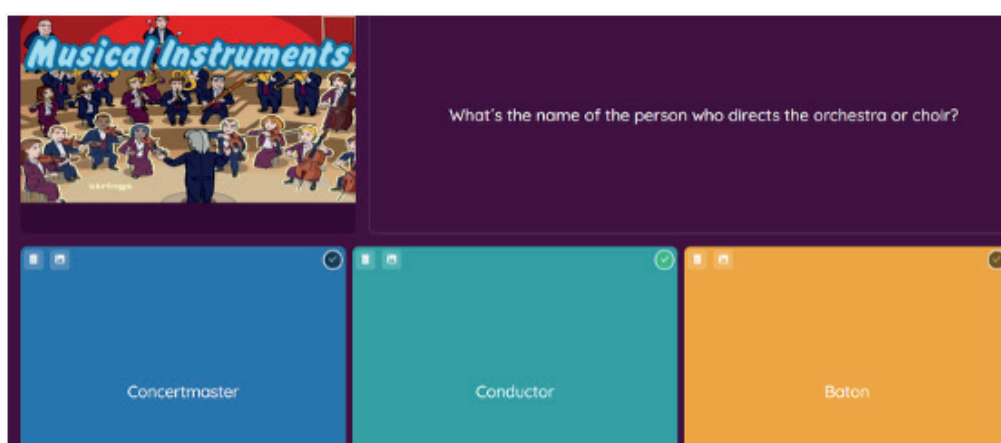


Figure 6. Quiz. The Concert: The instruments of the orchestra. (https://quizizz.com/admin/quiz/6094f49927e67b001f0e58f3?source=quiz_share)

During the implementation of all these digital games in the classroom, it was observed how these applications motivate students from the outset, leading to more dynamic participation in class, such as asking more questions on the subject and offering more opinions during the discussions. In real-time classroom settings, the teacher gathers relevant information to tailor the progress of each student, fostering a positive disposition toward learning. Furthermore, through the various direct instruction sessions, continuous feedback on the students' development is provided, enabling the teacher to offer optimal educational support. At the conclusion of the intervention, a post-intervention questionnaire was administered to gather students' evaluations of the digital resources used.

Data Collection Instrument

Data was collected using both a pre-intervention and post-intervention questionnaire, designed to be identical.

Questionnaire

For this research, a questionnaire was designed and administered before (PRE) and after (POST) the instructional intervention. This questionnaire evaluates students' perceptions of their learning and motivation through the use of digital resources such as Breakout, Genially, Educaplay, Quizizz, and Nearpod during the lessons. The design of this questionnaire is based on scientific literature (Carrion et al., 2024), which employs similar questionnaires and justifies the improvement in learning perception and motivation using digital resources in higher education. The questionnaire developed by Carrion et al. (2024) was used as a foundation, with five additional items included.

The questionnaire consists of a 15-item Likert scale with responses ranging from 1 to 5, where 1 is strongly disagree, 2 is disagree, 3 is neither agree nor disagree, 4 is agree, and 5 is strongly agree. Students completed the questionnaire via Google Forms, accessible through a computer, tablet, or mobile device. The 15 questions are organized into two related categories:

- *Learning:* Items 2 (competence), 3 (non-memorized learning), 4 (different learning), 5 (unattainable objectives), 7 (realistic learning), 8 (improvement of learning), 9 (student-centered learning), 12 (autonomous learning), 13 (meaningful learning), 14 (knowledge), 15 (quality of learning).
- *Motivation:* Items 6 (motivation), 10 (participation), 11 (group work), and 16 (recommendation).

The reliability of the questionnaire, calculated using Cronbach's alpha and McDonald's omega, was found to be strong for both the PRE ($\alpha = .925$, $\Omega = .938$) and POST ($\alpha = .895$, $\Omega = .916$) questionnaires. Content validity was assessed by three education experts specialized in educational technology, with a good degree of agreement evaluated using the Kappa coefficient, yielding a value of .86.

Procedure and Data Analysis

Procedure

The procedure followed in this study was as follows: During the first class, students were informed about the research, the necessity of obtaining informed consent, the anonymity of the data, and their right to withdraw at any point. During this initial class, the PRE questionnaire was administered through a Google Forms link provided to the students. Subsequently, the instructional intervention took place over four practical workshops or sessions, each lasting one hour, using the following resources: In the first and second workshops, the Nearpod application was used. In the third workshop, various games created with Genially and Educaplay were implemented. Finally, in the fourth workshop, a Breakout activity and a review game using the Quizizz application were conducted.

All workshops were held across four practical sessions from February to June 2024. Upon completing the instructional intervention in June, the POST questionnaire was administered during the final online class through a Google Forms link provided to the students.

Data Analysis

To estimate the questionnaire results, it is essential to first evaluate the content validity and reliability of the questionnaire. Given that it is a Likert scale (ordinal data), the corresponding coefficients, in this case, Kappa and Alpha, were employed. The normality of each questionnaire item was then assessed using the Kolmogorov-Smirnov test, which indicated a significance ($p = 0.000$) below .05 for all items, confirming the assumption of non-normality. Consequently, non-parametric tests were applied to the data.

For the descriptive analysis, frequencies were used for each response option, and for the inferential PRE-POST analysis, the Wilcoxon Signed Rank Test (W) was employed. Effect size was measured using the biserial rank (95% Confidence Interval) and interpreted according to Coolican's (2009) classification of low, moderate, and high. To control for the effects of confounding variables that could bias the results, the effects of gender, age, and degree program on learning and motivation were examined. For gender, the Mann-Whitney U test was used, while for age and degree program, the Kruskal-Wallis H test was applied.

All analyses were conducted using SPSS version 27 (IBM, 2016) and R version 4.2 for effect size calculations (R Core Team, 2021). The significance level was set at $p = .05$.

FINDINGS

The results are presented in accordance with the research objectives and hypotheses.

O1. To Analyze The Perception of Learning Before and After The Instructional Experience

Figure 7 displays a comparison of the PRE and POST frequencies for each individual learning item. It is evident that the frequencies for responses 4 (agree) and 5 (strongly agree) increase across all POST items. Conversely, the frequencies for responses 1 (strongly disagree), 2 (disagree), and 3 (neither agree nor disagree) present in the PRE items decrease almost to the point of disappearing (remaining in only three items) in the POST items. This suggests that students are more inclined to agree with the perception of enhanced learning (significant, active, realistic, autonomous learning, with the acquisition of objectives, competencies, and knowledge) following the instructional intervention using digital resources (Nearpod, Genially, Educaplay, Breakout, and Quizizz) in the classroom.



Figure 7. Comparison of PRE-POST learning frequencies

As it can be observed in Table 1, the inferential analysis using the Wilcoxon Signed Rank Test (W) indicates that students perceive a significant improvement in all learning items after the use of Breakout, Genially, Educaplay, Quizizz, and Nearpod in the online classroom. Table 2 presents the number of positive, negative, and tie ranks, average ranks, sum of the ranks, W, significance level, and effect size. A statistically significant increase is observed in the POST questionnaire for all learning items, with a medium to low effect size. With this educational intervention approach, students feel more knowledgeable about the subject matter and more competent in using digital resources, perceiving their learning as more active, realistic, autonomous, and significant, allowing them to achieve objectives and become protagonists of a different, higher-quality learning experience. These results reject the null hypothesis (H₀) and support the alternative hypothesis

(H₁): The use of gamified digital resources enhances students' perception of learning in an online university classroom. Therefore, students perceive a positive improvement in their learning when digital resources such as Breakout, Genially, Educaplay, Quizizz, and Nearpod are used to explain course content.

Table 2. PRE-POST learning results

Variables		N	Average Rank	Rank Sum	W	p	Effect size
Competence	Negative ranks	19	35.18	668.50	3883	.000*	-.491
	Postivie ranks	53	36.97	1959.50			
Active learning	Ties	75			3956	.000*	-.424
	Negative ranks	39	45.09	1758.50			
	Postivie ranks	71	61.22	4346.50			
Different learning	Ties	37			2630	.009*	-.289
	Negative ranks	32	50.63	1620.00			
	Postivie ranks	63	46.67	2940.00			
Objetives	Ties				2611	.009*	-.288
	Negative ranks	39	47.00	1833.00			
Realistic learning	Postivie ranks	52	53.52	3318.00	2988	.003*	-.343
	Ties	46					
Learning improvement	Negative ranks	35	40.14	1405.00	2174	.030*	-.243
	Postivie ranks	57	50.40	2873.00			
Student-centered learning	Ties	55			3235	.001*	-.359
	Negative ranks	39	44.26	1726.00			
Autonomous learning	Postivie ranks	56	50.61	2834.00	3726	.000*	-.434
	Ties	52					
Meaningful learning	Negative ranks	35	44.40	1554.00	4174	.000*	-.457
	Postivie ranks	66	52.23	3297.00			
Knowledge	Ties	49			4675	.000*	-.535
	Negative ranks	26	41.61	1083.50			
Learning quality	Postivie ranks	61	44.99	2744.50	5580	.000*	-.636
	Ties	60					
	Negative ranks	19	40.95	778.00			
	Postivie ranks	73	47.95	3500.00			
	Ties	55					
	Negative ranks	28	46.11	1291.00			
	Postivie ranks	69	50.17	3462.00			
	Ties	50					
	Negative ranks	23	43.22	994.00			
	Postivie ranks	69	47.59	3284.00			
	Ties	54					

* $p < .05$

The analysis conducted to control for confounding variables in the learning items shows that there are no differences based on gender in either the PRE questionnaire ($n = 147$, $U = 1632.500$, $p = .431$) or the POST questionnaire ($n = 147$, $U = 1794.000$, $p = .985$). Similarly, there are no differences based on age in the PRE questionnaire ($n = 147$, $H = 751$, $p = .861$) or the POST questionnaire ($n = 147$, $H = 5236$, $p = .155$). No differences are observed based on academic degree in the PRE questionnaire ($n = 147$, $H = 5264$, $p = .153$) or the POST questionnaire ($n = 147$, $H = 2769$, $p = .429$). Therefore, gender, age, and academic degree do not generate significant differences that could influence the results regarding university students' perception of learning.

O2. To Examine The Perception of Motivation Before and After The Instructional Experience

Figure 8 shows a comparison of the PRE and POST frequencies for each motivation item. The frequencies for responses 4 (agree) and 5 (strongly agree) increase across all POST items. Response 1 (strongly disagree) is virtually non-existent in both the PRE and POST questionnaires, while response 2 (disagree) appears in three PRE items and two POST items. Response 3 (neither agree nor disagree) is also low in all PRE and POST items. Meanwhile, responses 4 (agree) and 5 (strongly agree) increase in frequency from the PRE to the POST questionnaire. This indicates that students are more inclined to agree with the perception of improved motivation (motivation, participation, teamwork, and recommendation) following the instructional intervention with digital resources (Breakout, Genially, Educaplay, Quizizz, and Nearpod) in the classroom.

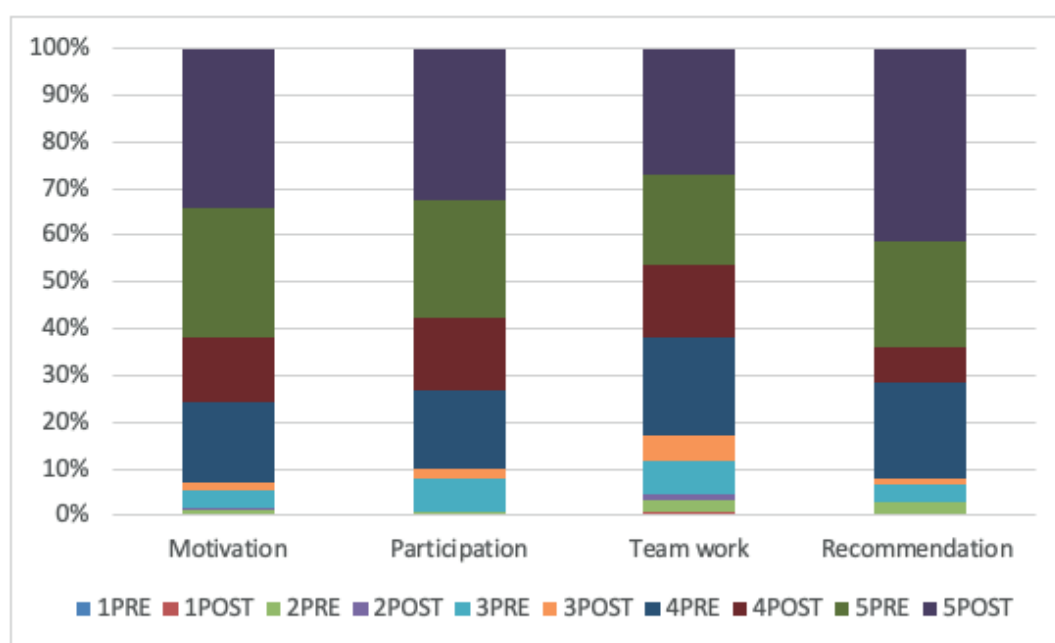


Figure 8. Comparison of PRE-POST motivation frequencies

The inferential analysis using the Wilcoxon Signed Rank Test (W) indicates that students perceive a significant improvement in all motivation items after the use of Nearpod, Genially, Educaplay, Breakout, and Quizizz in the online classroom. Table 3 presents the number of positive, negative, and tie ranks, average ranks, sum of the ranks, W, significance level, and effect size. A statistically significant increase is observed in the POST questionnaire for all motivation items, with a medium effect size. With this educational intervention approach, students feel more engaged and motivated in class, showing greater enthusiasm for participating in activities and group work. Moreover, they recommend this approach for other subjects in higher education. These results reject the null hypothesis (H_0) and support the alternative hypothesis (H_2): The use of gamified digital resources enhances students' perception of motivation in an online university classroom. Therefore, students perceive a positive improvement in their motivation when digital resources such as Nearpod, Genially, Educaplay, Breakout, and Quizizz are used to explain different content in music courses.

Table 3. Resultados PRE-POST en Motivación

Variables		N	Average Rank	Rank Sum	W	p	Effect size
Motivation	Negative ranks	28	37.29	1044.00	2498	.013*	-.305
	Postivie ranks	49	39.98	1959.00			
Participation	Ties	70			3144	.002*	-.361
	Negative ranks	32	40.88	1309.00			
	Postivie ranks	58	48.05	2787.00			
Team work	Ties	57			2141	.032*	-.249
	Negative ranks	35	45.91	1607.00			
	Postivie ranks	57	45.86	2671.00			
Recommendation	Ties	55			5799	.000*	-.692
	Negative ranks	14	38.36	537.00			
	Postivie ranks	69	42.74	2949.00			
	Ties	64					

* $p < .05$

The analysis conducted to control for confounding variables in the motivation items shows that there are no differences based on gender in either the PRE questionnaire ($n = 147$, $U = 1648.000$, $p = .469$) or the POST questionnaire ($n = 147$, $U = 1539.000$, $p = .195$). Similarly, no differences are observed based on age in the PRE questionnaire ($n = 147$, $H = 1571$, $p = .666$) or the POST questionnaire ($n = 147$, $H = 3797$, $p = .284$). No differences are observed based on academic degree in the PRE questionnaire ($n = 147$, $H = 7602$, $p = .055$) or the POST questionnaire ($n = 147$, $H = 7589$, $p = .055$). Therefore, gender, age, and academic degree do not generate significant differences that could influence the results regarding university students' perception of motivation.

DISCUSSIONS AND CONCLUSION

This study analyzes university students' perceptions of learning and motivation following a didactic intervention in an online classroom using digital resources such as Breakout, Genially, Educaplay, Quizizz, and Nearpod. The results show significantly positive perceptions of moderate magnitude after the didactic intervention, as reflected by the W test and the effect size. This rejects the null hypothesis (H_0) and confirms hypotheses 1 and 2 proposed in the study, validating that a didactic intervention using the aforementioned gamified digital resources positively enhances students' perceptions of their learning and motivation.

O1. To Analyze Perceptions of Learning Before and After The Didactic Experience

The results reflect a more positive perception of the quality of learning after the didactic intervention. Specifically, significant differences are found in the students' perceptions of all items related to learning in an online class. Students perceive that digital resources such as Nearpod, Genially, Educaplay, Breakout, and Quizizz positively enhance their level of competence and knowledge in music subjects, fostering a more active, realistic, autonomous, and meaningful learning process. These tools help to achieve previously unattainable goals with improved quality. This leads to the acceptance of hypothesis 1: "The use of gamified digital resources improves students' perceptions of their learning in an online university classroom." This finding aligns with other studies (Boom-Carcamo et al., 2024; Gironella, 2023; Lee et al., 2023; Mese & Dursun, 2019; Ozdamli & Yazdeen, 2021), which also support that the use of digital resources enhances students' perceptions of learning in an online university environment. These researchers agree that digital game-based learning (DGBL) has become an effective medium for developing cognitive skills or adopting simulations that allow students to practice their skills in a virtual environment, recognizing the benefits of motivation and engagement in learning performance compared to conventional and traditional classroom teaching.

Inuguidan (2024) found that students show a positive perception and efficacy towards digital tools like Kahoot, Padlet, and Quizizz, agreeing that the use of these digital tools enhances their overall learning experience, engagement, and confidence in acquiring knowledge. Similarly, research involving the digital tool Genially (Cabrera-Solano, 2022; Castillo-Cuesta, 2022) revealed that Genially has the potential to improve the academic performance of students learning English as a foreign language in online instruction, particularly in grammar and vocabulary acquisition. Studies involving Nearpod (Al Redhaei et al., 2022; Armas-Arias et al., 2023; Hernandez-Mena et al., 2024) demonstrate that it promotes active learning in the classroom. Students expressed high satisfaction with the integrated learning environment and recommended Nearpod for all courses, particularly those conducted through videoconferencing systems.

The study confirms that university students' perceptions of learning can be enhanced through didactic experiences. The results indicate a moderate positive change in perceptions of learning as being more active, realistic, autonomous, and significant. These changes enable students to take a more active role in their learning, achieving higher-quality outcomes with greater competence and knowledge. A slight positive change was also observed in the perception of achieving objectives and engaging in diverse learning activities. The didactic intervention thus fosters an environment conducive to in-class learning development, likely contributing significantly to improved academic performance. Mustafa and Karimi (2021) demonstrated that gamified resources optimize and motivate learning, enhancing educational performance. Similarly, Hamari et al. (2014) found improvements in students' learning across various educational stages.

02. To Examine Perceptions of Motivation Before and After The Didactic Experience

The data indicate a more positive perception of motivation in classes following the didactic intervention. Significant differences are found in all items related to students' motivation in an online class. This leads to the acceptance of hypothesis 2: "Students perceive that digital resources such as Nearpod, Genially, Educaplay, Breakout, and Quizizz positively impact their interest and motivation in class, participation, group work, and consider using these resources in other Higher Education subjects. These findings are consistent with other studies (Adams & Du Preez, 2022; Bouchrika et al., 2021; Kyewski & Kramer, 2018), which have shown that DGBL can be considered a valuable and innovative tool in educational contexts to engage students and address motivational challenges, increasing their interactivity and participation. These studies also support the idea that digital resources enrich learning by fostering autonomy and personalized teaching in a university setting.

Fahada & Asrul (2024) emphasize the potential of digital games to improve students' participation, enjoyment, and learning efficacy. Specifically, their study demonstrated that Quizizz significantly increased students' motivation and interest in learning English. Dhamayanti (2021) found that most English as a Foreign Language (EFL) students had a positive perception and motivation toward Quizizz, supporting the idea that Quizizz is an appropriate e-learning tool to enhance motivation in the English classroom. Other studies on Genially (Cabrera-Solano, 2022; Castillo-Cuesta, 2022) reveal that, according to students' perceptions, the implementation of this tool increases their motivation, especially when effective feedback is provided. Al Redhaei et al. (2022) found that Nearpod promotes inclusion, active participation, and collaborative work, allowing the teacher to act as a guide or mediator in the learning process while students feel motivated and, most importantly, generate knowledge.

The use of digital resources such as Nearpod, Genially, Educaplay, Breakout, and Quizizz emphasizes the role of the student as an active participant in their learning, which, according to Strelan et al. (2020), is the learning style that education should promote. Therefore, in this case, technology is a useful complement to pedagogical instruction in Higher Education (Alomari et al., 2019; Zainuddin et al., 2020; Padilla et al., 2024), as these tools help enhance the quality and efficacy of Music Education by improving students' experiences, making learning more engaging, enriching, and autonomous. These approaches are also supported by experts in the field of educational technology in Music Education, such as Liu & Shao (2022), Sun (2023), Wang (2022), and Yao & Li (2023), who have highlighted that the implementation and use of technology in Music Education, through blended and online teaching modalities, yield significant results in developing students' musical skills and abilities through the use of these technological resources.

The results also indicate that university students' motivation perceptions can be improved through didactic interventions. The findings reveal a moderate positive change in motivation, participation, and willingness to recommend the course to others, along with a slight positive change in perceptions of teamwork. Consequently, the intervention cultivates an environment that supports motivational development, significantly contributing to students' engagement and classroom well-being. This aligns with prior studies, such as those by Colomo-Magana et al. (2024) and Erkinovna (2024), which highlight the impact of gamified resources on university students' motivation. Furthermore, Albdullah et al. (2022) and Mokhtari et al. (2021) stated that students who feel motivated and interested in the tasks proposed, have a better academic performance, and Haji Vosoogh et al. (2021) found a significant and positive correlation between motivation and psychosocial climate in the classroom since students who are motivated to do their work, advance their educational interests, improve their performance, self-confidence, self-esteem and classroom interactions.

Additional research (Adie et al., 2024; Gutierrez & Tomas, 2018) emphasizes the relationship between student motivation, classroom climate, and academic performance. For instance, Adie et al. (2024) examined how peer-created learning environments influence academic motivation and engagement, finding that positive climates foster higher motivation and participation. Similarly, Gutierrez and Tomas (2018) and Sanchez de Miguel et al. (2023) concluded that positive classroom climates mediate the relationship between motivation and academic success. Therefore, research indicates that increased motivation in the university environment enhances student well-being, fosters a positive classroom climate, and improves academic performance. This context promotes active participation and skill development, underscoring the importance of implementing strategies that cultivate a motivating and collaborative learning environment.

This study provides scientific evidence supporting the significant and perceptible improvement (ranging from slight to moderate) in learning and motivation perceptions through a didactic intervention employing gamified digital resources. These findings align with and expand upon existing literature, contributing to the development of more dynamic learning environments. In summary, interaction with technology has allowed students to explore musical concepts more interactively, enhancing their music teaching and learning process. For these reasons, the importance of integrating educational technology into the field of Music Education is emphasized, and further exploration and expansion of these approaches using digital resources in the curriculum are suggested to align with the demands of an increasingly technological society.

The educational implications for university educators highlight the necessity of implementing pedagogical practices that foster student motivation and engagement, thereby enhancing their well-being and academic performance (Darling-Hammond et al., 2020). Active learning methodologies, such as Project-Based Learning and gamification, can increase student interest by connecting academic content with meaningful and collaborative experiences (Jaaska & Aaltonen, 2022). The constant students' interaction and the development of interpersonal skills and autonomy helps students increase their knowledge in a distended atmosphere (Chaves-Yuste, 2023). The integration of gamified digital resources fosters student-centered learning environments. By actively engage with content, students undergo an interactive and experiential learning process aligned with 21st-century educational goals. The improvement in students' perceptions of their learning suggests that these gamified digital resources not only enhance understanding of the the music content but also build other soft skills which are essential for professional and academic success, such as collaboration, critical thinking or problem-solving. Additionally, fostering a positive classroom climate

characterized by respect, active participation, and constructive interaction promotes a safer and more stimulating learning environment. Educators should also strive to personalize teaching by adapting activities to the interests and abilities of their students. This tailored approach reinforces self-confidence and perceived competence. To do so, educators should receive targeted training to integrate these tools effectively into their teaching practices. The observed increase in motivation and participation highlights the need for educators to adopt active learning methodologies, such as gamification, to encourage students' engagement. Continuous and detailed feedback further supports students' self-regulation and sense of achievement, strengthening their capacity for autonomous learning. Finally, encouraging student autonomy through decision-making in their educational processes enhances their sense of belonging and responsibility. These strategies underscore the importance of educators serving not only as knowledge transmitters but also as facilitators of motivating environments that promote students' holistic development. This study is focused on music courses but gamified digital resources have the potential to improve learning and motivation in other disciplines and academic fields. Finally, the analysis of the variables of gender, age, and academic degree shows that they do not significantly influence the results, which underscore the inclusivity of gamified digital resources, being a suitable option for diverse student populations.

This research presents certain limitations inherent to its methodological characteristics, such as the sample size or the type of methodological design. On the one hand, future research could benefit from increasing the sample size to enhance data generalizability, incorporating university students from other subjects, degree programs, and institutions, including public universities and monolingual and bilingual students. This approach would enable researchers to determine whether the didactic intervention yields benefits across disciplines and cultural contexts, particularly in settings with greater demand for technological training resources to optimize learning and academic performance. On the other hand, employing a pure experimental design with control and experimental groups, rather than a pre-experimental single-group design, could address concerns about scientific rigor. Furthermore, regarding the data collection, the use of a single questionnaire may contribute to some limitations; however, a questionnaire already used in other studies with very good reliability was selected for this research in both measurements (pre- and post-intervention). Future studies might also incorporate mixed-method approaches, such as brief interviews during the intervention, or the use of a focus group, to provide a more comprehensive understanding of students' perceptions. Combining qualitative and quantitative data would enrich the findings and offer deeper insights into the effectiveness of didactic interventions.

Nevertheless, despite the benefits obtained in this study, it is crucial to recognize that the field of educational technology continues evolving. For this reason, several emerging lines of research may contribute to a deeper understanding of learning through these resources. These include studies on the adaptation of these technologies to different educational levels, their implementation in various Higher Education subjects, and the ongoing evaluation of learning outcomes. Additionally, the integration of Artificial Intelligence could be explored to offer new perspectives that may further enrich the learning experience through educational technology. In conclusion, this study provides a solid foundation for future research to maximize the potential of educational technology for learning in Music Education.

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RISKS OF THE DIGITAL WORLD: DIGITAL RISK-TAKING SCALE (DRTS) VALIDITY AND RELIABILITY STUDY

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ABSTRACT

This study aims to conduct validity and reliability of a measurement tool developed to determine university students' levels of digital risk taking. 646 undergraduate students from 8 different universities voluntarily participated in the study. Exploratory and confirmatory factor analyses were conducted to reveal the factor structure of the measurement tool. Data were collected from two different sample groups sequentially. Item-total correlations and internal consistency values were considered to determine the reliability of the measurement tool. The analyses revealed that 12 items of the measurement tool clustered under two different factors. The item loadings ranged from .49 to .76. The results of the confirmatory factor analysis indicated a good fit for the measurement tool. The internal consistency coefficient of the measurement tool was calculated as .77 for the first sample and .76 for the second sample. Correlation analyses conducted to determine the criterion validity of the measurement tool revealed significant relationships between the scores obtained from the measurement tool and variables such as digital dependency, digital citizenship, cognitive flexibility, and emotion regulation. Based on the conducted analyses, it was determined that the measurement tool is a valid and reliable instrument that can be employed to assess the university students' levels of digital risk taking.

Keywords: Digital risks, online risk-taking, risk-taking behaviors, scale development.

INTRODUCTION

Digital Technologies, which present numerous risk factors along with their opportunities, hold significant importance in the daily lives of especially young individuals. One of the concepts used to represent the dangers introduced into our lives with the use of digital technologies is "digital risk." Individuals in today's younger age groups are the recipients of this risky content (Alsoubai et. al., 2024). Contents encountered in digital environments, such as sexually explicit risks, violence and hate speech, and harmful software, can have significant and critical consequences on young individuals (Organization for Economic Co-operation and Development-OECD, 2022). In recent years, as a result of the increasing digital socialization and communication among university students, new digital content and security risks have emerged. For example, personal information and data can be misused as a result of risky communications experienced by university students, especially on social networks (Lin et al., 2020; Purnama et al., 2021). These risks introduced into our lives with digital technologies result in psychological and physiological health problems, particularly among young age groups (OECD, 2022). It has been reported that individuals exposed to digital risks experience significant psychological problems such as depression and anxiety disorders (Mallik, 2020; Montreuil & Malikin, 2021).

Despite the awareness of the significant negative consequences of digital risks and threats, it is noteworthy that there are deficiencies in clear conceptualizations and measurement tools regarding digital risk taking. However, in the constantly evolving digital world, it is critically important to conceptualize and measure these risk factors clearly and explicitly (Strohmeier & Gradinger, 2022). When examining the relevant literature, it is possible to come across differentiated sub-concepts such as “online risk,” “digital danger,” and “online harm” used to represent these dangers (Livingstone et al., 2020). Similarly, measurement tools found to determine university students’ levels of digital risk taking are limited and specific to online risks, internet, and social media risks, and they need to be continually updated to adapt to the ever-changing digital world. This is because digital risks encompass a wide range of content (Colak, 2019; Livingstone et al., 2009). However, in this study, the proposed concept of “Digital Risks” is considered more inclusive as it encompasses risks encountered in both online and offline contexts and various digital devices and usage durations. Therefore, in this study, the term digital risk, which expresses a broader and more inclusive meaning than online risks, is preferred (Inan-Kaya et al., 2018). From this perspective, the concept of “digital risk taking” has been preferred in this study to define risky behaviors that encompass various risks, both online and offline, with the aim of identifying risk levels among university students. These risk definitions inherently require updating due to the nature of digital technologies. However, updating measurement tools with every emerging technology may not be a functional and effective solution. Therefore, it is important for measurement tools to be nourished with expressions that encompass all digital technologies.

Due to the impact of the ongoing Covid-19 pandemic, university students’ increased usage of digital technologies compared to previous generations is evident. This increase is considered a significant problem in the literature as it results in an increase in exposure to digital risks (Shen et al., 2021). Similarly, the increasing digital risks on campuses can disrupt the desired learning outcomes in higher education (Mahato et al., 2022). From this perspective, determining the levels of digital risks among university students is of utmost importance. Through a comprehensive review of the current literature, it has been observed that there is a need for a measurement tool that assesses digital risk-taking levels among university students and encompasses current risk-taking tendencies. In this study, aiming to address this gap, the steps outlined in the following methods section were followed to develop a valid and reliable measurement tool.

METHOD

In this study, the steps of developing a digital risk-taking scale for university students were implemented. This section provides information about the study group, data collection process, and the development of the measurement tool, which includes the construction of an item pool. The process also includes application and validity-reliability studies. Details of the steps involved in developing the scale are given under the heading ‘Procedure’.

Study Group

The research included undergraduate students from 14 different departments of 8 different universities in Türkiye during the fall semester of 2022. The study was conducted sequentially with two different groups. Firstly, a total of 304 students participated in the Exploratory Factor Analysis (EFA) group, and then 342 students participated in the Confirmatory Factor Analysis (CFA) group, resulting in a total of 646 participants. In the EFA group, 61.8% (f=188) of the 304 students were female, and 38.2% (f=116) were male. The age of this group ranged from 17 to 36, with a mean age of 20.49 and a standard deviation (SD) of 2.05. In the subsequent CFA process, 64% of the 342 university students were female, and 36% were male. The age of the CFA group ranged from 18 to 39, with a mean age of 20.25 and a standard deviation (SD) of 2.35.

Data Collection Process and Tools

Data were collected in two different formats: face-to-face and online, for both the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) processes. This was done to avoid potential biases

associated with collecting data solely from online platforms. Information regarding the data collection tools used in this process is presented below.

Voluntary Participant Personal Information Form

This form, developed by the researchers, aims to determine various personal information of the study group participants. It includes inquiries about participants' voluntary participation consent and their "Gender," "Age," "University," "Faculty," and "Department" information.

Digital Risk-Taking Scale Draft Form

A draft item pool of 22 items was developed by the researchers. Opinions from experts and students were employed to determine the content and face validity of the draft scale. Detailed information about the development process of this form is provided in the data collection process. The tools for determining criterion validity are given below.

Digital Citizenship Scale (DCS)

The "Proper Use" dimension of the Digital Citizenship Scale, developed by Som Vural and Kurt (2018), was employed to determine the level of correct usage of digital technologies among university students participating in the research. The Digital Citizenship Scale consists of 23 items gathered under five sub-dimensions, and the "Proper Use" dimension contains a total of 11 items. The scale was designed in a five-point Likert type and reported a total explained variance of 41.43%. Fit indices obtained through DFA analysis (X^2/df : 1.66; RMSEA: 0.052; SRMR: 0.056; AGFI: 0.86; CFI: 0.91; NNFI: 0.90; IFI: 0.91) were reported. According to reliability analysis conducted with three different samples, internal consistency coefficients were calculated as .74, .73, and .75, and .77 for the entire samples.

Cognitive Flexibility Scale (CFS)

Developed by Martin and Rubin (1995) and adapted into Turkish by Altunkol (2011), this scale consists of 11 items and a single dimension. It is responded to on a six-point Likert scale. The scale reported a total explained variance of 50%. Internal consistency coefficients of the scale were reported as .74, .73, .75 for three different samples and .77 for the entire sample. Test-retest analysis of the tool resulted in a relationship of .98 between the two applications. The lowest score a university student can receive on the CFS is 6, while the highest score is 72. It is accepted that as students' CFS scores increase, their cognitive flexibility also increases.

Emotion Regulation Scale (ERS)

The Emotion Regulation Scale (ERS), developed by Gross and John (2003) and adapted into Turkish by Yurtsever (2008), consists of 10 items grouped under two sub-dimensions. The scale is responded to on a seven-point Likert scale. The internal consistency coefficients for the dimensions of the scale were reported as .85 for the first sub-dimension and .78 for the second sub-dimension. Test-retest coefficients conducted by the researcher for the sub-dimensions were .88 and .82, respectively.

Procedure

This section provides details about the steps carried out in the development process of the measurement tool. Accordingly, information is provided regarding the creation of the item pool and the validity-reliability studies. The steps followed in the scale development process are presented in Figure 1.

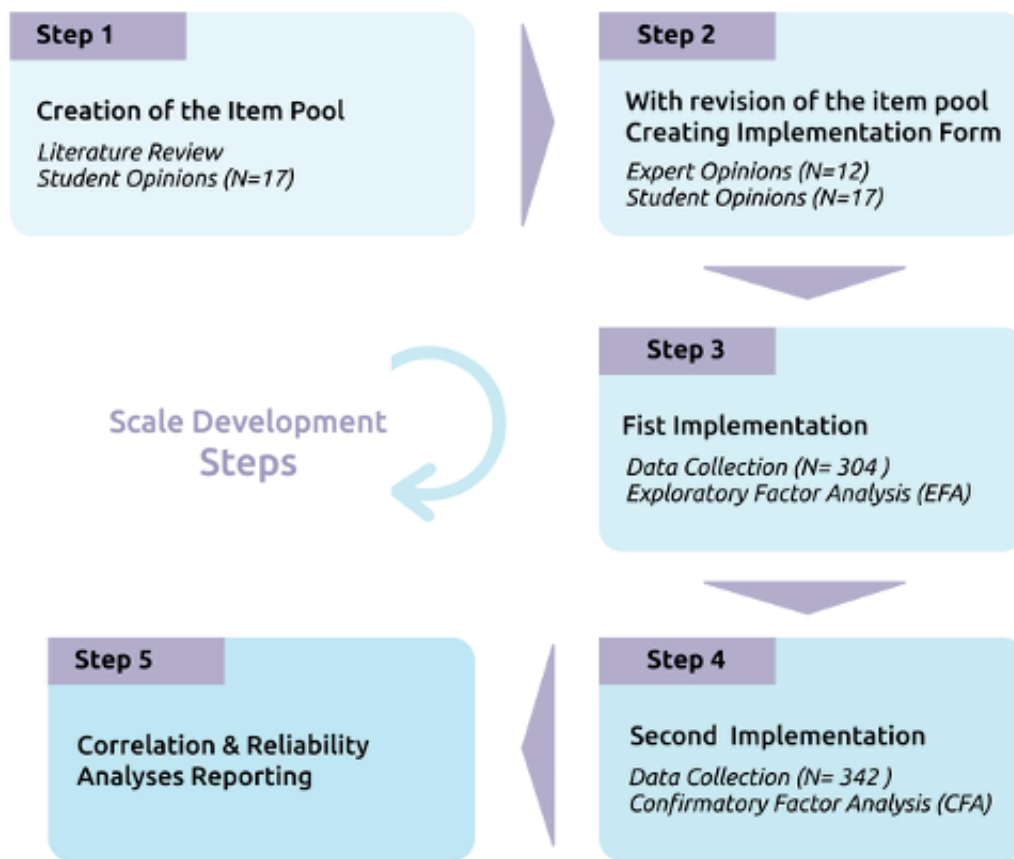


Figure 1. Scale Development Process

Creation of the Item Pool

As a result of the literature review conducted in line with the objectives of the current study, a draft item pool consisting of 32 items was created by the researchers. Expert and student interview forms were prepared to determine the content and face validity of the relevant draft scale. The items were revised based on the opinions of 12 experts (4 professors, 5 associate professors, and 3 doctoral lecturers conducting academic studies in the fields of Measurement and Evaluation, Computer and Instructional Technology Education, Turkish Language and Literature, and Psychology). Since the experts stated that different items measured similar characteristics, a total of 10 items were merged, and 2 items were revised for linguistic and load coherence. The revised items were then presented to 17 university students from different class levels, and they were asked to indicate any expressions that were difficult to understand. The students suggested providing examples of certain types of digital risks. The opinions and suggestions of experts and students were taken into account, and a pre-application form consisting of 22 items was prepared. Participants were expected to respond to the items on a five-point Likert scale, ranging from 1 (“Strongly Disagree”) to 5 (“Strongly Agree”).

Validity and Reliability Studies

SPSS v25 and AMOS v247 software programs were used for data analysis in this phase of the research. Initially, exploratory factor analysis (EFA) was conducted to determine the factor structure of the candidate measurement tool consisting of 22 items, followed by confirmatory factor analysis (CFA) with a different sample group. It was observed that the kurtosis and skewness values of some items were greater than 2, indicating that these items did not meet the assumption of normality (Tabachnick & Fidell, 2013). Therefore, the principal component analysis, a commonly used factor extraction technique in the social sciences, was employed (Cokluk et al., 2012; Tabachnick & Fidell, 2013). Considering the interrelatedness

of the factors in this scale developed in the social sciences, the promax rotation technique, one of the oblique rotation methods, was used (Cokluk et al., 2012; Field, 2009). The adequacy of the sample and the dataset was determined by conducting Kaiser-Meyer-Olkin (KMO) and Bartlett's tests. In this context, a KMO value of .60 or above and a significant chi-square value in Bartlett's test were considered as criteria to test the suitability of the dataset for factor analysis (Buyukozturk, 2010). Additionally, factor loading values and the explained variance values of the items were taken into account (Cokluk et al., 2012; Stevens, 2009). In order to determine the reliability of the instrument, the Cronbach alpha values of the factors and the Composite Reliability (CR) values were also analyzed. The findings of the conducted EFA, CFA, correlation analyses, and reliability analyses are presented in the next section.

FINDINGS

This section presents the results of the exploratory factor analysis (EFA), confirmatory factor analysis (CFA), reliability, and correlation analyses conducted for the 22-items draft form.

Validity Analysis Results for the Digital Risk-Taking Scale (DRTS)

Before conducting the factor analysis for the candidate measurement tool, the assumptions of the analysis were examined. The Kaiser-Meyer-Olkin value was calculated as .83, indicating sampling adequacy, and the Bartlett's test yielded a significant result (Bartlett's $\chi^2 = 1365.148$, $df = 231$, $p < .001$). Based on KMO results, it was determined that the dataset was suitable for factor analysis (Field, 2013). When all 22 items included in the candidate form were analyzed, it was found that the measurement tool explained approximately 54% of the total variance. Subsequently, attention was paid to the explained variance values and eigenvalues being above 1 to determine the factor structure of the measurement tool. Additionally, the scree plot for the 22 items included in the EFA process (See Figure 2) was evaluated (Cokluk et al., 2012).

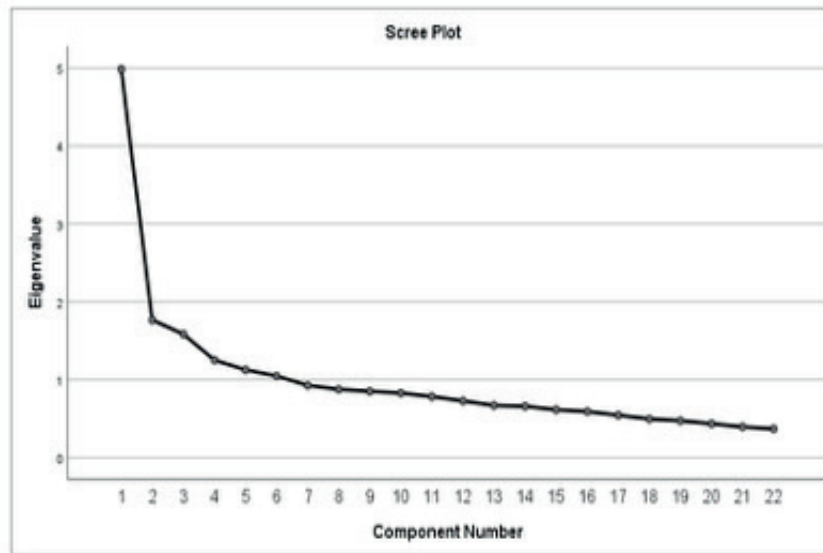


Figure 2. Scree Plot for Factor Analysis

In the conducted factor analysis process, initially all items were included, and a six-dimensional structure with eigenvalues exceeding 1 was observed. It was observed that the eigenvalues related to the scale decreased from 1.765 to 1.585 after the third dimension. With the fourth dimension, this value was observed to be 1.252. Additionally, the substantial concentration of explained variance in the first three dimensions, the number of items in the dimensions, and the variation in eigenvalues indicated a three-dimensional structure of the measurement tool. Furthermore, after examining the slope-intercept graph, explained variance, and eigenvalues, factor loadings of the scale items were taken into consideration. A factor loading value of .40

and above is considered good for sample groups ranging from 200 to 350 (Cokluk et al., 2012). Therefore, items with factor loading values of .40 and below were not included in the analysis.

After these processes, the factor loadings were reconsidered in terms of overlapping items. Accordingly, a factor loading value of .30 and above in another component was considered as an overlapping item (Stevens, 2009). Considering this criterion, 10 items were removed from the analysis one by one on the grounds that they showed an item loading value of .30 and above under more than one dimension at the same time, and then the factor analysis was repeated each time in turn. Before discarding items, experts were consulted about whether the removal of these items would threaten the content validity.

After the factor analyses repeated one by one, it was determined that the measurement tool exhibited a structure consisting of two dimensions in total, with 6 items in each sub-dimension. The EFA results for the two-dimensional and 12-item structure of the measurement tool are given in Table 1.

Table 1. Exploratory Factor Analysis (EFA) Results for the Factor Structure of the Measurement Tool

	Components		Common factor variance	Item-total correlation
	Dimension 1	Dimension 2		
DR12	,767	-,063	.551	.535
DR10	,684	,032	.448	.513
DR13	,646	-,058	.389	.426
DR1	,634	-,091	.362	.401
DR21	,583	-,018	.331	.395
DR11	,568	,227	.482	.497
DR14	-,023	,736	.529	.511
DR15	,021	,639	.420	.391
DR2	-,100	,638	.363	.355
DR5	-,072	,627	.360	.374
DR8	-,013	,554	.301	.373
DR7	,199	,496	.367	.413
Eigenvalue	3.488	1.456	—	—
Explained variance	29.064	12.130	41.194	—
Cronbach alfa (α)	.72	.66		
Composit Reliability (CR)	.81	.77		

According to the findings obtained from the final factor analysis, it is observed that the first dimension of the measurement tool consists of 6 items with factor loadings ranging from .568 to .767, explaining approximately 29% of the total variance. In the second dimension of the measurement tool, six items are clustered, explaining approximately 12% of the total variance, and the factor loadings of these items range from .496 to .736. It is determined that the scale explains approximately 41% of the total variance. After determining the factor structure of the scale, a confirmatory factor analysis (CFA) was conducted on the model consisting of 12 items with two dimensions. Examining the Cronbach alpha scores, the first dimension was calculated as .72 and the second as .66. These values provide clues about the reliability of the scale (Kartal & Dirlik, 2016). Composit Reliability (CR) was calculated as 0.81 for the first factor and 0.77 for the second factor. CR value above 0.70 indicates that the items represent the construct they are trying to measure well and that there is consistency between these items (Kline, 2015).

Results of Confirmatory Factor Analysis for DRTS

In order to reassess the structure consisting of 12 items and two dimensions obtained during the CFA process of the study, commonly used model fit indices in the literature were considered. One of the values taken into account in the process of deciding on model fit is the chi-square (χ^2) statistic. However, since the chi-square

(χ^2) statistic is sensitive to sample size, the ratio of the chi-square value to the degrees of freedom (df) was considered (Cokluk et al., 2012; Hooper et al., 2008; Kline, 2015). In addition, commonly recommended fit indices such as CFI, TLI, RMSEA, and SRMR were also taken into account. The decision-making process regarding fit indices was based on the criteria provided below (Cokluk et al., 2012; Hooper et al., 2008; Kline, 2015; Mueller & Hancock, 2008). In this context, Table 2 presents the fit indices and the results of the measurement model conducted within the scope of the study.

Table 2. Chi-Square Test and Fit Indices for the Measurement Model

Model	χ^2 /sd	RMSEA (90% C.I.)	CFI	TLI	SRMR
Indices	(χ^2 /sd <3): Good Fit	(RMSEA<5): Good Fit	>0.95	>0.90	<.10
DRTS Model Results	1.657 (87.799/53)	.044 (.027 – .060)	0.95	0.94	.046

In line with this, when examining the fit indices presented in Table 2, it can be observed that the ratio of χ^2 /df is 1.657 (87.799/53), indicating a good fit. The TLI value for the measurement model is .94, the CFI value is .95, the RMSEA value is .044 (LO-HI 90= .027 - .060), and the SRMR value is .046. These findings indicate that the two-dimensional model proposed during the CFA process exhibits a good fit. Subsequently, considering the factor loadings of the measurement items, the relevant values for the model are presented in Figure 3.

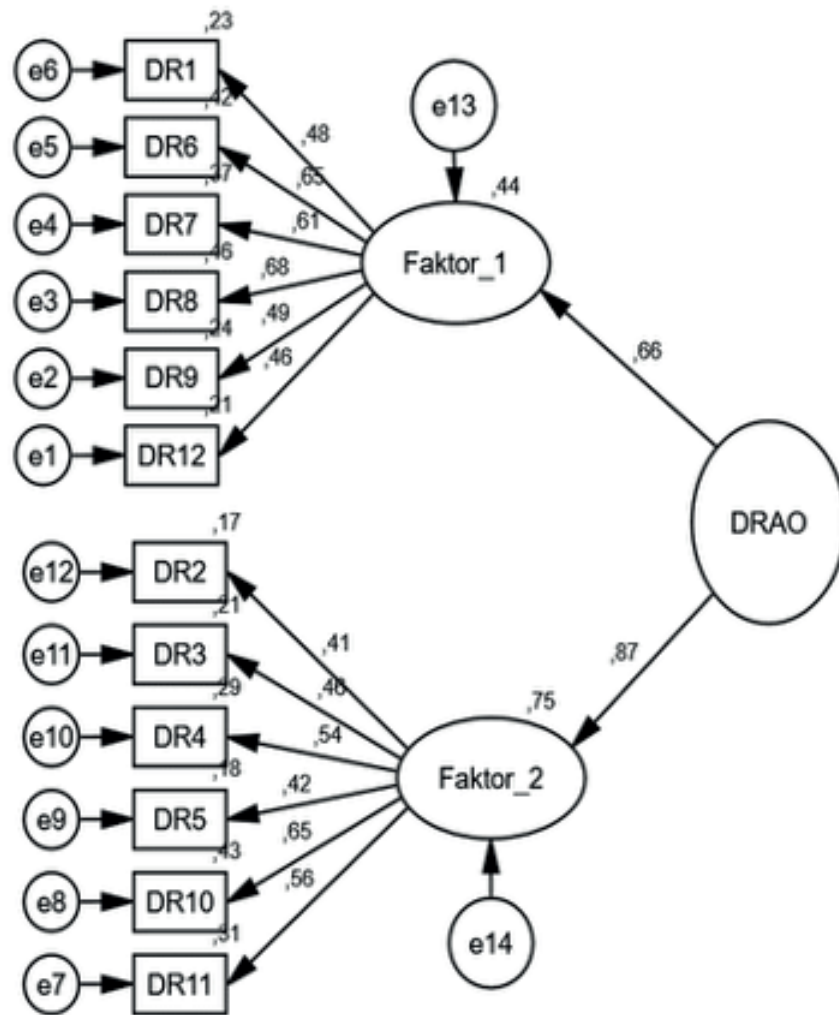


Figure 3. Results of Confirmatory Factor Analysis for Digital Risk-Taking Scale

Upon inspection of Figure 3, it is evident that the factor loadings for the items within the primary dimension span a range of 0.46 to 0.68. Conversely, the factor loadings for items belonging to the secondary dimension exhibit a range of 0.41 to 0.65. Given these observations, it can be concluded that the factor loadings associated with the scale items surpass the established threshold of 0.40 as outlined in the extant literature (Cokluk et al., 2012; Stevens, 2009). Subsequent to this analysis, consultations were conducted with six experts who had previously been involved in delineating the names of the two dimensions. Furthermore, a comprehensive review of the pertinent literature was undertaken, culminating in the decision to designate these sub-dimensions as “digital content risk” and “digital security/privacy risks,” respectively.

Findings of Reliability Analysis for DRTS

To examine the reliability of the measurement instrument, the Cronbach alpha values (α) were investigated for each sub-dimension and the total score using the data obtained from both the EFA and CFA samples. As a result, the internal consistency values for the first sub-dimension of the scale were determined as .72 and .73 for the two different samples, respectively. For the second sub-dimension of the scale, the internal consistency value was calculated as .66 in both samples. Regarding the total scale score, the internal consistency value was found to be .77 in the first sample and .76 in the second sample. According to the relevant literature, an internal consistency value of .60 or higher is considered acceptable for reliability (Buyukozturk, 2010; Taber, 2018). McDonald's Omega test result for the total scale was calculated as .76. In order to strengthen estimates of the reliability of the scale, two split-half reliability and Composit Reliability (CR) analyses were conducted. Spearman-Brown coefficient for equal groups consisting of six items each was determined as .73.

Findings of Correlation Analysis

Pearson correlation analysis was conducted to examine the relationship between digital risk-taking behaviors and digital addiction, correct usage, cognitive flexibility, and emotion regulation, which are known to be associated with digital risk-taking behaviors. The findings of the relevant analysis are presented in Table 3.

Table 3. Results of Correlation Analysis for Research Variables

	DRT	DA	CU	ER	CF
Digital Risk-Taking (DRT)	1				
Digital Addiction (DA)	-.18**	1			
Correct Usage (CU)	-.389**	-.273**	1		
Emotional Regulation (ER)	-.171**	-.240**	.292**	1	
Cognitive Flexibility (CF)	-.113**	-.322**	.389**	.469**	1

When examining Table 3, it is evident that there is a positive and significant relationship between the scores of university students participating in the study on the DRTS and their levels of digital addiction. Furthermore, a negative and significant relationship was observed between the variables of Correct usage (CU), emotion regulation (ER), and cognitive flexibility (CF) with the scale. The presence of significant relationships between the variables provides evidence for the criterion validity of the DRTS scale. The observation of significant, albeit not strong, relationships between these variables and DRTS scores provides clues about the criterion validity of the instrument. Indeed, the relevant literature emphasizes that there are significant relationships between digital risk-taking behavior and the variables listed in Table 3. (Cudo & Zabielska-Mendyk, 2019; Li et al., 2020; Liu et al., 2023). The score obtained from the DRTS has a significant correlation with the variables related in the literature.

DISCUSSIONS AND CONCLUSION

In this study, a measurement instrument was developed to determine university students' levels of digital risk-taking behavior. In this process, considering the steps of scale development, a preliminary item pool was created, and through expert and student opinions, as well as item analyses, an item pool consisting

of 12 items with 2 sub-dimensions was developed. The sub-dimensions of the scale were named “*digital security/privacy risks*” and “*digital content risks*” with the guidance of expert opinions. The analyses conducted resulted in the determination that DRTS is a valid and reliable measurement instrument. Furthermore, correlation analyses were performed to determine the criterion validity of the instrument by examining its relationships with various variables associated with digital risk-taking behaviors in the literature. In line with this purpose, the relationship between the scores obtained from the DRTS and the variable of proper usage of digital technologies was examined, revealing a significant negative relationship between these variables. Similar findings can be found in the literature regarding the relationships between online risk-taking, proper usage of digital technologies, and digital literacy (Helsper & Smahel, 2020; Purnama et al., 2021; Qiu et al., 2022; Wang et al., 2021).

Another variable expected to be associated with digital risk-taking in the literature is digital addiction (Davis et al., 2023; Jalil & Sinnamon, 2019; Nwanosike et al., 2022). In this research, a significant relationship was observed between university students’ levels of digital addiction and scores on the DRTS scale through correlation analysis. Risk-taking behaviors are influenced by psychosocial variables (Bilgic et al., 2021). In this study, a negative and significant relationship was found between students’ DRTS scores and their levels of cognitive flexibility and emotion regulation. Similarly, in the relevant literature, studies reporting relationships between online risk-taking behaviors and emotion regulation (Dawson et al., 2019; Li et al., 2020; Turliuc et al., 2020; Uddin & Rahman, 2022) and cognitive flexibility (Raj et al., 2023; Ryu et al., 2021; Tanhan et al., 2023) variables can be found.

In conclusion, the developed DRTS within the scope of this research can be used to determine university students’ levels of digital risk-taking behavior. Digital technologies are constantly and rapidly changing. Therefore, specifying certain social media names or limiting them with specific tools may not be an effective approach in measurement instruments. Additionally, digital risks are constantly evolving and transforming. It is expected that the developed DRTS will fill the gap in the current literature and serve as a valuable and reliable tool for research on digital risks.

Authors’ Note: This measurement instrument was developed within the framework of a doctoral dissertation written by the first author under the supervision of the second author. A significant portion of the research report is taken from the relevant doctoral dissertation work.

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MODELING USERS' CONTINUED ENGAGEMENT IN E- LEARNING IN THE POST-COVID ERA IN A DEVELOPING COUNTRY: GSCA-SEM APPROACH

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ABSTRACT

The notion of e-learning is not new to Bangladeshi HEIs. However, the tidal wave of e-learning turned into a tsunami after the outbreak, thus heightening its acceptance in developing countries like Bangladesh. Literature suggests that e-learning has several benefits a user may reap, but it also has some hurdles that may prevent a user from using it. Literature also claims that a user may discontinue using e-learning after the user has accepted it. Therefore, the study aims to identify factors propelling users to use the system for a sustained time in the post-pandemic era in a developing country. The research model of the study was tested against data from users in a developing country. To collect data from 426 respondents, the study designed an instrument comprising items adopted from prior studies conducted on a similar theme. The respondents of the study included educators working for different HEIs in Bangladesh and students enrolled in these institutions. Most of the respondents were approached on social media platforms and through email, whereas a few were approached directly with paper-based questionnaires. A standard SEM package, namely GSCA, was employed to analyze the research model. The study found a direct and positive impact of network externality and interactivity & control on continuance intention. The variables: technology support, information quality, and system quality, were identified as the components of facilitating conditions. The study urges the key decision-makers of HEIs to communicate the latest advancements in e-learning and e-learning usage with the community to expedite e-learning usage within the institutions. Infrastructure development in all aspects, providing organizational support, arranging training on usage, taking initiatives to enrich knowledge, stakeholder support, and incorporating interactive teaching and learning content into traditional teaching and learning are among the few areas where HEIs should focus on expediting the continuance intention to use e-learning. The study can be an important blueprint for the leaders of HEIs willing to facilitate and expedite e-learning, for policymakers and stakeholders looking for policies to expedite the sustained integration of educational technology, ensuring competencies and readiness to face future uncertainties, and for the commercial vendors envisioning expanding their operations in Southeast Asia. The study contributes to the theory of technology acceptance in the post-pandemic era in a developing country.

Keywords: Continued use of e-learning, developing country, IGSCA-SEM, interactivity and control, network externality, post-pandemic, SDG 4.

INTRODUCTION

During the pandemic, roughly 1.2 billion students were out of physical classrooms due to the restrictions imposed across 144 countries (L. Li, 2020; M. Uddin, 2020). Conducting academic activities online in synchronous mode was comparatively new to developing countries, such as Bangladesh. The pandemic caused a huge surge in the use of online education in Bangladesh and has continued to maintain its momentum moving forward.

As per government directives, higher education institutions were forced to fold up educational activities on March 20, 2020. Physical classes were replaced by online classes to avoid study breaks, regardless of barriers such as psychological, technical, and environmental challenges (Jameel & Real, 2020).

Understanding the technological need, a government institution called 'Bangladesh Research and Education Network (BdREN)' put forward a revolutionary initiative for providing minimal technology support, including providing access to the Zoom platform at a reduced rate to around forty-seven private and public HEIs, which made a significant surge in e-learning usage (M. Rahman, Mustahsin, & Ahmed, 2020). Likewise, HEIs started realizing the need for utilizing UGC Digital Library (UDL) E-Resources provided by UGC before the pandemic in full range, which was neglected earlier.

Despite several initiatives, attending classes online was challenging and much harder for the learners. A study revealed that 55% of students had no access to the internet to continue with online education during the pandemic (Islam, Tanvir, Amin and Salman, 2020). In addition, around 44.6% of students in Bangladesh could not attend online classes due to a lack of essential resources (M. M. Khan, Rahman, & Islam, 2021). Several challenges were confronted by the neighboring country, i.e., India; in which, apart from confronting technical and psychological issues, such as spending a long time on screen, students got engaged in other unproductive activities when the camera was turned off (Priyanka Prakash, n.d.).

At present, the Bangladeshi education sector at the tertiary level employs 30,899 educators, among whom 9,205 are female educators working for both private and public institutions. Around 15,390 educators are working for private HEIs, among whom 15,236 educators belong to public HEIs. On the other hand, a total of 1,034,320 learners, including female learners of 388,662, are enrolled in 164 HEIs in Bangladesh (Bangladesh Education Statistics, 2022).

At the very beginning, the initiative to shift online was not welcomed by the learners with open arms since they lacked resources and technicalities (Iqbal, 2021). As time went on, the community of Bangladesh began to recognize the importance of e-learning in all aspects, witnessing a huge boost in online education. The development of a robust education system by 2030, injecting online education, has been identified as essential to achieving the Sustainable Development Goals (Noor, 2023). At the beginning of the new normal era, the regulatory bodies advised the HEIs in Bangladesh to continue academic activities, implementing the blended learning approach.

The effectiveness of online education is so admired by the community that they are suggesting incorporating some advanced features that can help to include learners with disabilities (Rafa, 2024). The incorporation of a blended mode in education has even been suggested by the University Grants Commission, proposing a framework to foster blended education at the tertiary level (UGC, 2021).

Despite several initiatives taken by the government and private sector, educators of HEIs in Bangladesh confronted several challenges: technological and psychological in dealing with the transition (Rouf & Rashid, 2021). The educators also faced challenges at the primary level in the form of technological and psychological issues (Ali, 2024; A. Rahman, Islam, & Boyd, 2023). Opposing the hurdles, some educators arranged personal initiatives to conduct lessons online (Nasir Uddin, 2024).

Learning online has become a global trend, and many HEIs across the globe have invested heavily in the development of online platforms, resulting in a huge surge in online enrollment (from 30% to 70%) across the globe (Santos & M, 2022). However, in Bangladesh, the total number of internet users is around 66.94 million, with an internet penetration rate of over 38% (Hossain, 2024).

In the past few years, the government of Bangladesh has been trying to revive the education system by ensuring the use of technology and subsequently providing adequate training programs to develop digital content across the country, but challenges remain as most teachers are reluctant to conduct academic activities since they do not have competencies in dealing with technology (Nasir Uddin, 2024). The need for a skilled and

competent workforce able to adopt innovative technologies is crucial (Rakshand, 2024). The post-COVID era of Bangladesh is quite proactive, as the educational system of Bangladesh has gone through several changes, resulting in a huge boost in online classes, distance learning, and hybrid models (Kamal & Habib, 2023). As a result, several HEIs in Bangladesh have adopted various modes of online teaching. Some courses of a program are offered fully online, including the assessment, while the rest are offered on-site. In some cases, classes or sessions of a particular course are provided online, but assessments are held on campus. Moreover, full programs, including assessment, are delivered online, and these formats are expected to expand in the future.

Since March 2020, Bangladeshi academics at the tertiary level have been relying mostly on different chat-based platforms: MS Teams, Google Meet, Zoom, Cisco Webex, Adobe Connect, etc., most of which are accessible for free with limited features. At the secondary level, game-based platforms, e.g., Kahoot educational platforms, are also in high demand. Additionally, various AI-based LMSs such as Moodle, Canvas, and Blackboard offer personalized learning experiences that cater to students' needs and are highly appreciated by the users. Moreover, online course providers or education platforms, such as Khan Academy, Coursera, and EdX, with their comprehensive features and user-friendly interfaces, have generated significant interest among learners.

Following these, some social media platforms, such as Facebook and YouTube, accompanied by free messaging and video calling apps, such as WhatsApp, Viber, etc., were also utilized during the pandemic and in the new normal. Nevertheless, Massive Open Online Courses (MOOCs) or Open Educational Resources (OER) were also on the list of fewer educators, though the usage rate remained relatively low.

The notion of online learning has been explored from learners' perspectives and studied extensively across the globe, but factors influencing educators' continuous use of e-learning in developing countries are largely untapped and unexplored. Moreover, a tendency to incorporate e-learning mechanisms into traditional teaching methods by educators at the tertiary level in Bangladesh has been increasing day by day in the post-pandemic era, attracting scholars to put the phenomenon under the microscope.

Indeed, e-learning is a blessing for the global education sector. Due to the advancement of e-learning, HEIs across the globe managed the uncertainties caused by the pandemic with determination and competencies. In the new normal, the sector has turned around, leaving the drawbacks behind. However, the presence of some challenges in the post-pandemic era, such as technical issues, interaction issues, training, and literacy issues, has been highlighted in the literature (Nouraey, Bavali, & Behjat, 2023). In the context of Bangladesh, the continuity of using e-learning is still under challenge. In a study, it has been found that most of the educators at the tertiary level in Bangladesh are not familiar with technological gadgets. In addition, educators repeatedly show concern about the connectivity issues for conducting online classes (M. E. I. Khan, 2021). Furthermore, among other issues, a lack of quality e-learning resources was much stressed by the scholars (Alam, Pervez, Kabir, Amin, & Bhuiya, 2023).

With the incorporation of various e-learning tools, Bangladeshi HEIs have shown competencies in coping with unwanted situations and are proactively advancing in the digital education landscape. However, technological availability in conducting remote learning is also being questioned (Laden, 2021). Conducting assessments online is still viewed with skepticism by educators in Bangladesh, and this may prevent them from using e-learning (M. A. Islam, Nur, & Talukder, 2021). In addition, educators are struggling to deal with issues, such as poor internet connection, expensive data packages, and not having a proper environment to conduct classes from home (M. A. Islam et al., 2021). The educators began embracing e-learning during the pandemic or before the pandemic, and the extent to which they intend to continue using e-learning in Bangladesh in the post-COVID era is largely unexplored and unclear. Despite visible benefits and unforeseen challenges, the intention to continue using such types of systems is marginal. Discontinuing the use of the e-learning system after initial acceptance is a frequent occurrence (M.-C. Lee, 2010).

The study delves into understanding influential factors influencing educators' continuance intention to use Edu-tech in the traditional educational setting in the post-COVID era in Bangladesh. Scholars from diverse disciplines across the globe have continued to understand users' motivating factors to adopt e-learning; eventually, they have confirmed the positive or negative relationships of the variables, such as performance expectancy, effort expectancy, social influence, self-efficacy, facilitating condition, interactivity and control, network externality, etc. Therefore, knowing the factors forming continuance intention to use e-learning in the post-pandemic era in a developing country could be a timely initiative.

LITERATURE

E-Learning Platforms in Remote Education

Since its inception in 1990, e-learning, also known as remote learning, online learning, virtual learning, and distance education, has emerged as a paradigm to reshape the global education system. The acceptance of e-learning has grown rapidly in recent years, especially after the emergence of the pandemic the world experienced in 2020. Due to the increasing demand in recent years, the notion has gone through several advancements. According to Simonson et al. (2019), the notion of e-learning can be defined as “*The acquisition of knowledge and skills through mediated information and instruction delivered over the Internet, sometimes replacing traditional classroom instruction but often supplementing it.*” (Garrison et al. (1999) described e-learning as “*The use of electronic educational technology in learning and teaching. It encompasses various applications and processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration.* When the learners are physically separated from the instructor, and the lessons are provided online, the concept will turn into ‘Distance Education’ (Moore & Kearsley, 2012). The traditional face-to-face method with techno-mediated activities will be transformed into ‘Blended Learning’ (Graham, 2006). When an online system is designed to allow educators and learners to conduct academic activities, such as accessing resources, submitting assignments, and communicating with peers, it will be better called a Virtual Learning Environment (VLE) (Garrison et al., 1999).

Various learning management tools (LMS), such as Moodle, Canvas, and Blackboard, have gained much attention due to their widespread features and functionality (Wang and Baker, 2020). The tools embedded with video conference features, such as Zoom, Microsoft Teams, and Google Meet, have revolutionized education in synchronous modes, speeding up real-time interaction between educators and learners during the pandemic (Ramsey, 2020).

Apart from the LMS and video conferencing tools, there are some content-creating platforms: Articulate Storyline, Adobe Captivate, and H5P, embedded with gamification elements, parallelly empowered by the educators in designing educational content attuned to the needs of the learners in hopes of providing a personalized learning experience (Hamalainen and Vahakangas, 2021). Learning environments augmented with virtual reality (VR) and augmented reality (AR) technologies: EngageVR, AltspaceVR, and ClassVR, have proven effective in delivering complex concepts, particularly in science and engineering disciplines (Dalgarno et al., 2020). Mobile-based learning services provided by Khan Academy, Duolingo, and Coursera have accelerated self-directed and micro-learning and offered flexible learning opportunities catering to the needs of modern learners ahead of their learning journey (Al-Samarraie et al., 2021).

The educators and learners perceived copious benefits of the approach. The functionality of e-learning allows users to gain access to the content at their own pace from across the globe, overcoming the geographical constraints (Allen & Seaman, 2016). The approach offers high flexibility to educators, allowing them to innovate interactive content with the platform (Kebritchi, Lipschuetz, & Santiago, 2017). E-learning provides a dynamic environment to incorporate interactive features, such as virtual labs, allowing educators to design assessments attuned to the needs of the learners (Gikas & Grant, 2013). Lastly, e-learning facilitates collaborative learning, allowing users to engage and interact with each other in a virtual setting (Bawane & Spector, 2009).

E-learning confronted several obstacles to overcome. The slogan ‘Technology for All’ remains under scrutiny. Accessing content in rural areas is highlighted as the most significant challenge (UNESCO, 2021). At the beginning of the pandemic, as per instructions, most educators started conducting online classes without having proper training and additional resources. To cope with the transition, educators utilized the resources that they used before the pandemic, raising serious concerns over the suitability of the content in the techno-mediated environment (Hodges, Moore, Lockee, Trust, & Bond, 2020). The study also found that the learners were frustrated as they encountered technical and environmental issues, such as unstable connection, incompatible devices, and inability to deal with technicalities, making the learning a bit chaotic (Means & Neisler, 2020). The shift also put much stress on learners’ mental health and well-being as they were isolated for a while (Loades et al., 2020). The notion of e-learning has been much discussed in recent years, allowing the decision-makers to put forward initiatives to uplift the growth.

Right after the outbreak, the institutions' priority was to provide the users with a digital platform and the necessary training to carry out the task vested in them (UNESCO, 2020). Out of many modes of delivery, the asynchronous approach was prioritized effectively to cope with the situation (Al Lily et al., 2020). HEIs revived the culture of accessing digital libraries and various databases to offset the need for printed materials (Garcia, 2020).

To foster usage and encourage the users to use the provided services, various schemes and facilities were introduced, which included online technology support and a help desk (Taylor et al., 2020), financial schemes to support tuition (Adams & Williams, 2020), support to improve mental health and wellbeing (Jones, 2021), e-learning platforms to conduct and attend classes (Johnson, 2020). These initiatives helped the community mitigate uncertainties and inject quality into learning during the pandemic.

The injection of digital technology in education has been highly recognized by UNESCO, suggesting policies to propel growth (UNESCO, 2020). To do so, the roles of international organizations, government, and non-governmental organizations in fostering use behavior have been stressed highly (Anonymous, n.d.). The three areas: digital infrastructure, teacher training, and curriculum development, require funds to be operational to ensure smooth access to the resources, which can be availed by developing partnerships between HEIs and technology providers (Instefjord & Munthe, 2015).

Factors Affecting Users to Adopt E-learning

The phenomenon of e-learning has been spotted by scholars globally, pinpointing several influential factors along with the barriers to adoption. Out of many, a lack of technological backbone, such as bandwidth, hardware, and necessary software, was the line of attention in a developing country (Alenezi, Karim, & Veloo, 2011). The second barrier could be the culture, attitude, and norms of society; as such, if there is a cultural requirement to choose a traditional classroom over online learning, it may jeopardize e-learning adoption (Al-Senaidi, Lin, & Poirot, 2009).

In addition, higher satisfaction and adoption are the result of the user-friendliness of the interface of an e-learning system (Al-Fraihat, Joy, & Sinclair, 2020). A study found that the e-learning attributes, i.e., well-structured elements and interactive content, led to better learning outcomes, thus increasing adoption (Al-Harbi, 2011). High-quality content was found to be motivating for learners to adopt the e-learning system consistently (Algahtani, 2011). Organizational support, institutional policy, and strategic planning are the three broad areas where focus should be given to promote e-learning. Continuous management support and scopes for professional development were found to be essential to adopt e-learning (Alsabawy, Cater-Steel, & Soar, 2016). Further to this, e-learning policies and leadership have been found to have an impact on e-learning adoption (2014, الحجران, اللوزي, & الدبعي). Other than technological components, e-learning acceptance was found to be influenced by some behavioral components, such as perceived ease of use and perceived usefulness (Alraimi, Zo, & Ciganek, 2015). Scholars suggested enhancing self-efficacy or confidence through training and support because these two factors were liable to engage learners with the e-learning system (Alenezi et al., 2011). Users are more likely to engage in e-learning activities when they perceive that the system is useful and easy to use and serves their learning needs (N. Islam, Beer, & Slack, 2015).

In the case of Pakistan, the influences were akin to other developing countries, where perceived usefulness and perceived ease of use were the most influential in expediting e-learning. Besides, self-efficacy, internet experience, enjoyment, and system characteristics were found to be influencing perceived ease of use, whereas system characteristics impacted perceived usefulness (Kanwal & Rehman, 2017). E-learning adoption was influenced by institutional infrastructure, staff attitudes and skills, and perceived student expectations (King & Boyatt, 2015). Information system expertise and expected benefits played pivotal roles in e-learning implementation (B. Raouf, Seger Naser, & Khireibut Jassim, 2012).

Few studies have been conducted discussing the impact of network externality or network effect. Network externality was found to be influencing users' persistence in completing MOOCs indirectly (B. Li, Wang, & Tan, 2018). Technology and the learner dimension influenced e-learning adoption (Vanitha & Alathur, 2021). Self-efficacy and interaction were found to have impacted user intention indirectly (Dash, Akmal, Mehta, & Chakraborty, 2022). The intention to use e-learning was directly impacted by one's e-learning

experience and attitude (Mailizar, Almanthari, & Maulina, 2021). Students' intention to use e-learning was found to be strongly influenced by performance expectancy, social influence, effort expectancy, and service quality (Perera & Abeysekera, 2022).

E-learning in Bangladesh

As mentioned before, e-learning is not a new concept to Bangladeshi HEIs. Due to its capability to mitigate the digital divide, the notion has gained enormous attention as an alternative to the traditional delivery mode. In addition, it has been found that the notion was well embraced by the users (e.g., learners and educators) as they believe that it is useful in viewing lessons, reading materials, completing assignments, taking part in different webinars, forums, etc. (Eltahir, 2019; Sarker, Mahmud, Islam, & Islam, 2019). However, the main drawbacks of learning online were the poorly designed content and poorly configured connectivity (Sarker et al., 2019). The scholars also suggested diminishing major downsides by taking the initiative to enrich users' knowledge and technical skills (Akter, Munira, & Amin, 2017). In addition, the development of quality and interactive content, and a user-friendly system promoting asynchronous interaction, was highlighted as the prerequisite to continued acceptance (Sarker et al., 2019). Another concept, m-learning, was introduced in Bangladesh in 2015 and was found to be useful in mitigating study gaps during the pandemic (Biswas, Roy, & Roy, 2020). In a study, it was found that system quality, information quality, and service quality influenced users' satisfaction with using m-learning (M. M. Uddin, Ghosh, & Isaac, 2019). In the post-pandemic era, performance expectancy and social influence played a pivotal role in expediting e-learning acceptance among users in Bangladesh (Maisha & Shetu, 2023).

Technology Adoption Theories and Models on E-learning

E-learning is a mode of providing education through various techno-mediated platforms (Vanitha & Alathur, 2021). Over the past few years, several models and theories have been applied to explore the adoption behavior of e-learning (Baig, Shuib, & Yadegaridehkordi, 2022). People's perceptions and attitudes toward e-learning were examined in light of Rogers' innovation adoption theory, which confirmed that the influence of cost, quality, agility, schedule control, certification of degree, and personal demand on the adoption of e-learning (Zhang, Wen, Li, Fu, & Cui, 2010). The original technology acceptance model (TAM) (Davis, 1989) was applied to understand the adoption behavior of e-learning several times globally. Computer self-efficacy was found to influence perceived ease of use, whereas content quality was found to have influenced perceived usefulness (Y. Lee, 2006). Based on TAM, the UTAUT (Venkatesh, Morris, Davis, & Davis, 2003) the model was developed with a couple of extensions. The original UTAUT (Venkatesh et al., 2003) was applied to explain the adoption behavior of e-learning and confirmed the impact of performance expectancy, social influence, effort expectancy, and facilitating conditions on the intention to adopt e-learning and the subsequent use behavior (Perera & Abeysekera, 2022). The UTAUT 2 was applied to determine the factors predicting the behavioral intention of university students to use the e-learning platform, confirming the direct impact of the variables: performance expectancy, social influence, hedonic motivation, learning value, and habit on students' intention to use e-learning (G. Zacharis & Nikolopoulou, 2022).

The IS success model identifies the relationships among six critical dimensions, including the dimension of 'service quality' added in 2003 (W. DeLone & McLean, 2003). Due to its robustness, scholars have applied several models for assessing and developing e-learning, but this model can be useful in measuring challenges associated with e-learning (Perera & Abeysekera, 2022). The DeLone and McLean (D&M) (W. H. DeLone & McLean, 1992). The information systems (IS) success model was applied to understand how students' accessibility varies gender-wise, and it was found to have a significant and direct impact of e-service quality on system use and user satisfaction for both groups (Shams, Niazi, Gul, Mei, & Khan, 2022).

The General Extended Technology Acceptance Model for E-Learning (GETAMEL) was applied to measure students' acceptance of technology and found that subjective norms, experience of self-efficacy, and enjoyment had a positive impact on perceived ease of use, whereas self-efficacy and enjoyment had a significant impact on students' perceived usefulness (Abdullah, Ward, & Ahmed, 2016). Student's readiness for e-learning applications was measured by incorporating the TRI theory (Parasuraman, 2000) highlighting that students'

positive attitude towards e-learning gave them a feeling of optimism and innovativeness (Kaushik & Agrawal, 2021). Expectation-confirmation theory (ECT) (Bhattacharjee, 2001) was applied to understand factors leading to continued usage of e-learning technology and found that the intention to continue e-learning usage was influenced by education level, expectation, perceived performance, confirmation, and satisfaction (Chou, Lin, Woung, & Tsai, 2012).

The above literature sheds light on several aspects. Firstly, users' continuance intention to use e-learning was extensively studied before the pandemic, and few studies were made during the pandemic, but only a few studies were conducted in the post-COVID era globally. However, few studies have been conducted exemplifying Bangladesh, covering all the eras (before, during, and after). Secondly, the incorporation of variables: interactivity and control, and network externality in explaining phenomena was not seen extensively. Thirdly, the impact of facilitating conditions was seen to be studied widely without generalizing the aspects. Lastly, the application of GSCA approaches in analyzing models was not seen in e-learning. Therefore, the study was undertaken to address the above literature gaps.

DEVELOPMENT OF THE FRAMEWORK

Research Model

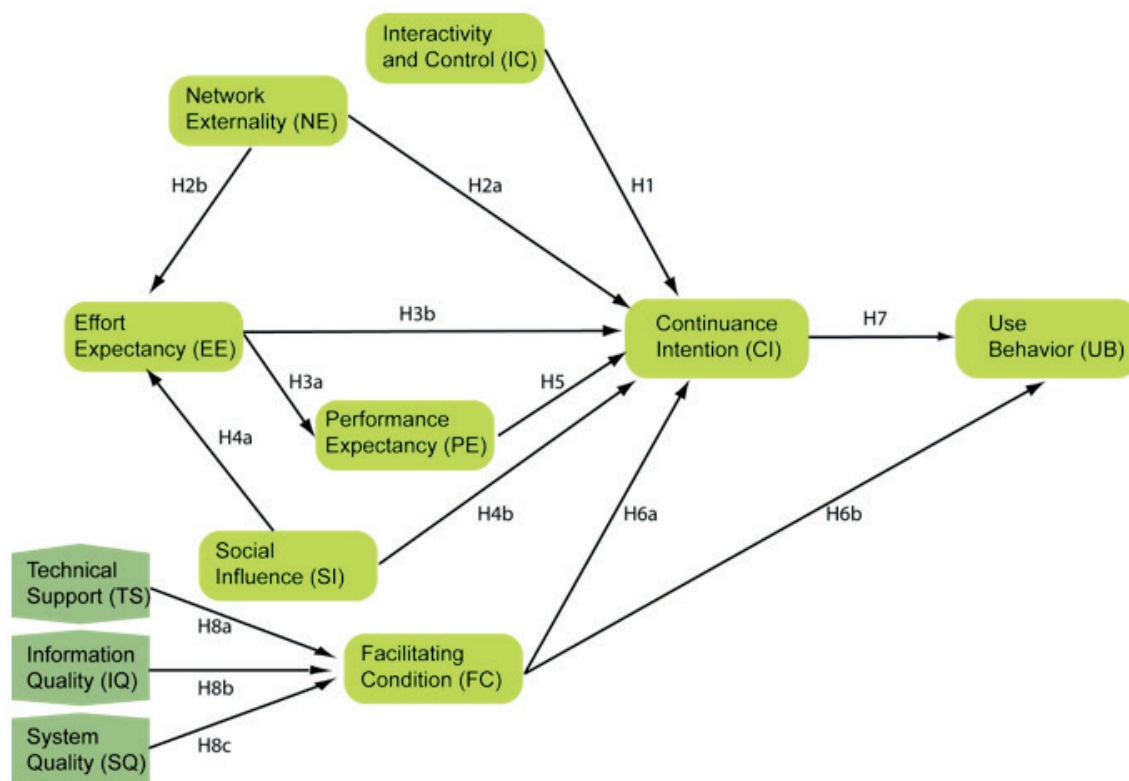


Figure 1. Integrated Model for Continued Use of Digital Learning (IMCUDL)

Source: Own illustration

Figure 1 shows the research model of the study conceptualized from prior research. The research model comprises endogenous and exogenous variables forming causal relationships between or among the variables. In the model (e.g., Figure 1), the construct “Facilitating Conditions” is the aggregation of technology support (TS), information quality (IQ), and system quality (SQ), which were declared as components of facilitating conditions in this study. The observed variables forming a component in a model are referred to as composite indicators (Bollen, 2011). Technical Support is generated by three composite indicators (TS1, TS2, and TS3). The composite indicators: IQ1, IQ2, IQ3, and IQ4 together generate the component

“Information Quality.” System Quality is reflected by four composite indicators: SQ1, SQ2, SQ3, and SQ4. The model has four endogenous and four exogenous variables. Arrows point toward endogenous constructs forming causal relationships between the variables. Each of the causal relationships is conceptualized in line with the literature discussed earlier. In this model, the variables TS, IQ, and SQ are the components that together form facilitating conditions. The variables used to conceptualize the models are largely adopted from UTAUT (Venkatesh et al., 2003), the IS success model (W. H. DeLone & McLean, 1992), E-learning technology acceptance model (Martinez-Torres et al., 2008). The variable network externality (Van den Ende, Wijnberg, Vogels, & Kerstens, 2003), Interactivity, and control (IC) (Martinez-Torres et al., 2008) have been added to the model to explain the phenomena observed, which are theoretically woven. In addition, the three constructs: TS, IS, and SQ adopted from the IS success model (W. DeLone & McLean, 2003) conceptualized as the components of facilitating conditions in this study.

Model Variable and Development of Hypotheses

Interactivity and Control (IC)

Interactivity and Control can be defined as “*The system characteristics by which users could interact with each other and control the form and content of a mediated environment.*” (Martinez-Torres et al., 2008). Content, interface, and system feedback—all of which rely on interaction—showed a strong correlation with learner satisfaction, which in turn affected learners’ intentions to continue learning (Kishabale, 2019). The relationship between interactivity and control (IC) and continuance intention has never been identified or shown in any study. However, Martinez-Torres et al., (2008) discovered a correlation between perceived utility and interaction and control (IC). Hence, the study proposes the following hypothesis:

H1: Interactivity and control (IC) will have a significant positive impact on continuous intention (CI) to use e-learning.

Network Externality (NE)

Network externality, also known as the Network effect (Liebowitz & Margolis, n.d.) can be defined as “*an increase in the utility of a product for a user as the number of other users of that product increases.*” (Van den Ende et al., 2003). According to Y. Lee (2002), network externality was determined to be the second most significant element influencing the adoption of e-learning, having a direct impact on usage intention, perceived usefulness, and perceived ease of use of the system. According to a study, users’ perceptions of the value of technology and their intention to continue using e-learning were directly impacted by network externality (Cheng, 2014a). In a study, it was found that network externality (NE) had a direct impact on users’ continuance intention to use e-learning and the perceived usefulness of technology (Cheng, 2014a). If educators or learners realize that other users are using the e-learning system, they will be motivated by the effect and try out the system (Y. Lee, 2006). The influence of NE on adoption was seen when Microsoft launched its operating system, namely Windows. The study, therefore, proposes the following hypotheses:

H2a: Network Externality (NE) will have a significant positive impact on continuous intention (CI) to use e-learning.

H2b: Network Externality (NE) will have a significant positive impact on effort expectancy (EE)

Effort Expectancy (EE)

The degree of flexibility and ease of use with which a user can use the technology of their choice is known as effort expectancy, and it is the primary determinant of the UTAUT model. Users are more likely to accept a technology when they discover that it is simple, hassle-free, and that they can operate it with little to no technical understanding (Venkatesh et al., 2003). Perceived ease of use (PEOU) and complexity are similar perspectives on EE (Utomo, Kurniasari, & Purnamaningsih, 2021). It was discovered that effort expectancy in adopting e-learning positively influenced behavioral intention to adopt e-learning, as well as performance expectancy (Mehta, Morris, Swinnerton, & Homer, 2019). Furthermore, according to Boateng, Mbrokoh, Boateng, Senyo, and Ansong (2016), perceived usefulness was positively impacted by perceived ease of use. Therefore, the study proposes the following hypotheses:

H3a: Effort Expectancy (EE) will have a positive and significant impact on Performance Expectancy (PE)

H3b: Effort Expectancy (EE) will have a positive and significant impact on continuous intention (CI)

Social Influence (SI)

“Social influence is the degree to which a person perceives or prioritizes the importance of other people’s beliefs and viewpoints about using technology.” (Venkatesh et al., 2003). Students’ behavioral intention to use e-learning was highly influenced by social learning (Tarhini, Masa’deh, Al-Busaidi, Mohammed, & Maqableh, 2017). This variable was formed in part by constructs including image, social circumstances, and subjective norms (Utomo et al., 2021)). According to Mehta et al. (2019), social influence had a beneficial impact on both behavioral intentions to adopt e-learning and performance expectancy. In a developing country, social influence positively influences behavioral intention to utilize e-learning (Maisha & Shetu, 2023). As a result, we postulated the following connections:

H4a: Social Influence (SI) will have a positive impact on effort expectancy (EE)

H5b: Social Influence (SI) will have a positive impact on continuous intention (CI)

Performance Expectancy (PE)

The degree to which users believe that utilizing the system will help them achieve their academic goals is known as performance expectancy, and it includes benefits and usefulness (Venkatesh et al., 2003). The expectation for effort and performance in e-learning both have a significant impact on how long people use it. Users are more likely to adopt e-learning if they believe it to be beneficial (M.-C. Lee, 2010). Combining elements, including perceived utility, external incentive, work fit, relative advantage, and outcome anticipation, resulted in performance expectancy (Utomo et al., 2021). According to Boateng et al. (2016), perceived usefulness did not affect e-learning intention behavior, but perceived simplicity of use had a favorable effect. The researcher, therefore, postulates the following hypothesis:

H5: Performance Expectancy (PE) will have a significant positive impact on continuous intention (CI)

Facilitating Condition (FC)

Facilitating conditions can be defined as *“the degree to which an individual believes that an organization and technical infrastructure exist to support the use of the system.”* (Venkatesh et al., 2003). The construct was built upon the idea of the perceived availability of internal and external resources (Park, Lee, & Yi, 2011). Factors, such as knowledge, resources, opportunities, and advice from marketers and peers, can reflect the construct (Venkatesh et al., 2003). Facilitating conditions can be reflected by network coverage or device operating system (Mahardika, Thomas, Ewing, & Japutra, 2019). Facilitating conditions encompass perceived behavioral control, facilitating conditions, and adaptability (Utomo et al., 2021). In the original study, it was declared as an independent variable. Facilitating Conditions, including accessibility to technological devices (laptops, smartphones, etc.), stable internet connection, training program, and non-technical external control, such as legal and regulatory protection, guidance, and control (Lu, Yu, & Liu, 2005) influences both intention and actual behavior (G. Zacharis & Nikolopoulou, 2022). The construct was conceptualized from compatibility, perceived behavioral control, and facilitating conditions taken from several models, such as TPB, CTAMTPB, MPCU, and IDT (Marikyan, 2023).

Facilitating conditions can be individual, i.e., individual abilities and knowledge, or organizational, such as infrastructure, and stakeholder support (Park et al., 2011). Facilitating conditions were reflected by financial resources, infrastructure, human resources, and educational content (Paul, Musa, & Nansubuga, 2015). Facilitating conditions were found to have influenced the perceived usefulness (Teo, 2010). A study confirmed the influence of facilitating conditions on perceived usefulness and perceived ease of use (Park et al., 2011). Based on the above discussion, the study therefore proposes the following hypotheses:

H6a: Facilitating Condition (FC) will have a positive impact on continuous intention (CI)

H6b: Facilitating condition (FC) will have a positive impact on use Behavior (UB)

Continuance Intention (CI)

Numerous studies identified continuance intention as the predicted variable. In the context of e-learning, the variable continuance intention was influenced by several predictors. On the other hand, the variable use behavior is a strongly predicted variable of continuance intention. In several studies, use behavior was influenced by facilitating conditions. Therefore, the researcher proposes the following hypothesis:

H7: Continuous intention (CI) will have a positive impact on use behavior (UB)

Technical Support (TS), Information Quality (IQ), and System Quality (SQ)

Technological dimensions underlie system quality, information quality, and service quality, which are the predictors of the variables: perceived usefulness and satisfaction in adopting e-learning (Vanitha & Alathur, 2021). Furthermore, the literature also clarifies the context of technology, which is composed of system quality, infrastructure, perceived ease of use, and learning experts (Ansong, Boateng, Boateng, & Effah, 2016). The effect of content quality was found to significantly influence the perceived usefulness of adopting an e-learning system (Y. Lee, 2006). E-learning content had an insignificant relationship with the intention to use e-learning, but had a positive significant relationship with users' satisfaction (Dash et al., 2022). In a study, system quality, content, information quality, and service quality have been labeled as components suitable for measuring e-learning system success (Hassanzadeh, Kanaani, & Elahi, 2012). System quality is reflected by flexibility and sophistication, whereas information quality is reflected by content and format (Gorla, Somers, & Wong, 2010). According to W. DeLone & McLean (2003), the quality of content produced by a system is known as "Information quality." It is also conceptualized as the ease of retrieving information stored securely (Y. W. Lee et al., 2002).

Gorla et al., (2010) introduced five constructs, such as content, accuracy, format, ease of use, and timeliness. System quality positively impacts information quality (Gorla et al., 2010). Ensuring necessary resources and support systems to expedite or facilitate the use of the system is a part of facilitating conditions. This can be ensured through collaboration with the technology provider, government agencies, and funders to secure necessary resources, such as infrastructure, funds, and technical assistance. Efforts on human capital development by offering training and professional development initiatives may aid the users in adopting emerging technologies (James, 2023). In this study, the construct "Facilitating Condition" is seen as a summary of the aggregation of observed variables of the constructs: technical support, information quality, and system quality. On the other hand, scholars identified several dimensions of the variable 'facilitating conditions' which are documented in the literature.

The term 'Network Coverage and operating system' was compared with the facilitating condition (Mahardika et al., 2019). Similarly, knowledge, resources, opportunities, and advice from marketers were narrowed down to the notion of facilitating conditions (Venkatesh et al., 2003). The term 'facilitating condition' is also compared with network coverage and the operating system of a device (Mahardika et al., 2019). In a study, it was shown that the concept of FC was originally theorized from perceived behavioral control and adaptability (Utomo et al., 2021). FC ranges from providing access to technological devices, such as laptops and smartphones, and a stable internet connection, etc., to non-technical external control, i.e., legal, and regulatory protection, guidance, and control (G. Zacharis & Nikolopoulou, 2022). In addition to that, FC also encompasses organizational support, including infrastructure and stakeholders (Park et al., 2011). Resources—including financial, infrastructural, and human, as well as educational content—are encompassed within the concept of FC (Paul et al., 2015). Based on the above findings on facilitating conditions, we formulate the following hypotheses:

H8a: Technical Support (TS) will be a component of the Facilitating Condition (FC)

H8b: Information Quality (IQ) will be a component of the Facilitating Condition (FC)

H8c: System Quality (SQ) will be a component of the Facilitating Condition (FC)

Use Behavior (UB)

In various studies, the concept of use behavior has been identified as the predicted variable of several factors. In the context of higher education, the notion is conceptualized as the way students use mobile devices for educational purposes (G. K. Zacharis, 2020).

RESEARCH DESIGN AND METHODOLOGY

Research Setting, Instrument, and Measure

The researcher conducted explanatory research to understand how the independent variable impacts the dependent variable in a non-contrived setting (field study) (Bagram & Altaf, 2009). The study adopted a survey approach, in which a structured and self-administered questionnaire comprising both open-ended and closed-ended items was designed by reviewing articles, case studies, and newspaper columns centered on a similar theme.

Table 1. Measurement Items and Sources

Variables	Items (Codes)	Statements	Adopted from
Performance expectancy (PE)	PE1	Using online tools enables me to accomplish my academic needs more quickly and efficiently.	(Almaiah, Alamri, & Al-Rahmi, 2019; Venkatesh et al., 2003)
	PE2	Using online tools enables me to accomplish tasks quicker than conducting classes face-to-face on campus.	
	PE3	Using online tools would improve my teaching performance.	
	PE4	Online tools enhance equity between all students (Example: The System offers an equal chance for students to carry out tasks and communicate with faculty)	
	PE5	Using online tools increases the quality of the teaching process.	
	PE6	Using online tools would enhance my effectiveness in teaching.	
Effort Expectancy (EE)	EE1	Learning to operate the e-learning tool (e.g., MS Teams, Google Classroom, Moodle) is easy for me.	(Chao, 2019)
	EE2	My interaction with the tool (e.g., MS team) is clear and understandable.	
	EE3	I would find the systems easy to use.	
	EE4	It is easy for me to become skillful in using the systems.	
	EE5	I would find it easy to get the online systems to do what I want it to do.	

Social Influence (SI)	SI1	My coworkers who influence me a lot think that I should use the Online systems.	(Venkatesh, Thong, & Xu, 2012)
	SI2	People (e.g., family members, opinion leaders) who are important to me think that I should use the system.	
	SI3	In general, my institution has supported the use of the system.	
Interactivity and Control (IC)	IC1	The e-learning system enables interactive communication between the instructor and students.	(Martinez-Torres et al., 2008)
	IC2	The e-learning system facilitates interactive communication between students and educators.	
	IC3	The communicational tools in the e-learning system (chat, e-mail, and forum) are effective in facilitating interactivity between the users.	
	IC4	The e-learning system provides an opportunity to control communication between instructors whenever students require it.	
	IC5	The e-learning system allows for the control of the learning sequence.	
Network Externality (NE)	NE1	Most educators in my department use the e-learning system.	(Cheng, 2014a)
	NE2	Most educators in my faculty use the e-learning system.	
	NE3	Most educators in my university use the e-learning system.	
	NE4	As more and more educators use the e-learning system, I think related services and support will soon be developed.	
Facilitating Condition (FC)	FC1	I have the resources necessary to use the e-learning system.	(Venkatesh et al., 2003)
	FC2	I have the knowledge necessary to use the e-learning system.	
	FC3	My institution provides support services or a center for dealing with technical issues of the e-learning system.	
	FC4	I have a flawless internet connection to support the use of e-learning tools at home or in the office.	
	FC5	To me, the Internet connection I use is not costly.	
	FC6	I always have access to a high-speed Internet connection from anywhere to use online systems to conduct classes and assessments (e.g., quizzes, and case studies).	
	FC7	The device I use to get connected is quite advanced and compatible.	
	FC8	All payments related to internet connection and recharge are paid using a mobile wallet, such as bkaash, or Rocket.	

Continuance Intention (CI)	CI1	I intend to use the tools in the future if an opportunity is given.	(Bhattacharjee, 2001; Cheng, 2014a)
	CI2	I plan to use online systems in the future whenever needed.	
	CI3	I predict I will use the system whenever I get instructed.	
	CI4	I would recommend this platform to my friends.	
	CI5	I intend to continue using the e-learning system in the future.	
Use Behavior (UB)	UB1	I prefer to conduct classes and take all assessments online if there is a need for this.	(Ifinedo, 2012)
	UB2	I like to use online platforms for educational purposes.	
	UB3	I often use e-learning platforms to boost my knowledge.	
	UB4	I very often use e-learning to conduct classes.	
Technical Support (TS)	TS1	The e-learning system tool provides useful assistance online when there is a problem.	(Tsai, 2015)
	TS2	E-mail inquiries can be made with the service provided when there is a problem.	
	TS3	The e-learning system offers good technical support	
Information Quality (IQ)	IQ1	The e-learning system provides a wealth of high-quality learning resources.	(W. DeLone & McLean, 2003)
	IQ2	The e-learning system provides courses with clear learning objectives.	
	IQ3	The e-learning system provides courses covering the main points.	
	IQ4	The courses offered by the e-learning system are very attractive to me	
System Quality (SQ)	SQ1	The e-learning system runs stably.	(W. DeLone & McLean, 2003)
	SQ2	The e-learning system has a fast response speed.	
	SQ3	The e-learning system has perfect functions.	
	SQ4	The e-learning system interface design is reasonable.	

The questionnaire of the study consisted of two parts. Part one comprised questions about the demographics of the respondents, whereas part two comprised questions to measure the factors impacting the continuance intention to use e-learning. All the questions in part two were distributed under eleven constructs. Questionnaire items were primarily selected from prior studies conducted on similar themes and contexts. The determinant 'Performance Expectancy' was measured by six observed variables: PE1 to PE6, and were adopted from (Almaiah et al., 2019; Venkatesh et al., 2003). The construct 'Effort Expectancy' was measured

by five items: EE1 to EE5, and largely adopted from (Chao, 2019). The unobserved variable 'Facilitating Condition' was measured by three observed variables: FC1, FC2, and FC3, and the observed variables were adopted from prior studies (Venkatesh et al., 2003). The latent variable 'Interactivity and Control' was measured by five statements (IC1 to IC5), which were adopted from a study (Martinez-Torres et al., 2008). The predictor 'Network Externality' was measured by items (NE1 to NE4) adopted from a study (Cheng, 2014). The dependent variables: Continuance Intention and Use Behavior were separately measured by items adopted from studies (Bhattacharjee, 2001; Cheng, 2014a) and (Ifinedo, 2012), respectively. The three items (TS1 to TS3) related to the component 'Technical Support' were adopted from the literature (Tsai, 2015). The remaining two components, Information Quality and System Quality, were measured by items adopted from the literature (W. DeLone & McLean, 2003). All the statements were measured in seven-point Likert scales ranging from Strongly Disagree (1) to Strongly Agree (7) (Ejdys, 2021).

Participants

Respondents of the study were users, including educators and learners of public, private, and international universities located across the country. The study covered only the full-fledged universities running under UGC guidelines. The study incorporated responses collected from users, including educators and learners at all levels of tertiary education in Bangladesh, including learners studying in public, private, and international HEIs operated in various regions, including urban and suburban areas throughout Bangladesh. The study is centered on identifying factors explaining e-learning adoption in the post-pandemic era in a developing country. A purposive non-probabilistic sampling technique (heterogeneous sampling) was opted for to reach out to the respondents, such as educators and learners. In purposive sampling, individuals are selected based on some criteria, and the research is guided by a quantitative research design (Rai & Thapa, 2015). To study the relationships, we employed the most suitable method, called the hypothetico-deductive method, in which the hypotheses were hypothesized based on theoretical and empirical contributions (Alami & El Idrissi, 2022). Hence, the study is positioned within positivist philosophy.

Data Collection Technique

Researchers designed an instrument comprising measures and scales largely adopted from prior studies. The instrument was handed out to approximately one hundred and thirty educators from thirty-five universities across the five divisions in Bangladesh for recording responses on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7). In the first round, a total of one hundred and six educators from twenty-seven universities responded, with a response rate of 81.53%. In the second round, a total of three hundred and fifty students from twenty-two institutions were invited to the survey. The link to the instrument was posted on a social media platform, i.e., Facebook. After carefully examining the data and minimizing non-response errors, the researchers validated the responses of four hundred and twenty-six participants, which exceeds the suggested sample size.

The sample size of the study was determined using a tool called G*Power, and the suggested sample size was 423. When determining the sample size, we opted for 0.80 as power on the G*Power tool, and the effect size and error were set to 0.10 (small) and 0.11, respectively (Faul, Erdfelder, Lang, & Buchner, 2007, p. 3).

Data Analysis

Scholars have incorporated various approaches to data analysis, such as CB-SEM and PLS-SEM, over time. Data analysis approaches are chosen depending on the research model and relationships identified between and among the variables. A researcher may opt for a simple OLS approach in a model where the independent variables are truly independent. PLS-SEM will be an excellent choice if the model is conceptualized using factors or determinants. In a situation where researchers need to conceptualize both the factors and components to understand a phenomenon, IGSCA-SEM is preferred over PLS-SEM. GSCA is the most general method for component-based SEM that can deal with models having both the components and factors (Hwang, Cho, & Choo, 2023).

In this study, collected data was coded into a spreadsheet and eyeballed to identify missing and non-response errors. The Excel dataset was taken to SPSS version 26 to generate descriptive analysis. To test hypotheses, GSCA Pro software was employed. A GSCA (Generalized Structured Component Analysis) Pro is a standalone structural equation modeling (SEM) software that implements three statistical methods for estimating models (Hwang, Cho, & Bank, 2021). Generalized structured component analysis (GSCA) is a component-based approach to structural equation modeling (Hwang & Takane, 2004). It has been argued that the SEM method developed for one domain and used for another may provide biased solutions (Hwang, Cho, et al., 2023). Studies show that IGSCA tends to perform better than PLS under various conditions (Hwang et al., 2021). Also, the method is a non-parametric method that does not require any distributional assumption, such as multivariate normality.

Despite limitations in estimating the mediation effect, the approach has emerged in marketing and psychometric literature as an alternative to structural equation modeling (Henseler, 2012). The use of the GSCA approach can be seen in health information systems, retail businesses, e-learning, digital libraries, financial technologies, websites, and more. The study's research model comprises factors and components together; hence, the IGSCA module of the GSCA software is more suitable for the analysis. The GSCA (Hwang et al., 2021) tool has three standalone modules: GSCA (model comprising components only), GSCAm (model comprising factors only), and IGSCA (model comprising factors and components). Depending on the research framework, a researcher can employ any of these.

Ethical Consideration

Research is a coordinated process that requires cooperation among many people in different disciplines; therefore, ethical standards are essential for any collaborative work (Gajjar, 2013). The study followed ethical principles to meet the global standard and increase acceptance of the results. The research was conducted with a substantial level of integrity, avoiding falsification, fabrication, and misrepresentation of data at any stage of reporting. The research instrument was shared with scholars working in similar areas for possible feedback and adjustment. The study did not use unpublished data other than researchers' survey results, and proper credits were cited where necessary to avoid plagiarism. The option for the 'third gender' was opted for under the gender category in the questionnaire to avoid discrimination based on sex and race. In addition, anonymity was maintained as individual data was not presented in the report. Respondents were given enough information about the research, the researcher, and the scope to establish contact further. Throughout the study, no monetary benefits or benefits in other forms were given to the respondents. The researcher did not violate any policies imposed by the institutions.

ANALYSIS AND RESULTS

Respondents' Profile

Table 2. Demographics of the respondents (N= 426)

Variables	Categories	Frequencies	Percentage
Participants and Gender	Educators		
	Male	77	18%
	Female	29	7%
	Learners		
	Male	215	50%
	Female	105	25%

Age	18-24	246	57.60%
	25-24	109	25.58%
	35-44	53	12.44%
	45-54	10	2.34%
	55-64	5	1.17%
	Above 64	3	0.70%
Academic fields	Technical (Science, Engineering)	171	40%
	Non-technical (Business, Economics, Law, and Social Science)	193	45%
	Both technical and non-technical	62	15%
Location	In Dhaka city	301	71%
	City outside Dhaka	125	29%
Usage status	More than three years	128	30%
	Less than three years	298	70%

Source: Survey result

As shown in Table 2, the participants of the study were educators (25%) and learners (75%) of different HEIs running under UGC guidelines, of whom 78% were male and 32% were female respondents. Among the educators, 18 % were male, and the remaining 7% were female respondents. In addition, the percentage of male and female respondents among learners was 50% and 25%, respectively. The majority (57%) of the respondents were aged between 18 and 24 years old. In addition, almost one-third of the respondents were between 25 and 24 years old. However, around 12% of participants belonged to the category of 34-44. Only 2.34% were between 45 and 54, and less than 1 % were aged over 64 years old.

Forty percent of the respondents were from a technical background. Conversely, 45% of the respondents were from a non-technical background. However, 15% of respondents were from both technical and non-technical backgrounds. Two-thirds (71%) of respondents resided in Dhaka city, and the remaining 29% lived in cities outside Dhaka. The usage status of e-learning shows an interesting scenario. The majority (70%) started using e-learning after the spread of the disease. Thirty percent of the respondents said that they were exposed to e-learning before the pandemic.

In addition, IGSCA was employed to estimate the research model. Considering 95% confidence intervals, the study prioritized 1000 bootstrap samples (Hwang, Sarstedt, Cho, Choo, & Ringle, 2023) to calculate the following model estimates.

Model Fit

Model Fit Measures

Table 3. Fit measures

FIT	FITs	FITm	GFI	SRMR
0.735	0.23	0.861	0.956	0.081

Source: Survey result

GSCA Pro provides several indices, such as GFI, SRMR, and FIT, to assess the adequacy of the overall model. As shown in Table 1, the calculated GFI value is 0.956, which is higher than the threshold of 0.91, and the estimated SRMR is 0.081, which is less than the cutoff of 0.10 (Hwang, Cho, et al., 2023). Overall, 73% of the total variance in all variables is explained by the model. In addition, the structural model explains 23% of the total variance of all components. Moreover, the measurement model explains 86% of the total variance in all indicators.

Measurement Model

Measurement Model Estimates for Factors

Table 4. Estimates for factors.

Factor/component	Indicator	Estimate	Loading SE	95% CI
Network Externality (NE)	NE1	0.84	0.027	0.788
	NE2	0.932	0.015	0.9
	NE3	0.847	0.029	0.788
	NE4	0.58	0.05	0.473
Effort Expectancy (EE)	EE1	0.744	0.036	0.677
	EE2	0.865	0.029	0.803
	EE3	0.822	0.03	0.763
	EE4	0.706	0.042	0.618
	EE5	0.675	0.044	0.586
Social Influence (SI)	SI1	0.928	0.035	0.804
	SI2	0.602	0.051	0.506
	SI3	0.506	0.054	0.405
Performance expectancy (PE)	PE1	0.573	0.044	0.484
	PE2	0.579	0.041	0.509 (Eliminated)
	PE3	0.754	0.043	0.667
	PE4	0.634	0.038	0.563 (Eliminated)
	PE5	0.755	0.04	0.676
	PE6	0.807	0.044	0.718
Interactivity and Control (IC)	IC1	0.836	0.031	0.77
	IC2	0.813	0.032	0.742
	IC3	0.721	0.037	0.645
	IC4	0.775	0.029	0.719
	IC5	0.684	0.039	0.609
Continuance Intention (CI)	CI1	0.763	0.042	0.678
	CI2	0.842	0.03	0.785
	CI3	0.806	0.028	0.753
	CI4	0.776	0.032	0.708
	CI5	0.811	0.03	0.757
Use Behavior (UB)	UB1	0.657	0.051	0.551
	UB2	0.768	0.048	0.686
	UB3	0.773	0.038	0.699
	UB4	0.603	0.061	0.504
Facilitating Condition (FC)	FC1	0.584	0.046	0.498 (Eliminated)
	FC2	0.338	0.066	0.202 (Eliminated)
	FC3	0.471	0.049	0.376 (Eliminated)
	FC4	0.797	0.035	0.733
	FC5	0.669	0.041	0.591
	FC6	0.73	0.052	0.632
	FC7	0.653	0.041	0.567 (Eliminated)
	FC8	0.546	0.052	0.436 (Eliminated)

Source: Survey result

All the estimates of the indicators are presented in column three of Table 4. From the above table, it can be seen that the estimates are above 0.40. In addition, a total of forty statements, which were distributed under eight factors, were analyzed using the IGSCA module of the GSCA tool, seven of which were eliminated for not achieving the cutoff points of a standard loading and adjusting the AVE values of the factors. Finally, the model was analyzed with thirty-three statements (indicators).

Measurement Model Estimates for Components

Table 5. Estimates for components.

Construct	Indicators	Weights			Loadings		
		Estimate	SE	95% CI	Estimate	SE	95% CI
Technical Support (TS)	TS1	0.473	0.019	0.439	0.827	0.02	0.786
	TS2	0.453	0.018	0.419	0.792	0.029	0.725
	TS3	0.378	0.023	0.328	0.662	0.049	0.549
Information Quality (IQ)	IQ1	0.347	0.019	0.319	0.755	0.03	0.695
	IQ2	0.346	0.016	0.316	0.786	0.026	0.73
	IQ3	0.319	0.015	0.285	0.704	0.037	0.627
	IQ4	0.32	0.016	0.289	0.754	0.031	0.685
System Quality (SQ)	SQ1	0.303	0.011	0.279	0.839	0.018	0.799
	SQ2	0.303	0.01	0.285	0.86	0.019	0.82
	SQ3	0.30	0.01	0.278	0.883	0.014	0.851
	SQ4	0.277	0.01	0.259	0.798	0.026	0.742

Source: Survey result

A total of eleven statements were analyzed in the module. As shown in Table 5, all estimates of the composite indicators distributed under the three components were loaded well, and the weights were of good size. From the above table, the weights of composite indicators of each of the components are closely related. All the loadings and weights are statistically significant because none of their 95% CIs contain zero, suggesting that the indicators are forming the corresponding components. Component loading estimates are statistically significant and large, suggesting that the components are highly related to their corresponding indicators.

Discriminant Validity Analysis

Fornell-Larcker Criterion Analysis

Table 6. Fornell-Larcker Criterion Analysis

	TS	IQ	SQ	NE	EE	SI	PE	IC	CI	UB	FC
TS	0.764										
IQ	0.505	0.75									
SQ	0.484	0.74	0.845								
NE	0.53	0.479	0.445	0.811							
EE	0.447	0.601	0.558	0.468	0.766						
SI	0.486	0.642	0.555	0.503	0.651	0.702					
PE	0.478	0.807	0.591	0.392	0.599	0.692	0.728				
IC	0.592	0.634	0.557	0.499	0.5	0.638	0.627	0.768			
CI	0.464	0.6	0.607	0.542	0.76	0.609	0.603	0.569	0.80		
UB	0.424	0.718	0.719	0.518	0.705	0.676	0.63	0.593	0.859	0.704	
FC	0.305	0.488	0.487	0.212	0.359	0.485	0.416	0.492	0.262	0.423	

Source: Survey result

Fornell-Larcker criterion analysis was conducted to check the discriminant validity of the measurement model. All the square roots of AVE values are higher up, bolded, and placed diagonally. As shown in Table 6, the value of each column is higher than the corresponding values of the same column, except for two variables: IQ and CI. The researcher, therefore, checked HTMT (Heterotrait–Monotrait) values for eight factors to check the factors' discriminant validity. As shown in Table 8 and Figure 2, it can be seen that all the values are below 0.9 or .85 (Hwang, Sarstedt, et al., 2023). Therefore, it can be claimed that the discriminant validity was well established. In addition, the constructs are positively correlated, and the strengths are marked as strong.

Structural Model

IGSCA's Estimates of Path Coefficients in the Structural Model

Table 7. Estimates for path coefficients.

Hypotheses	IV	DV	Estimate	SE	95% CI		Result
H7	CI	UB	0.803	0.038	0.708	0.856	Supported
H6b	FC	UB	0.213	0.045	0.129	0.304	Supported
H6a	FC	CI	-0.124	0.047	-0.215	-0.026	Not Supported
H1	IC	CI	0.174	0.078	0.014	0.315	Supported
H2a	NE	CI	0.158	0.058	0.048	0.272	Supported
H3b	EE	CI	0.54	0.077	0.387	0.683	Supported
H5	PE	CI	0.139	0.072	-0.005	0.273	Not Supported
H4b	SI	CI	0.03	0.083	-0.136	0.19	Not Supported
H2b	NE	EE	0.188	0.067	0.056	0.319	Supported
H4a	SI	EE	0.557	0.063	0.427	0.674	Supported
H3a	EE	PE	0.599	0.049	0.493	0.68	Supported
H8a	TS	FC	0.139	0.061	0.083	0.259	Supported
H8b	IQ	FC	0.27	0.077	0.113	0.42	Supported
H8c	SQ	FC	0.269	0.085	0.118	0.434	Supported

Source: Survey result

Structural Model

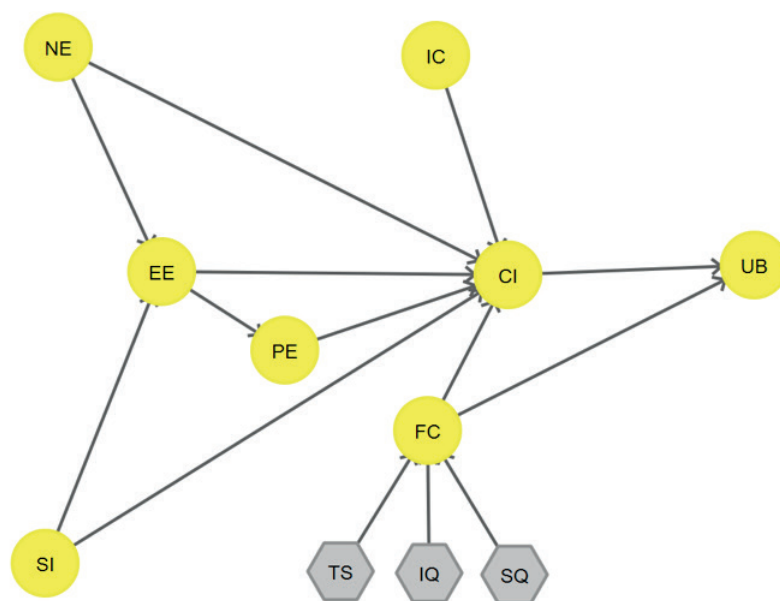


Figure 2. Structural Model
Source: Simulation output

As shown in Table 7, the path coefficients' estimates are placed across the estimate column. The larger the path coefficient estimate, the stronger the impact on the dependent variables is (Hwang, Cho, et al., 2023). Data show that the variable CI has the highest impact on UB (0.80, SE=0.038, 95% CI= [0.70, 0.85]), and the relationship is significant (95% confidence interval does not contain zero.) The variable EE has the second highest impact on PE (0.59, SE=0.49, 95% CI= [0.493, 0.68]) and the relationship is significant (95% confidence interval does not contain zero.) The variable SI also has the third highest effect on EE (0.557, SE=0.063, 95% CI= [0.427, 0.674]), and the variable EE has the fourth highest impact on CI (0.54, SE=0.077, 95% CI= [0.387, 0.683]); both the relationships are significant because the 95% confidence interval does not contain any zeros. Among the fourteen hypothesized paths, three hypothesized paths are statistically insignificant cause 95% of the CIs contain zeros. The impact of the components: TS, IQ, and SQ on FC is also significant. Among the components, SQ (0.269, SE=0.085, 95% CI= [0.118, 0.434]) and IQ (0.27, SE=0.077, 95% CI= [0.113, 0.42]) together have the highest impact on FC. The component TS has a significant impact on FC (0.139, SE=0.061, 95% CI= [0.083, 0.259]). All the components have positive significant relationships because the 95% confidence interval does not contain zero. FC (-0.124, SE=0.047, 95% CI= [-0.215, -0.026]) has an insignificant relationship on CI because the 95% confidence interval contains zero. PE (0.139, SE=0.072, 95% CI= [-0.005, 0.273]) also has an insignificant relationship on CI because the 95% confidence interval contains zero. SI (0.03, SE=0.083, 95% CI= [-0.136, 0.19]) has an insignificant relationship with EE because the 95% confidence interval contains zero.

Additional Metrics for Model Assessment in the IGSCA

Table 8. Additional estimates for the model assessments

	Cronbach's α	Rho	AVE	R2		
Network Externality (NE)	0.864	0.882	0.657			
Effort Expectancy (EE)	0.867	0.875	0.586	0.451		
Social Influence (SI)	0.646	0.732	0.493			
Performance Expectancy (PE)	0.797	0.816	0.53	0.359		
Interactivity and Control (IC)	0.870	0.877	0.59			
Continuance Intention (CI)	0.896	0.899	0.64	0.665		
Use Behavior (UB)	0.782	0.796	0.496	0.78		
Facilitating Condition (FC)	0.764	0.777	0.539	0.274		
Dimensionality		PVE				
Technical Support (TS)	1	0.584				
Information Quality (IQ)	1	0.563				
System Quality (SQ)	1	0.715				
HTMT						
IVs	DVs	Estimate	SE	95% CI	VIF	Effect size (f2)
CI	UB	0.875	0.029	0.787	1.073	1.822
FC	UB	0.443	0.062	0.279	1.073	0.047
FC	CI	0.269	0.057	0.102	1.439	0.016
IC	CI	0.588	0.055	0.408	2.194	0.031
NE	CI	0.593	0.05	0.448	1.525	0.026
EE	CI	0.775	0.043	0.634	1.958	0.411
PE	CI	0.639	0.044	0.514	2.303	0.02
SI	CI	0.729	0.049	0.599	2.758	0.001
NE	EE	0.513	0.055	0.34	1.339	0.037
SI	EE	0.790	0.044	0.657	1.339	0.449
EE	PE	0.634	0.049	0.5		0.559
TS	FC	0.384	0.061	0.227		0.03
IQ	FC	0.578	0.051	0.417		0.078
SQ	FC	0.538	0.052	0.377		0.078

Source: Survey result

As shown in the above table, 45% of the variance in EE is shared by NE and SI. In addition, 35% of the variance in PE is shared by EE. However, 66% of the variance in CI is shared by IC, NE, PE, SI, and FC. Furthermore, 78% of the variance in UB is shared by CI and FC. Finally, a 27% variance in FC is shared by the three components: TS, IQ, and SQ.

A reliability test was conducted for reflective indicators. As shown in Table 8, Cronbach's α and ρ_c values of the reflective indicators are above 0.70 but less than 0.95 (Hwang, Cho, et al., 2023). Thus, it can be concluded that the scales used in the study are reliable. Also, convergent validity was tested considering AVE (Average Variance Extracted), and the values are all above 0.50 (Hwang, Sarstedt, et al., 2023).

To assess the measurement model that involves components, the researcher investigated the composite indicators' dimensionality. The researcher found that each of the components has a dimensionality value of one, and the PVE (Proportion of Variance) value of SQ is greater than 0.7, but the values of TS and IQ are slightly below the cutoff point. (Hwang, Sarstedt, et al., 2023). The researcher wanted to know if there were multicollinearity issues in the dataset. The analysis shows that all the VIF values are smaller than 3 (Hwang, Cho, et al., 2023). This indicates that multicollinearity is not an issue in the dataset.

The effect size of the independent factor on the dependent factor was checked using f^2 . The effect sizes range from small for the effect of FC on UB (0.04), IC on CI (0.031), NE on CI (0.026), EE on CI (0.411), NE on EE (0.037) to large for the effect of EE on CI (0.411), CI on UB (1.822), SI on EE (0.559), EE on PE (0.559) (Hwang, Sarstedt, et al., 2023).

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

The research model comprising hypotheses was tested using a structural equation modeling tool. The study proved and refuted several relationships, which were consistent and inconsistent with the findings highlighted in the literature. In a developing country, users' continuance intention to use e-learning in the post-pandemic is impacted by several factors: IC, NE, NE via EE, EE, and SI via EE. The study established the direct impact of IC on CI to use e-learning, which is inconsistent with the findings shared by Kishabale (2019) in which the author confirmed a significant relationship of IC on continuance intention to use e-learning via learners' satisfaction. However, in a study in which Martinez-Torres et al., (2008) confirmed the significant relationship between IC and perceived usefulness. NE has a significant direct impact on users' continuance intention to use e-learning, which is consistent with the findings contributed by Y. Lee (2006) and Cheng (2014b). NE also has an indirect impact on CI via EE, which is also similar to the study conducted by Y. Lee (2006). EE has a direct impact on CI to use e-learning in Bangladesh. Furthermore, EE also has a significant impact on PE, but PE failed to have an impact on CI. The findings of the study are similar to the study conducted by Mehta, Morris, Swinnerton, & Homer. (2019).

In addition, SI has an insignificant impact on CI, which is inconsistent with the findings shared by Maisha & Shetu (2023) and Tarhini et al.,(2017). However, SI has a significant impact on EE and an indirect impact on CI via EE. In the literature, the impact of FC on CI and UB has been well-documented (G. Zacharis & Nikolopoulou, 2022). In this study, FC has a significant impact on UB, but FC did not significantly impact CI. The study identified CI as the strongest predictor of UB. UB is influenced by both the CI and FC and accounts for 78% of the variance in UB.

However, the three components: TS, IQ, and SQ accounted for 27% of the variance in FC, thus collectively making a significant impact on FC. The component TS is reflected by three composite indicators. IQ is reflected by four composite indicators, and SQ is reflected by three composite indicators. The weights of the composite indicators are close; therefore, they represent the respective components. The variable FC is the aggregation of the three components: TS, IQ, and SQ.

Furthermore, 35% of the variance in EE is shared by NE and SI; the remaining 74% of the variance is shared by other factors that are not shown in the study. NE has a significant positive impact on EE; likewise, SI also has a significant positive impact on EE. The two variables combined accounted for almost half of the variance in EE. Therefore, it can be predicted that the variables NE and SI can be called the antecedents of the factor EE, which also have significant positive impacts on CI and PE.

In the early 90s, knowledge used to be imparted using different technologies, e.g., the internet, extranet, satellite broadcast, audio/video tape, interactive TV, CD, or DVR. With the emergence of electronic learning, the notion of e-learning turned into a more robust and versatile one (Hassanzadeh et al., 2012). The phenomenon gave birth to many institutions providing electronic education globally. What was disputed once is now well-accepted by the majority. The increasing number of programs offered online makes the notion more accessible to learners. Learners continuously reap benefits from it.

The role of e-learning in imparting knowledge during the pandemic was vital. The process of disseminating knowledge was highly supported by e-learning platforms introduced by the government and initiatives put forward by the HEIs and regulatory bodies. The emergence of the notion was well accepted by the community, making them resilient, and eventually provoked several reactive measures, such as setting up support centers, modernizing infrastructure, educating facilitators, partnering with vendors, etc. The pandemic taught the HEIs how to operate education in times of uncertainty. The actors: educators, learners, regulatory bodies, and technologies formed a value network ensuring personalized and rich learning. In addition, learners showed a positive attitude toward the new notion and became accustomed to it.

The transition was much smoother because of the prior knowledge in dealing with e-learning tools. An elevated level of self-esteem, together with social influence, aided them in dealing with the technicalities with minimal or zero intervention. Learners' interaction with the tool was found to be clear and understandable, stimulating self-paced learning. The adoption rate was even noticeable when the country's internet service providers (ISPs) provided speedy internet. The compatibility issues were minimized by the devices available in the market. The country's vibrant digital wallet industry plays a major role in dealing with issues related to financing services. Combined efforts enforced the widespread adoption of e-learning tools and platforms, making the notion a part of the knowledge-imparting mechanism at the tertiary level. However, the transition was well managed by large universities, but not by small universities. Some users are reluctant to continue with e-learning due to the lack of policies to uphold the usage that they experienced during the pandemic, resulting in discontinuity in usage. Lastly, ongoing investment in technology and infrastructure, continuous innovation in pedagogy, interactive support service, and collaboration between HEIs and industry partners are mandatory to empower remote education. It is expected that, based on the lessons learned from the pandemic, the country's HEIs will be spearheaded to harness the power of e-learning toward establishing a sustainable, cutting-edge, and inclusive education system.

The following are the policies this study may put forward to augment continuance intention to embrace e-learning in Bangladesh:

1. HEIs should acquire or develop an industry-standard LMS to ensure the quality and clarity of educational content, as these tools are developed by professionals for professionals and have widespread features and functionality to support teaching and learning.
2. HEIs should provide industry-standard content creation platforms attuned to the needs of educators and learners to provide personalized learning experiences.
3. HEIs should facilitate self-directed and micro-learning opportunities crafted to the needs of learners.
4. The educators should be provided with additional technical resources and training facilities to increase self-esteem.
5. HEIs should set up one-stop centers for taking care of the mental health and well-being of both the learners and educators.
6. HEIs should provide digital devices and connectivity at reduced cost to ensure communication.
7. HEIs should arrange training, workshops, and symposiums to enrich the technical knowledge of the users with recent advancements.
8. Technology support and a help desk can be provided to assist users in solving technical issues round the clock.
9. Collaboration and communication with international organizations, governments, and NGOs can be nurtured in shaping the online education agenda.
10. Establishing a partnership between HEIs and the technology provided can unlock opportunities to ease e-learning technicalities.

11. Setting up technological infrastructure, including internet bandwidth, hardware, and software to facilitate e-learning.
12. Usage of interactive content should be encouraged by the education expert for inclusion in the lesson.
13. Institutional policy and strategic planning should be attuned to facilitate e-learning usage.
14. HEIs can impose incentives in several categories, encouraging educators to include e-learning tools and techniques.
15. Professional development opportunities should be provided to the educators in the form of training and higher studies, fostering e-learning usage.
16. HEIs should practice or nurture an innovative culture within the organization to teach and learn online.
17. E-newsletters or other means of communication can be enriched with information covering global and local e-learning usage information and the latest advancements.
18. HEIs should encourage opinion leaders, i.e., influencers, celebrities, and philanthropists, to promote the use of e-learning tools and techniques in academia.
19. Government or private organizations may arrange training on non-technical aspects, such as legal, regulatory, advisory, and governance, to foster the use of e-learning in HEIs.
20. Aligning organizational policies with stakeholders' perspectives and expectations is essential to ensuring the successful adoption and effective utilization of e-learning.

The research is centered on some selected dimensions and factors highlighted in the literature. The survey excluded university colleges (e.g., degree colleges under national universities) and open universities. The study is centered on the post-COVID era, excluding the pre-pandemic and pandemic phases. The study examined the continuance intention to accept a variety of educational technologies from users' perspectives, including educators and learners, without exploring the viewpoints of other stakeholders, such as vendors, developers, and support service personnel. The researchers prioritized the survey approach in obtaining the study, excluding the approaches of a qualitative and mixed study. The data collection phase was limited to one month. In addition, the study did not examine the benefits and challenges of EdTech in the post-pandemic era. All the suggested policies and recommendations are applicable and suitable only for the tertiary level, and findings may not be generalizable beyond the educational context of developing countries, such as Bangladesh.

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GENERATIVE AI IN HIGHER EDUCATION: UNIVERSITY FACULTY PERSPECTIVES ON OPPORTUNITIES AND CHALLENGES

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ABSTRACT

This study aims to understand how faculty members at higher education institutions in Pakistan respond to the opportunities and challenges associated with using GAI in teaching and learning. The research employed a phenomenological approach within the qualitative research tradition. Data were collected from 33 university faculty members through semi-structured interviews, which were analyzed thematically. Our analysis identified that ethical issues and overreliance were significant challenges to the use of GAI. Key ethical challenges included data privacy and security and the unethical use of GAI in exams and assessments. Shortcomings in GAI's ability to produce unreliable outputs in instances could lead to potential bias due to over reliance on it. Overreliance may also compromise human values and privacy, replace human critical thinking capabilities, and encourage cheating and plagiarism. The key opportunities associated with the use of GAI included improved learning outcomes and contextual integration of GAI. Using GAI was found to improve knowledge acquisition and research efficiency, offering access to a vast amount of information, entertaining personalized learning needs, and generating course content. Tailored use in specific subjects or learning scenarios was also found to be an opportunity associated with the use of GAI. It was also found beneficial for use in data-intensive processes such as analyzing a long text or summarizing a report. Although there are some shortcomings that need to be addressed, the findings confirm that GAI is a valuable tool for education. It has the potential to transform into an invaluable asset for faculty and students alike, enriching their learning experiences. The introduction of GAI has opened up new opportunities for transforming teaching, learning, and research. However, certain emerging challenges must be addressed. In this context, this study provides first-hand insights by analyzing teachers' responses.

Keywords: Generative AI, education, challenges, higher education, opportunities, university faculty.

INTRODUCTION

The groundbreaking advent of OpenAI's ChatGPT (Generative Pre-trained Transformer) (Brown et al., 2020) as a natural language processing model (Gilson et al., 2023) also termed as generative artificial intelligence (GAI) is another manifestation of the ongoing Fourth Industrial Revolution. Alawi (2023) exclaimed, "The future is here," with profound implications for practitioners and academics alike across all academic disciplines. The most surprising aspect is GAI's capability and the rigorous nature of its replies to the prompts (George et al., 2023). During the week of its launch, the response rate from users reached an amazing 180.5 million user figure (Duarte, 2024). The reaction of the research community has been spontaneous in all academic disciplines, including business, marketing, health, and education (Ali et al., 2023; Alawi, 2023; Bitzenbauer, 2023; Chatterjee & Dethlefs, 2023; Chocarro et al., 2023; Chan & Hu, 2023; Fuchs, 2023; Joksimovic et al., 2023; Mizumoto & Eguchi, 2023; Mohamed, 2023; Ray, 2023; Su et al., 2023). It is instructive to point out that education-related research is conspicuously more preoccupied with the risks or disadvantages of GAI for learning. GAI is regarded as a potential threat to the critical thinking and creativity of students due to the fact that its implementation could facilitate plagiarism and cheating, generate fabricated results, compromise the privacy and security of users, and supplant human instructors (Ajami & Karimi, 2023; Iskender, 2023). As a result, the reservations regarding GAI have even facilitated its prohibition in specific countries (Yang, 2023). Nevertheless, while simultaneously offering personalized learning environments and the ability to access a wealth of knowledge resources in a fraction of the time, it is lauded by many as a tremendous asset to learners (Bitzenbauer, 2023; Chocarro et al., 2023). Despite the considerable discourse surrounding the advantages and disadvantages of utilizing GAI for educational purposes, it may seem illogical to assert that it should be implemented for learning or banned. The full extent of its benefits and threats to learning remains unknown, as it is still in its nascent stages and requires additional time to develop a deeper understanding in this regard.

The purpose of this study encompasses three distinct aspects. First, there is limited research on GAI's educational use in general and acceptance because it is still in its infancy in education (Chen et al., 2020; Chocarro et al., 2023), as compared to other sectors like health and health education (Alawi, 2023; Johnson, 2023; Miao et al., 2023), business, and finance (Ajami & Karimi, 2023). For instance, ChatGPT's introduction was also accompanied by doubt (Wang & Guo, 2023). Second, there is a heated debate concerning the drawbacks of GAI as a threat to learning (Iskender, 2023). While these assumptions may appear rational to some extent, the lack of scientific data to support them renders such claims more dubious and unwarranted. Further understanding is necessary to make these claims rational or otherwise necessitate additional empirical evidence. Third, the available research is already concerned with the digital inequalities within communities across the globe (Johnson, 2023; Wang, 2013). Any differences in national or organizational responses may inadvertently further deepen the digital divide between those who have banned GAI and those who have not. More is explored in the context of developed and advanced societies (Dabis and Csaki, 2024), such as Türkiye, Sweden, Canada, and Australia (Firat, 2023) than the least developed societies from Africa (Nyaaba & Zhai, 2024) and Asia (Jaffar et al., 2024) in relation to a range of opportunities and challenges that GAI offers for education. Also, recent research is primarily concerned about the use of GAI by students in their learning and assessment (Johnston et al., 2024) or subjects like English (Liu and Ma, 2023; Mohamed, 2023) and Physics (Bitzenbauer, 2023). There is a need to understand GAI in multiple contexts, in both developed and least developed societies. Furthermore, a comprehensive cross-disciplinary approach can identify a broader array of challenges and opportunities for the collective good of GAI as an effective and relevant learning. As argued by Firat (2023), we need to further explore the implications of GAI for education to make it more productive, so educational institutions can best prepare for its integration. Al Murshidi et al. (2024) also found that understanding the limitations and risks of using GAI can encourage its use. Considering all these three key dimensions, this study is of significant importance in illuminating research, policy, and practices through communicating the responses of faculty members from higher education institutes (HEIs) in Pakistan. The study has the following research question:

- What opportunities and challenges do university faculty in Pakistan associate with the use of GAI in teaching and learning?

LITERATURE REVIEW

GAI has been found to offer numerous advancements over traditional bots or voice assistants currently available in the market such as understanding context from conversations, which enables it to respond more accurately than most existing solutions (George et al., 2023). GAI, like other forms of AI (artificial intelligence), has undeniably presented several prospects for knowledge acquisition. There exists a body of research that examines the utilization of GAI and its advantages and disadvantages in the context of education, including several areas like assessment, curriculum, and teachers' professional development (Cotton et al., 2023; Dabis and Csaki, 2024; Dawson et al., 2023; DuBose & Marshall, 2023; Eke, 2023; Finn, 2023; Firat, 2023; Goldman, 2023; Heimans et al., 2023; Liu et al., 2023; Lund et al., 2023; Ray, 2023; Whalen & Mouza, 2023). Research has found its use equally beneficial for both teachers and students. Teachers can use GAI to increase efficiency and provide support to supplement their instructional practices. Araya and Marber (2023) argued that GAI is increasingly woven into all stages of learning and education, including course design, one-on-one tutoring, note-taking, and task automation. While students, according to Cotton et al. (2023), can find GAI capable of offering benefits, such as increased engagement, collaboration, and accessibility in higher education. The most prominent learning facet of GAI, according to Chocarro et al. (2023), is its capability to address students' learning needs in a personalized way and on demand. According to Li et al. (2023), it has a huge capacity to produce high-quality reflections, even outperforming student written reflections in all assessment criteria. The authors argued that human evaluators could not accurately differentiate GAI-generated reflections from students' original work, highlighting the need for effective approaches to distinguish between the two.

There is a similar mix of responses encompassing the pros and cons of GAI use in learning. According to Bitzenbauer (2023), GAI integration had a positive effect on fostering critical thinking skills at the school level. However, they suggest its use with caution to avoid the associated limitations and biases. The aspect of bias is still crucial, in particular when students are using GAI according to their own priorities and judgments and without the guidance of the teachers. It is doubtful that they can avoid bias when using such a powerful tool. In this regard, Heimans et al. (2023) consider teachers' responses to promote subjectification as a remedy to empower students to think critically and independently, make informed decisions, and take meaningful advantage of using GAI.

Students can also use GAI as an illegal means to cheat in exams (Huh, 2003). The most pertinent arguments to combat this misuse of GAI involve prohibiting copying and pasting questions (Miao et al., 2023). In this regard, Dawson et al. (2023) also propose moving away from the traditional exams and considering a more nuanced approach to assessment.

There is also a range of other ethical issues (Blackshaw, 2023; Kumar, 2023), such as the ability of GAI to produce academic papers owned by learners and researchers as their own (Sardana et al., 2023), which constitutes outright plagiarism. (Eke, 2023). Likewise, GAI's capability to generate highly realistic synthetic text or speech that could be used to impersonate or deceive others is a violation of the user's privacy (Lund & Wang, 2023). In this regard, researchers call for transparency in the design, training, and deployment of GAI, including the data used to train the model, so that any potential biases or errors can be identified and addressed. This very suggestion remains relevant but is currently at the back of developers' minds. At the same time, a proper response to this challenge is still expected from the educational system. Cotton et al. (2023) suggest that universities should develop policies and procedures to ensure ethical and responsible use of GAI and other AI tools in higher education. These policies can work as institutional support to facilitate the integration of GAI (Nyaaba & Zhai, 2024). These are the initial responses to overcome the limitations of GAI and we need to be both cautious and optimistic about more sophisticated measures and procedures of the future (DuBose & Marshall, 2023). Sardana et al. (2023) rightly suggest continuity in research to reach meaningful use of GAI in learning.

Theoretical Framework

GAI, with the capability of responding to human queries (George et al., 2023) has generated an extensive debate on the pros and cons of its capabilities for education (Eke, 2023; Lund & Wang, 2023). The need for further clarity for its use by teachers has been highly emphasized. Teachers make the decision to use GAI based on their understanding of its functionality (Roger, 2014). Teachers' awareness of the benefits and shortcomings could be central to GAI's educational use. Teachers' response in this regard is highly significant. According to Lai (2017), a person's acceptance to use a new technology is also linked to how they perceive its potential to improve their performance. The fast technological development and constant incorporation of new devices and information systems continue to motivate research (Scherer et al., 2019) on factors that condition the acceptance of technology among educational users and contribute to the transformation of the teaching-learning process (Gros, 2016). In this regard, the technology acceptance model (TAM) rises as the dominant model in the educational context (Davis et al., 1989; Scherer et al., 2019). In the context of this study, TAM (Davis et al., 1989) is acknowledged as an important tool for understanding users' responses to new technology. TAM explains the users' behavioral intentions using two factors, namely the perceived usefulness of the new technology and its perceived ease of use. Perceived usefulness refers to the degree to which people believe that using a particular system would enhance their job performance (Davis et al., 1989). Perceived ease of use refers to the degree to which potential users believe that using a particular system would be free of effort or non-challenging (Davis et al., 1989).

One of the important aspects of TAM is that it is highly generalizable and allows easy transfer and application to different contexts (Venkatesh, 2000) through understanding users' intentions to implement a particular technology. It is highly relevant to understand one's intentions prior to implementing an educational innovation (Baloch et al., 2022). TAM also suggests that intention is directly related to actual behavior (Davis et al., 1989). Recent research on how people accept AI technology shows that people who think AI is easy to use, useful, innovative, and have a positive view of its usefulness are more likely to interact with chatbots and use them (Liu & Ma, 2022). Teachers' understanding of AI as an opportunity increases its acceptance and efficiency as they promote it as an instructional support tool. This study takes this perspective into account by using the theoretical lens of TAM to elucidate university faculty understanding in relation to the opportunities that GAI offers or the perceived usefulness and ease of GAI use (Davis et al., 1989). We perceive the faculty's ease of use in the context of associated challenges and the opportunities that GAI offers (Figure 1). According to Al Murshidi et al. (2024), these challenges and opportunities are related aspects and are often excluded from current technology acceptance models such as TAM.

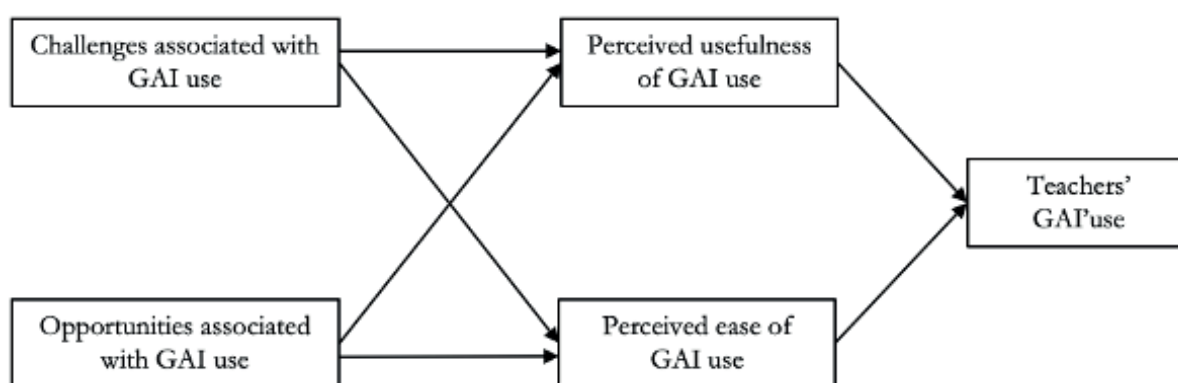


Figure 1. Study Framework (Adapted from Davis, 2003).

METHOD

This is a qualitative phenomenological study within the interpretivist paradigm of qualitative research (Miles et al., 2014). Phenomenology refers to a phenomenon that the researchers aim to understand through their respondents' perspectives (Neuman, 2014). In this study, opportunities and challenges associated with the use of GAI in teaching and learning were the phenomena that the authors aimed to explore using the

responses of the university teachers. The purpose of using a phenomenological approach is to generate insights and experiences that the participants hold about the pros and cons of GAI in teaching and learning (Grbich, 2013) by interacting with them in the actual setting (Patton, 2002). Thus, the purpose of this qualitative research is to illuminate the areas of GAI use in teaching and learning by exploring the voices of university teachers.

Participants

Purposefully selected university faculty from across the country participated in the research (Neuman, 2014). The aim was to recruit university faculty members who have engaged with GAI, thereby providing a valuable source of information (Patton, 1990) and facilitating a deeper and more pertinent understanding of the phenomenon. Initially, faculty members from various university disciplines were contacted via phone to gather information regarding their use of GAI and ascertain their willingness to participate. Their use of GAI was considered either for personal learning or instructional purposes. The communication yielded 33 respondents (R01 to R33) from across Pakistan, with a proportion of 17 males and 16 females. The sample size of the study was mostly attributed to the recruitment criteria, which specifically targeted individuals with prior experience using GAI. Given the current circumstances, one could argue that the sample provided is the most representative available, especially considering the limited application of GAI in education throughout Pakistan, as noted during the participant recruitment process. Out of the 139 participants we contacted, only 47 had knowledge of GAI, and 33 agreed to take part in the study. The use of open-ended interview questions facilitated the acquisition of a substantial amount of data (Ogden & Cornwell, 2010), enhancing the relevance and appropriateness of the sample size. The participants were made acquainted with the purpose of the study; voluntary participation consents were collected prior to data collection.

In this study, gender and other factors, like qualifications and experience, were not analyzed. Table 1 shows that faculty members represent almost all the faculties, including engineering, social sciences, humanities, and natural sciences. The majority of the participants (49%) held a PhD, while 51% held an MPhil or MSc. Their teaching experience falls in the range of 3–23 years.

Table 1. Participants' Demographics

S. No	Participant ID	Gender	Qualification	Experience (in years)
1	R01	Male	PhD	17
2	R02	Female	PhD	14
3	R03	Female	MPhil	10
4	R04	Male	PhD	13
5	R05	Male	PhD	19
6	R06	Male	PhD	21
7	R07	Female	MS	10
8	R08	Male	MS	11
9	R09	Male	MS	13
10	R10	Female	PhD	15
11	R11	Male	PhD	22
12	R12	Female	PhD	18
13	R13	Female	PhD	19
14	R14	Female	MS	11
15	R15	Female	MPhil	10
16	R16	Male	MPhil	16

17	R17	Male	MS	7
18	R18	Male	PhD	11
19	R19	Female	MPhil	3
20	R20	Male	PhD	14
21	R21	Female	PhD	11
22	R22	Female	MPhil	6
23	R23	Female	MPhil	4
24	R24	Male	PhD	10
25	R25	Male	MPhil	9
26	R26	Male	PhD	13
27	R27	Female	MS	5
28	R28	Male	MS	12
29	R29	Female	MPhil	5
30	R30	Female	MPhil	4
31	R31	Male	PhD	9
32	R32	Male	PhD	11
33	R33	Female	MPhil	3

Data Collection and Analysis

We conducted interviews both online via Zoom and in person. Each interview lasted between 35 and 40 minutes. We transcribed the interviews verbatim to ensure that they captured the nuances and richness of participants' responses. Interviews were translated from Urdu to English, considering the genuineness of the data (Halai, 2007; Khilji & Jomezai, 2024). A co-researcher, an expert in bilingual data translation, conducted reverse translation (Brislin, 1970) for each transcript. This process involved translating the transcripts that had been converted to English back into Urdu to validate the accuracy of the initial translation. The sampled interview questions included: What is your initial response to GAI as an instructional tool? What challenges do you find associated with GAI use in teaching and learning? And what opportunities do you find associated with GAI use in teaching and learning? The literature (e.g., Ajami and Karimi, 2023; Chan et al., 2023; Cotton et al., 2023; Fuchs, 2023; Ray, 2023) guided the development of the interview questions. Data analysis in qualitative research is a critical phase. It involves a systematic search and arrangement of information gathered from non-numerical sources, including interviews, observations, and textual analysis (Creswell, 2006). It illustrates the data in detail and deals with diverse subjects via interpretations (Boyatzis, 1998). This study employed Braun and Clarke's (2006) thematic analysis framework for data analysis. The steps for thematic analysis consisted of 1) getting familiar with the data, 2) generating codes, 3) generating themes, 4) reviewing themes, 5) defining and naming themes, and 6) locating examples.

For the first step, the authors reviewed all the interview transcripts and finalized them after several deliberations. The authors then generated codes to assign descriptive labels to the data with the aim of helping researchers develop their theories and hypotheses (Auerbach & Silverstein, 2003). Codes were generated deductively by creating a code manual that included two main categories: challenges and opportunities. After coding the data, preliminary themes were formed through the categorization of codes that shared common meanings. Subsequently, preliminary themes were assessed in relation to both the coded data and the entire dataset. This procedure was carried out to guarantee that codes corresponded to themes accurately and that themes adequately guided the interpretation of the dataset with respect to the research inquiry. Themes underwent a process of revision and refinement. The themes were designated with names that encapsulated their meaning. The culminating task involved composing a thematic analysis report, which entailed choosing data extracts that encapsulated the fundamental concepts of each theme.

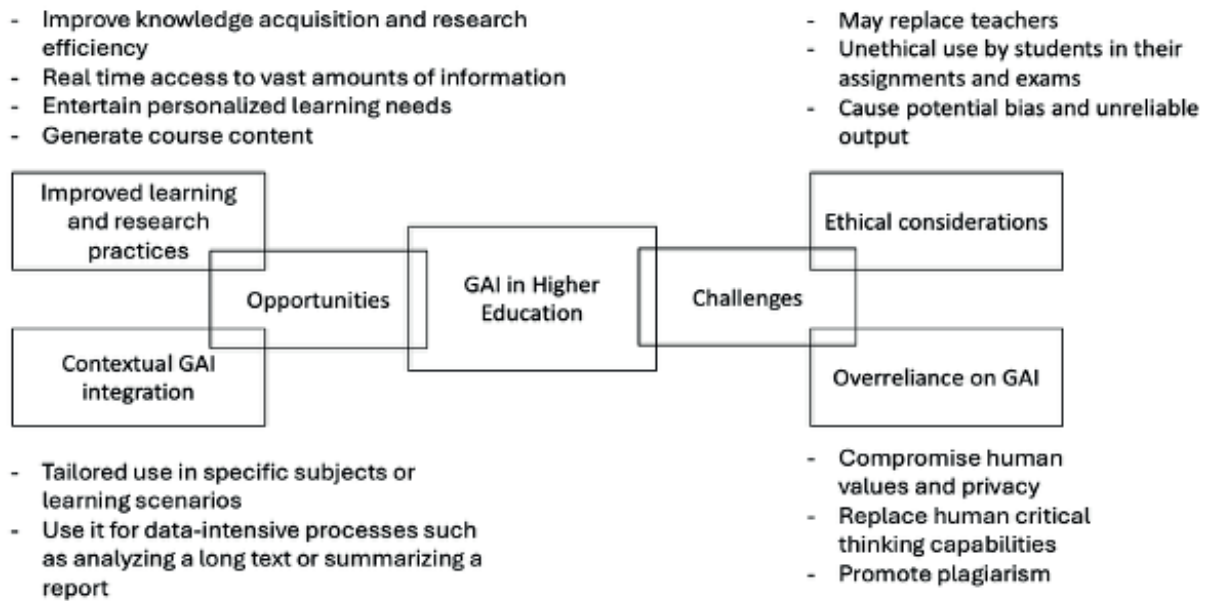


Figure 2. Visual Presentation of the Results (Source: Authors).

RESULTS

This section presents the results of the study.

Challenges

Overreliance on GAI

Respondents viewed overreliance on GAI is a significant challenge. This excessive reliance refers to an overdependence on its capabilities without considering its limitations or potential drawbacks. For the majority of the participants, such a reliance led to the replacement of humans. In this regard, one participant stated:

"I fear that these AI [GAI] will eventually replace us [teachers] and take over the role of teaching students. Additionally, I believe that learners will increasingly depend on them [GAIs], as they provide more than we do. It is more intriguing and fun for learners and consumes less time." (R12).

The primary concern for the participants was the use of GAI by students for their assignments and exams. They were particularly worried about losing control over the assessment of students' work, regardless of whether it was produced by the students themselves or generated by GAI. One respondent expressed the view:

"This is more technical [banning GAI], which I have no idea about. What I know is that it should not be allowed for students, whether in their assignments or exams. Because it will really make them dependent and overly dependent on it [GAI]." (R07)

The majority of the respondents shared their past experiences, noting that their students had already begun using other AIs for their assignments. One respondent observed a concerning level of improvement in the quality of students' work, despite believing that the students themselves lacked the necessary intelligence and capability to achieve such results independently. Likewise, they considered themselves incapable of making such modifications and would be over reliant on the use of these tools.

One of the primary challenges our results highlighted was the overreliance of learners on GAI. The respondent noted that addressing this overreliance posed a significant problem that individuals could not manage alone, indicating the need for a coordinated, system-wide response. According to them, the ultimate solution was to stop using GAI in the learning process.

Ethical Considerations

The participants raised concerns regarding GAI's potential effects on personal values and privacy, along with its ability to supplant human cognitive functions. They considered GAI to have the capability of generating content that may influence or shape personal values and beliefs. According to one participant, GAI was a threat to their religious ideology and cultural values. A respondent asserted:

"I am very concerned about our young generation being empowered to use GAI without any guidance. They may interact with it without taking into account cultural and religious values, as GAI provides information without any filtering." (R20)

The ethical aspect also included taking others' material and claiming it as their own. The respondents considered it cheating and an illegal means of knowledge acquisition, while some termed it knowledge stealing. The participants acknowledged instances of faculty members committing plagiarism by utilizing other AIs to paraphrase existing work and subsequently publishing it under their own names. One participant commented:

"I am sure that we [the faculty] will use it for publication—maybe not everyone, but most of us, I believe. I need publications for my career mobility, and I may consider this [GAI] a blessing in this regard. It is a rather bitter truth that we do not allow our students to plagiarize, but we have proven cases of plagiarism, and I see more to come, which is also an ethical dilemma." (R32)

The respondents expressed concerns about the ethical implications, yet they lacked viable solutions. They primarily hoped for positive outcomes and regarded human integrity as essential for addressing the ethical challenges related to the GAI. Additionally, the processes for ensuring validity and reliability in data collection and analysis should be adequately detailed.

Opportunities

Improved Learning and Research Practices

The respondents were optimistic about the potential benefits of AI in education, including enhanced knowledge acquisition and greater research efficiency. They believed that GAI has the capability to provide real-time access to vast amounts of information and offers learners a diverse range of resources and perspectives to enhance their understanding of various subjects. More importantly, it offered learners greater opportunities to address their personalized learning needs at their own pace. A respondent argued:

"It's great, and we must admit that it helps students learn what they want, how they want, and when they want. It can truly function as a personalized tutor, adapting content to individual learning styles and paces, thereby optimizing the learning process for each student." (R03).

The respondents also emphasized that GAI could potentially replace providers of short courses or customized programs for students and professionals. They expressed concerns that the future of some online courses with limited content may become obsolete due to the advancements brought by GAI. One respondent stated:

"I guess they [those offering short courses] will remain valid as they offer certificates, but I guess soon AI may be allowed to grant certificates, and such organizations may be in trouble. It is better for them to take GAI as a friend and use it for their programs rather than competing with it." (R11).

The respondents viewed GAI as playing a significant role in their professional development, as it may assist them in generating content for their courses and creating engaging assessment tasks for their students. Some saw this as an opportunity to compete with researchers who are native English speakers. In this context, one participant shared the following opinion:

"How well did I write? I wasn't perfect, and nearly all the comments on my paper pointed out that I was a nonnative speaker in terms of my writing abilities. I've noticed significant differences in the reviewers' feedback about my English since I began using AI editing tools. I view GAI as an opportunity for nonnative speakers when we use it wisely to enhance our English writing." (R31).

The participants' responses position GAI as a valuable resource for both students and faculty, creating opportunities for learning and facilitating ease of use regarding the pace and intensity of information. Additionally, faculty members' recognition of GAI as a supportive tool for their own publications enhances its value for them.

Contextual GAI Integration

The respondents advocated for the selective use of GAI in education, emphasizing the importance of tailoring its implementation to specific subjects or learning scenarios. This strategy aims to harness GAI's strengths where they are most effective while remaining aware of its limitations in other contexts. A participant explained this integration of GAI by stating:

"We need to understand the specific needs of the subject before using GAI. For instance, GAI is likely to be more beneficial for data-intensive tasks, such as analyzing lengthy texts or summarizing reports. This advantage makes it particularly relevant in fields like English language editing. Additionally, it could be especially beneficial for engineers, as they frequently need to manage extensive documents and large sets of data." (R06).

Likewise, the participants considered teachers from computer science, engineering, and English language departments to have an edge and relevance to using GAI. Such contextual GAI integration opportunities involve customizing its implementation to match the specific skills, needs, and requirements of the subject or learning situation. One of the respondents highlighted an intriguing point by adding that GAI-generated content may lack creativity or emotional intelligence, which are vital aspects of some educational experiences. Respect for privacy and the need to avoid perpetuating biases were highlighted as important areas in which the use of GAI should be limited. The respondents also stressed the importance of tailoring and aligning GAI with particular contextual needs, which was a vital component of its integration in this setting.

DISCUSSIONS

The study's findings aim to address three primary objectives by exploring the perspectives of university faculty members. The objectives included expanding the empirical foundation for the use of GAI in education. Specifically, there is a lack of research examining whether the ongoing debate about the drawbacks of GAI justifies its prohibition in learning (Iskender, 2023; Yang, 2023) and whether such a restriction might worsen the existing digital divide among communities worldwide (Jogezai et al., 2021). The results offer an explanation for the significant observations regarding the educational use of GAI.

The results highlight both the drawbacks and benefits of GAI in educational contexts, which have been well-documented in prior research. The study identified several key challenges associated with the use of GAI in learning, including uncertainties and limitations, overreliance, and ethical considerations. Ethical concerns encompassed the potential impact of GAI on personal values and privacy, along with the significant issue of plagiarism. The respondents also expressed worries about overreliance on GAI, particularly regarding the possible replacement of teachers and the authenticity of assessments. These findings match what other studies have said about the risks of using GAI in education. However, the results of this study emphasize that there must be human validation of knowledge produced by GAI to ensure its reliability and effectiveness. This reliability will help minimize the excessive overreliance on GAI and other AI tools and overcome the fear of GAI replacing teachers (Chan & Tsi, 2024). This approach emphasizes the importance of thoroughly understanding GAI as an innovation and the overall system to make necessary adjustments. For example, GAI's capability of editing English texts for nonnative English speakers can be a tremendous support for their research endeavors and teaching English as a second language. Likewise, GAI can significantly support the development of assessment tools to evaluate students' work. Our results support the notion that incorporating GAI into the educational system yields advantages, such as enhanced research and learning efficiency, personalized tutoring, and adapting material to the unique learning styles and pace of learners. It may substitute for specific short courses and assist non-native researchers in enhancing their academic rigor and writing. This all can happen if teachers are able to understand the benefits and shortcomings of GAI use. We, therefore, support Al Murshid et al. (2024), who found that awareness of the potential benefits is related

to the intention to use GAI because awareness of limitations and the intention to use GAI are positively related. Constraints of new technologies, therefore, may not always act as a barrier to their use.

Additionally, it is crucial to develop a systemwide capability that accommodates the strengths and shortcomings of GAI. The study found GAI to be a threat when education's system-wide characteristics are prone to its negative effects. A memory-based examination and assessment, for example, required reforms at the end of the education system rather than only blaming GAI for promoting cheating and illegal means. While Cotton et al. (2023) are right to think about how to improve education, Huh (2023) and Dawson et al. (2023) say that the assessment system, for example, needs to move beyond its traditional memory-based learning and an assessment mindset of closed versus open book exams and instead think about changing exams in a way that includes various different task modalities, such as graphs and figures that GAI and language models may have trouble with. According to Sardana et al. (2023) and Eke (2023), the education system will only be able to resolve issues of plagiarism and academic integrity at that point. The education system, therefore, needs to look beyond students' assessments, consider GAI within the broader context of its benefits for learners, and overcome the fear that we associate with the use of GAI in learning by making structural reforms and promoting the understanding of GAI through staff capacity building. This study agrees with Lund and Wang (2023) on the importance of being open about how GAI is designed, trained, and used, including the data used to train the model, so we can spot and fix any possible biases or mistakes. We also need to empower students to think critically (Bitzenbauer, 2023) and independently, make informed decisions, and take the meaningful option of using GAI, as argued by Heimans et al. (2023).

It is obvious from the results of this study that we cannot simply reject and ban an innovation, such as GAI. We need to be cautious and mindful of the continuous evolution of innovations and modifications of the education system to meet new realities and needs. Wang and Guo (2023) have rightly argued that the emergence of new educational technology is always accompanied by doubt, vigilance, and rejection from the traditional community. Research, therefore, needs to be abreast of the innovative and productive use of GAI by addressing the associated worries and concerns. The arguments of DuBose and Marshall (2023) are very relevant, and this study also supports their idea that we need to be optimistic about more sophisticated measures and procedures surfacing with the passage of time. We need to take GAI and other AI models as valuable tools, and they should be used as aids rather than replacements for human intelligence and decision-making. An intriguing and significant discovery pertains to the prioritization of contextual preferences and preparedness for utilizing GAI. Context is understood in terms of subject areas and areas of expertise, as the results of this study indicated. Data collection from a diverse group in terms of subject expertise supplements the literature by making the findings more applicable to diverse contexts. Therefore, it is necessary to align GAI with diverse learning requirements while remaining cognizant of its limitations and loopholes within the education system. Only then can we expect that GAI and other AIs will be increasingly and meaningfully woven into all stages of learning and education, including course and curriculum design (Finn, 2023), one-on-one tutoring, note-taking, and task automation (Araya & Marber, 2023).

Without taking on a balanced approach, considering the pros and cons of innovation and education, we should not jump to the conclusion that an innovation, such as GAI, is either a threat or a blessing to learning. Such an approach can overcome digital inequalities, which, in the case of bans, may further strengthen the digital divide. We need to address the challenges and shortcomings associated with its use with more responsibility and rigor. As Ray (2023) suggests, teachers, students, and researchers can responsibly use GAI to advance human knowledge and understanding. The discussions emphasize the value of responsible AI use and the need for further research and collaboration to address these issues effectively. We also need to distinguish machines from living beings and be confident that our lives take precedence over the "lives" of machines (Blackshaw, 2023).

IMPLICATIONS

This study revealed opportunities for improved learning and research, as well as the importance of contextual GAI integration. It is crucial to understand that not all educational contexts may benefit equally from GAI. This contextual nature of GAI integration has implications for a cross-context understanding of GAI (Johnson, 2023). We can gain insights from the successful, ineffective, or potentially harmful effects of GAI

in one context and apply them to another. Here, “context” encompasses not just geographical factors but also broader educational systems, including various pedagogical approaches such as reflective, participatory, and passive learning. These approaches will significantly influence the impact of GAI. The context also includes subjects like English and physics, which are open to using GAI, so it is important to understand it in all areas of study.

A significant implication is the need to consider how the education system is evolving, with pedagogies becoming more democratic and liberal, and teachers transitioning into roles as facilitators and learners rather than merely being sources of information. DuBose and Marshall (2023) suggest that GAI will develop and change our society or the education system in this context. There is also a lack of understanding of GAI, especially regarding its technical modalities and how they relate to teaching and learning. The very implication for educators, administrators, and policymakers is to proactively seek to educate themselves and their students on how to use GAI and other AI not only morally and ethically (Whalen & Mouza, 2023) but also for developing curricula and pedagogies. The moral and ethical dimensions are obvious, but we also need to be aware of the fact that the implications of GAI and ethics are to intertwine and evolve together (Kumar, 2023). It is human value judgment that, for example, must draw implications from machine-made and data-driven decisions (Brantley, 2023). It is recommended that GAI be used in conjunction with human decision-making rather than replacing it entirely to ensure that the decisions made are ethical and responsible (Ray, 2023).

The integrity-related dimension is yet another concern with the integration of GAI. Within the realm of education and scholarly investigation, the utilization of GAI necessitates the establishment of policies and protocols that facilitate its ethical and principled application. Regrettably, the present state of affairs lacks dependable AI tools capable of discerning the authorship of a given text as either human or machine-generated (Heimans et al., 2023). This problem is a prominent grievance for academia and research and must be considered in future research.

CONCLUSION

The integration of GAI in education presents opportunities and challenges. Acknowledging the uncertainty surrounding AI's limitations calls for continuous evaluation and refinement. By taking a responsible and cautious approach to GAI integration, we can make it beneficial for education and learning while mitigating potential risks and challenges. By safeguarding personal information, promoting transparency, and recognizing the limitations of GAI, we can ensure that GAI applications enhance human experiences while respecting individual rights and values. Addressing ethical considerations is critical for guaranteeing responsible GAI deployment and safeguarding personal values, privacy, and individual rights. GAI can be a valuable tool to enhance the learning process, but it should not replace human teachers or hinder critical thinking, or creativity in students. By maintaining a balanced approach, we can overcome the limitations of GAI and the shortcomings of the education system. This approach will help to conduct a critical analysis of the pros and cons of the GAI for learning while at the same time considering the negative effects of the innovation. With a human-centric focus, education can harness the benefits of GAI while preserving the unique qualities that only human educators can provide. By considering these principles, we can harness GAI's potential while respecting its limitations. We conclude that a balanced approach is needed to avoid excessive reliance on AI and preserve human-centric learning experiences.

LIMITATIONS AND FUTURE RESEARCH RECOMMENDATIONS

Prior to interpreting the results of this study, it is important to acknowledge and consider two limitations. This study employed a qualitative research design and was conducted within a specific geographical area, utilizing a limited sample size. As a result, caution should be exercised when attempting to extrapolate the findings to broader contexts. Furthermore, the current study did not investigate how GAI could be used in the real world to help people learn. This is because GAI is still new, and its uses and educational implications are not well known, especially among participants from less developed countries such as where this study was conducted. To overcome these limitations, future research endeavors should consider the utilization

of larger and more diverse samples. Employing longitudinal and cross-sectional designs would enable the tracking of changes in faculty perceptions of GAI over an extended period of time. This approach would also facilitate exploration of the integration of such technologies within the context of higher education. It is imperative to investigate the relationship between the utilization of generative AI and its impact on learning outcomes. It is also recommended that future research endeavors focus on investigating university faculty with varying academic histories and demographics, including age, gender, and cultural settings, in relation to their proficiency in and attitudes to GAI.

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CAN SELF-MADE VIDEOS PROMOTE L2 SPEAKING SKILLS IN A MOOC-BASED FLIPPED CLASSROOM MODEL?

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ABSTRACT

This study explored the impact of self-made videos as a pre-class activity within a flipped classroom (FC) approach, using a Massive Open Online Course (MOOC) as the primary online learning content. The focus was on assessing the effect of these self-made videos on pre-service English language teachers' foreign/second language (L2) speaking performance and course achievement in a MOOC-based FC model. The study was conducted at a Turkish state university with two cohorts of English as a foreign language (EFL) freshmen enrolled in the English Language Teaching (ELT) program during the fall semester of the 2022-2023 academic year. A quasi-experimental design was employed, involving pre-tests, an intervention, and post-tests. The findings revealed a significant positive impact of self-made videos on both L2 speaking performance and course achievement in the MOOC-based FC model. These results suggest that integrating self-made videos into pre-class activities can be a valuable strategy for enhancing L2 learning outcomes of EFL learners in flipped classroom settings.

Keywords: Pre-service English language teachers, pedagogical framework, student-centred learning, active learning, EFL learners.

INTRODUCTION

The COVID-19 crisis has revealed some of the limits of the traditional classroom instruction. It has emerged that the global lockdown of education institutions has disrupted the traditional education systems around the world (Babbar & Gupta, 2022). It has also showed us that what learners need from teachers can vary in the face of changing external and internal conditions, which would require teachers to make an additional effort in terms of the flexibility to develop their professional role as facilitators of learning processes (Bozkurt et al., 2022). Therefore, teachers should be ready to adopt blended learning including self-studying, classroom-based learning and online forms of learning since blended learning approaches seem to be the future of education (Kanwar & Ogan, 2021).

The Flipped Classroom (FC) instructional approach, an extension of classroom teaching in the form of blended learning, has seen rising popularity in the aftermath of COVID-19 (Khodaei et al., 2022). Numerous studies have endorsed flipped instruction during the pandemic and beyond, highlighting its rotational model that integrates online independent study with traditional classroom teaching (Clark et al., 2022). Many educators and researchers have noted the benefits of flipped instruction during the pandemic, suggesting it could be a valuable alternative to the traditional lecture-based classroom (Zhu et al., 2022).

Similarly, Massive Open Online Courses (MOOC)s, which can be defined as “online courses designed for large number of participants, that can be accessed by anyone anywhere as long as they have an internet connection, are open to everyone without entry qualifications, and offer a full/complete course experience online for free” (Jansen & Schuwer, 2015, p.11), could provide a useful approach for blended learning. One-third of all learners who ever enrolled on a MOOC did so in 2020, which was evidence of the large enrolment growth during the pandemic (Impey & Formanek, 2021). Given the pandemic-induced surge of interest in MOOCs and building on the experience they have gained during the covid lockdowns, many universities are likely to either supplement or even completely replace classroom-based instruction with MOOCs so that they can continue offering their students online education (Peters et al., 2022).

However, given the limitations of fully online learning, which may not be effective for all learners, and the fact that not every emerging technology is equally appropriate for all target audiences (Kanwar & Daniel, 2020), many universities are expected to adopt a blended approach for post-pandemic teacher education, recognizing that the future of teaching and learning is likely to be blended (Zhu & Liu, 2020).

As a result, the MOOC-based Flipped Classroom (FC) model has emerged as a viable solution for implementing flipped instruction since it offers learners a well-organized online learning experience through MOOCs at home, while encouraging deeper exploration of the learning content through collaborative discussions in the classroom (Wang & Zhu, 2019). It is a method of pedagogical inversion of traditional education as it shifts the traditional teacher-centered approaches to an approach that accommodates for learners’ needs and expectations before and after class time (Al-Rahmi et al., 2019). In a MOOC-based FC model, virtual learning materials such as video lectures, texts, quizzes can be provided by an already existing MOOC, rather than being prepared by the instructor (Bruff et al., 2013).

Despite the overall positive evaluations and impressive technological competence and network capabilities, a significant practical challenge remains that must be resolved for the effective implementation of the MOOC-based FC model. That major problem is the lack of opportunities for foreign/second language (L2) learners in an English as a Foreign Language (EFL) context to practice their L2 speaking skills in a flipped classroom, where little attention is given to its implementation in teaching L2 speaking skills (Amiryousefi, 2019), especially in countries like Türkiye, where EFL learners have little or no opportunities to practice their L2 speaking skills in essential communication settings (Kara, Ayaz, & Dundar, 2017; Ozturk & Gurbuz, 2014). This situation arises from multiple factors, including an educational system that prioritizes grammar and vocabulary over communicative competence, large class sizes that limit individual speaking opportunities, and cultural barriers that discourage active participation in speaking tasks (Ciftci & Ozcan, 2021; Kentmen et al., 2023). Moreover, Turkish learners often lack access to authentic English-speaking environments outside the classroom, making the classroom the primary venue for L2 speaking practice (Capan, 2021; Dagtan & Cabaroglu, 2021). Additionally, many teachers face challenges such as insufficient training in communicative methodologies and limited access to technological resources that could support interactive speaking activities (Capan, 2021). These barriers highlight the urgent need for innovative approaches, such as self-made videos, to provide learners with meaningful and effective L2 speaking practice.

As a consequence, further research is required to assess the effectiveness of potential prescriptive methods, tools, or techniques, such as video making, that could promote the development and enhancement of L2 speaking skills and provide training in L2 communication skills in online learning environments such as MOOCs (Akapinar & Bayazit, 2018; Appel & Pujola, 2021; Kose et al., 2020; Kose et al., 2024; Maravelaki & Panagiotidis, 2022; Samu & Pakula, 2024).

Self-made videos offer a practical and innovative solution to the persistent challenge of fostering L2 speaking skills in MOOC-based flipped classrooms (Fan, 2022; Shih, 2010; Yesilcinar, 2019). Unlike traditional speaking tasks, which may lack the flexibility and individualized focus learners require, self-made videos allow students to actively engage in meaningful language production at their own pace (Vdovina et al., 2019; Yang & Yeh, 2021). They also provide opportunities for reflection, revision, and iterative improvement, enabling learners to build confidence and fluency before classroom discussions (Huynh et al., 2022). This method not only supplements the MOOC content but also directly targets the gaps in speaking practice that many L2 learners face, particularly in EFL contexts where authentic communication opportunities are limited.

A large amount of research has examined the implementation of MOOCs and FCs in relation to learners' L2 speaking skills (Amiryousefi, 2019; Fan, 2022; Hashemifardnia et al., 2022; Pan et al., 2022; Phoeun & Sengsri, 2021; Sheerah & Yadav, 2022; Shih, 2010; Yesilcinar, 2019). Furthermore, some studies have investigated the effect of self-made videos on L2 speaking skills and course achievement in traditional classrooms (Indrastana & Rinda, 2021; Mazrida, 2019; Pisarenko, 2017; Vdovina et al., 2019; Yang & Yeh, 2021) and flipped classrooms (Moos & Bonde, 2016; Torio, 2019; Zhang, 2016; Zhu et al., 2022) separately. However, how self-made videos might affect learners' L2 speaking performance and course achievement in a MOOC-based FC model is unknown. Hence, a dearth of research is evident in the literature since the prior video-based studies only examined those variables distinctly in either a traditional or a flipped learning environment. By integrating self-made videos into the MOOC-based FC model, this study addresses a critical gap in existing approaches to L2 speaking development. Self-made videos stand out as an active learning tool that combines autonomy with structured feedback, allowing pre-service English language teachers (ELT) to practice and refine their L2 speaking skills effectively within a blended learning framework. This approach not only enhances learners' speaking performance but also complements the rotational model of the flipped classroom by bridging the gap between online and in-class activities.

Moreover, self-made videos are considered particularly effective in the MOOC-based FC model because they transform passive learning into an active, learner-centered process (Amiryousefi, 2019; Fan, 2022; Pan et al., 2022). Unlike other approaches such as discussion forums or synchronous video chats, self-made videos provide learners with the opportunity to independently produce and refine their spoken language (Atmojo, 2022; Nami & Asadnia, 2024). This autonomy reduces anxiety and allows for repeated attempts, enabling learners to focus on fluency and accuracy at their own pace (Mazrida, 2019). Additionally, self-made videos create a tangible output that can be reviewed and assessed by instructors and peers, facilitating constructive feedback and progress tracking (Jiang et al., 2024). In the MOOC-based FC model, where initial content is often delivered online, self-made videos bridge the gap between online content consumption and classroom interaction, ensuring that learners arrive prepared to engage in deeper, collaborative exploration of the subject matter (Phoeun & Sengsri, 2021; Shih, 2010).

This study extends the practice of self-made videos to the context of the MOOC-based FC model to promote EFL learners' L2 speaking performance and course achievement. It has the potential to furnish empirical evidence regarding the efficacy of self-made videos as a pre-class activity in a MOOC-based FC model in enhancing the L2 speaking performance and academic achievement of pre-service English language teachers, thereby providing evidence-based guidance for this promising pedagogical approach. By examining relevant factors in a MOOC-based FC model that could play a key role in the teaching and learning processes, the study could also offer practical guidelines for instructors who are interested in complementing traditional classroom teaching with MOOCs using FC model.

Therefore, the present study aimed to investigate the impact of a series of students' self-made videos as a pre-class activity with a flipped classroom approach, using a new video-based pedagogical framework. Specifically, the study examines how their self-made videos affect pre-service English language teachers' L2 speaking performance and course achievement, the content of which is delivered in a MOOC. In the light of the above-mentioned objectives, the present study aims to address the following research questions:

1. Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers' L2 speaking performance?
2. Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers' course achievement?

The findings of this study could have significant implications for both educational policies and classroom practices. First, integrating self-made videos into a MOOC-based FC model aligns well with global trends emphasizing blended learning as a key approach for future education. This is particularly relevant to post-pandemic educational policies that advocate for the integration of digital tools and flexible teaching methods to enhance learning outcomes (Kanwar & Ogange, 2021). Policymakers could leverage this study's insights to design teacher training programs that emphasize video-based pedagogical approaches, equipping educators with the skills necessary to implement blended learning models effectively. In classroom practice, the incorporation of self-made videos as a pre-class activity could provide teachers with an innovative strategy

to address the longstanding challenge of limited opportunities for L2 speaking practice in English EFL contexts. Second, teachers could adopt this approach to create a more learner-centered environment where students actively engage in language production and reflection before participating in classroom discussions. Moreover, the study's focus on pre-service English language teachers could encourage teacher education programs to integrate video-based methodologies as a core component of their curricula, preparing future educators to implement such strategies in diverse teaching contexts. Finally, the practical application of self-made videos could contribute to bridging the gap between technological advancements and their pedagogical implementation. By demonstrating how video creation can enhance learners' L2 speaking performance and course achievement, this study offers a replicable model for other subject areas where speaking or interactive communication skills are a priority.

LITERATURE REVIEW

Second Language (L2) Speaking Instruction

Speaking is the most important skill in both first and foreign languages (L2) in an increasingly globalized world (Salem, 2013). It offers several personal benefits, ranging from the experience of travelling abroad to the sense of achievement (Isaacs, 2016). Similarly, developing the ability to speak can enrich one's social life, leisure time, economic status, and living conditions (Fauzan, 2014). It can also broaden one's horizon and provide job opportunities, which makes it a source of motivation for most learners of foreign languages (Abugohar et al., 2019). Likewise, Leong and Ahmadi (2017) argue that the key determinant of success in foreign language learning lay in speaking it fluently, as translating a text and speaking a foreign language are not equivalent skills. Therefore, a complete mastery of a foreign language means speaking it fluently on a broad range of topics and conducting normal conversations with speakers of that language spontaneously and clearly (Dalton-Puffer, 2006).

On the other hand, L2 speaking is complex and difficult to maintain because it involves a combination of many linguistic and non-linguistic features such as social, cultural, psychological elements as well as phonetic, prosodic, and morphological features based on syntax, semantics, and the culturally differing pragmatics of discourse (Sayed, 2005). These are all decisive factors that contribute to the overall success of a verbal interaction between parties, because one can understand the real meaning of utterances only through pragmatics, which goes beyond what is said by the mere words by focusing on the functioning of speaking in context (Dincer & Yesilyurt, 2013).

Despite the high value language educators place on speaking, L2 speaking instruction has been a challenging process due to the need to address various linguistic and psychological factors, such as pronunciation, grammar, vocabulary, and learners' confidence and anxiety levels. As a result, many language learners struggle to express themselves clearly when speaking in the target language (Horwitz, 2009; Leong & Ahmadi, 2017). Therefore, L2 speaking is a skill that requires not only linguistic but also sociolinguistic competence. This leads us to another facet of speaking, which is called communicative competence.

The term 'communicative competence' was first coined by Hymes (1972) and defined as the ability to produce utterances that are linguistically correct, culturally appropriate, socially acceptable, and contextually relevant. The notion was further developed by Canale and Swain (1980), who identified its four main components as linguistic competence, sociolinguistic competence, strategic competence, and discourse competence.

Linguistic competence is about an adequate and sufficient mastery of the vocabulary and structure of the target language, while *sociolinguistic competence* refers to the ability to interact socially with those from different cultural backgrounds in the context of a diverse society (Shumin, 1997). It also refers to the ability to handle conflict situations and maintain peaceful discussions with others despite differences of opinions. *Strategic competence*, on the other hand, is identified as the ability to use all components of complex human communication such as language, gestures, facial expressions, context, behaviour, and accompanying activities to eliminate communication breakdowns arising from cultural differences or gaps in knowledge (Bailey, 2004). Lastly, *discourse competence* is about forming new words and putting them together into coherent messages in simple language (Goh & Burns, 2012). Namely, it refers to the ability to provide clear messages that can be made to work together as a coherent whole.

Hence, the variations in language views overall have revealed certain methodological differences in the field of ELT, promoting the development and implementation of new methods and modern alternative approaches to teaching and learning L2 speaking skills. Technology integration is one of the new trends in the field of ELT. It refers to the use of the technology such as language learning apps, internet-accessible devices, virtual reality, computer programs, and video conferencing to provide students with opportunities to practice speaking in authentic environments (Afify, 2020; Park & Son, 2022). Recent technological advancements and the current focus on informal language learning have also had a positive impact on the quality of teaching and learning as the mobility of international L2 learners has led to the introduction of new communication strategies, more authentic materials, and exchange of good practices and learning experiences (Kusuma, 2022). For instance, YouTube is used as a means of submitting speaking videos for assessment and classroom management purposes (Sun & Yang, 2015). Instead of emailing them directly to the teacher, students submit them on YouTube, recommending and commenting on them online. Thus, with its all features and benefits, technology-based instruction provides a learning environment that enables learners to further practice their language skills and promote the transfer of these new skills (Chun et al., 2016).

Similarly, self-made videos hold significant pedagogical potential for addressing the challenges of L2 speaking instruction in the MOOC-based FC model. By encouraging learners to create and share their own video recordings, this approach fosters active engagement, autonomy, and reflective practice, which are critical for developing communicative competence. Unlike traditional speaking exercises, self-made videos enable learners to practice language production at their own pace, allowing them to refine pronunciation, grammar, and fluency before receiving feedback (Yang & Yeh, 2021). This iterative process not only reduces language anxiety but also empowers learners to take ownership of their learning. Additionally, self-made videos provide opportunities for contextualized language use, mirroring real-world communication scenarios that are vital for building sociolinguistic competence (Vdovina et al., 2019). When integrated into the MOOC-based FC model, self-made videos bridge the gap between online and face-to-face learning by transforming passive content consumption into an active and personalized learning experience. This innovative approach complements the rotational model of the flipped classroom, ensuring that learners are better prepared to engage in collaborative, in-class discussions.

MOOCs, as an emerging technology, can offer many educational opportunities to L2 learners by providing them with some affordances to overcome the limited classroom time available for engaging as a group with the learning content and practicing L2 speaking skills (Cakmak, 2022). Some blended learning models in higher education have been developed around MOOCs, which have been used less as a replacement and more as an addition to the traditionally taught courses (Swinerton et al., 2017). As a result, there is a growing interest for exploring how MOOCs can be used effectively to enhance flipped learning among higher education students (Wang & Zhu, 2019). In view of this, the MOOC-based FC model will be described in more detail in the next sections. The following section, however, will provide more information about MOOCs.

Massive Open Online Courses (MOOCs)

The term Massive Open Online Course (MOOC), a specific form of online education, was first introduced by Downes (2008) to describe an experimental online course called 'Connectivism and Connective Knowledge'. In accordance with Siemens' (2005) connectivism theory, MOOCs (e.g. NovoEd, Udacity, edX, Coursera, FutureLearn, etc.) provide high-quality courses from leading universities to anyone globally, without limitations of space or time. As Yasar (2020) puts it, MOOCs "make it possible for a person's message to make its way around the globe to eventually end up back to the same person after being responded and commented by innumerable participants across borders" (p. 9).

Siemens (2012) mainly differentiates between two types of MOOCs: cMOOC (connectivist MOOC) and xMOOC (extended MOOC). A cMOOC supports cooperative learning, know-how and the sharing of experience through information networks for intercultural learning (Ferdig et al., 2014). An xMOOC, on the other hand, combines audio, video lectures, interactive assignments, quizzes and texts to design learning and perform new tasks (Lugton, 2012). Whereas cMOOCs focus on strengthening mutual learning

and cooperative work to create new knowledge, xMOOCs aim to ensure the widespread exploitation and duplication of existing knowledge (Caulfield, 2013).

Thanks to their convenient course design, high education standards and accessibility to all students, an increasing number of universities have started to integrate MOOC contents into their regular curriculum (Ersoy & Dogan, 2023). Accordingly, extensive research has focused on specific aspects of MOOCs such as learners' perceptions (Ossiannilsson, Altinay, & Altinay, 2016), quality (Mahraj, 2012), instructional design (Kopp & Lackner, 2014), completion rates (Kala & Chaubey, 2023), and self-regulated learning and motivation (Luo & Wang, 2023; Onah, et al., 2024). Not much research has focused on factors that could improve L2 speaking skills in blended learning approaches like MOOCs and flipped learning though. It's surprising that this aspect, which is crucial for L2 learning, has been largely overlooked in most MOOCs.

Therefore, further research is needed to identify key factors that could enhance L2 speaking skills within blended learning approaches. In this regard, some key factors will be described in more detail in the following sections. It would be helpful, however, to provide more information about the concept of flipped learning in the following section.

Flipped Learning (FL)

In 2007, two high school chemistry teachers, Jonathan Bergmann and Aaron Sams, developed a solution to address the issue of students missing classes due to sports events. This solution, known as 'flipped learning' (FL), has since attracted the attention of a diverse range of research studies. It is remarkable to observe how this approach to education is capturing the imagination of researchers who recognize its potential to revolutionize the way we learn (Merrill, 2015).

As a modern instructional strategy, flipped learning enables teachers to develop pre-class study materials, allowing for more focused engagement in collaborative and interactive activities during face-to-face instruction (Amiryousefi, 2019). It allows students to consume learning materials before class, so that valuable classroom time can be spent on practical, hands-on activities (Yasar & Polat, 2021). In view of this, FL aligns with contemporary educational paradigms that prioritize student-centered learning and active participation (Kusuma, 2020).

FL is a type of blended learning that combines interactive methods to enhance the learning experience (Xinying, 2017). It provides students with access to e-learning materials beyond the confines of the classroom, enabling them to acquire knowledge at their own pace and with their preferred learning style, while class time is mostly used for discussions and projects (Yeo, 2018). However, in traditional classrooms, students are exclusively reliant upon classroom instruction for their learning processes (Tucker, 2012). Furthermore, the adoption of technology has ushered in a new era of learning, where students are no longer passive recipients of knowledge but active participants in their own learning journey (Bishop & Verleger, 2013). Likewise, with the evolution of the FL approach, a more collaborative and engaging learning environment has been created for students that encourages active participation and fosters critical thinking (Noroozi et al., 2020; Overmyer, 2012).

By integrating MOOCs into the learning experience, flipped learning revolutionizes the traditional classroom approach and creates a more engaging and innovative learning environment (Yasar & Polat, 2021). As the impact of self-made videos as a pre-class activity on pre-service ELT teachers' L2 speaking performance and course achievement in a MOOC-based FC model is explored in this study, more details about the MOOC-based FC model are to be further described in the following section.

MOOC-based Flipped Classroom (FC)

The MOOC-based Flipped Classroom (FC) model combines FL and MOOCs, thereby offering flexible learning and high-quality online resources (O'Flaherty & Phillips, 2015). A recent form of blended learning, this model boosts student engagement, critical thinking, and supports the development of intercultural and communication competencies (Hung, 2017). The literature on this educational model suggests that the MOOC-based FC model can contribute to the development of more student-centred learning and better

academic achievement when compared to traditional classroom teaching methods (Wang & Zhu, 2019).

The model is gaining increasing importance as it combines classroom instruction with practical training modules and course materials provided on MOOCs, enabling the exploration of varied perspectives and materials (Yasar, 2020). Similarly, the fact that online learning materials from a MOOC supplement classroom training helps reduce the workload on instructors, as they merely need to review, validate and complete the information that has been imported from a MOOC, which can be used in class or by students at home (Glance et al., 2013; Yasar & Atay, 2023).

A rich variety of studies investigating the effects of MOOC and flipped instructions on learning certain English language skills and subskills, such as reading, writing, speaking skills, vocabulary, learning management, learning model, self-regulation, and self-efficacy have been found in the literature (Ahmed et al., 2022; Castro et al., 2022; Gimeno-Sanz, 2023; Huang et al., 2022; Liu et al., 2022; Niu & Gao, 2022; Wu & Sun, 2022; Zhang, 2022). On the other hand, as Yasar and Polat (2021) point out, the integration of MOOCs in a FC requires the consideration of a multitude of factors in cooperation with the students, including careful planning, implementation, monitoring, evaluation, student motivation and engagement. Hence, in these language learning contexts, participants should be encouraged to actively participate in discussions to develop their L2 speaking skills (Arabaci Atlamaz, 2022).

Similarly, Haryanti (2019) noted that for language learning the process of making a video might help language learners to be more creative, independent, and responsible. Barton (2019) also reported that video-making could be an effective tool for teaching and learning language skills in EFL classrooms. Therefore, there is a need to further examine effective strategies for enhancing L2 speaking skills in a MOOC-based FC model, which is within the scope of the present study. In this regard, studies and analysis on self-made videos will be presented below based on recent scientific research.

Studies on Self-made Videos

The use of video-making has become prevalent in EFL classrooms, as evidenced by several studies in the literature (Naqvi & Al Mahrooqi, 2016; Sun & Yang, 2015; Yeh, 2018). For instance, Sun and Yang (2015) explored the impact of student-generated videos on 14 EFL undergraduate students' oral communication skills. The researchers found that student-produced videos improved students' oral communication skills and confidence in public speaking. Likewise, Naqvi and Al Mahrooqi (2016) carried out a student-centred digital video-making project in EFL classrooms to examine its effects on 58 EFL undergraduate students' language development, research and analytical skills. The results showed that student-produced videos enhanced their analytical skills and research capacities, as well as their speaking, vocabulary and writing skills. In a similar vein, Yeh (2018) conducted a study with 72 EFL undergraduate students, which investigated the effects of multimodal video-making on their multi-literacy development. The results revealed an improvement in their translation, vocabulary, speaking, and writing skills.

In his study, Shih (2010) found that students' self-made videos were instrumental in helping them improve their speaking skills as well as their knowledge of specific elements of the language, such as facial expression, articulation, posture, and gestures. Encalada and Sarmiento (2019) also found in their study that self-recording videos help students assess their own didactic competences and encourage them to practice speaking English without anxiety through improvisation. This supports the statement of Shofatunnisa et al. (2021) that using technology helps students improve their ability to speak, understand grammatical structures, and use them in conversation. Similarly, Sun and Yang (2015) reported that self-made video tasks enabled EFL learners to monitor their progress and develop their learning processes and strategies.

Mazrida (2019) also found that imitating a native speaker's manner of pronunciation in self-made videos greatly supported students in learning pronunciation and motivated them in their English language learning. The participants who were required to generate three self-made videos in three weeks range by imitating a native speaker's audio supported the effectiveness of this approach. According to Ahmadi (2018), making self-made videos allows EFL learners to practice their target language with less anxiety as they can rehearse, make any necessary adjustments, and record outside of the classroom.

Weinstein (2006) argued that video-making can assist students in documenting their language learning progress and the different functions they can perform with language. Gareis (2000) referred to video-making as an ideal method to integrate skills practice with a focus on accuracy, authentic communication, and process-oriented group activities, with a high level of student involvement that is difficult to achieve through other media. In another study, Rebong (2022) examined whether self-made videos would enhance Junior High School students' academic achievements and improve their learning motivation. Results indicated that self-made videos make a significant difference and improves learners' learning in science. The results suggest that students can make the most of what they have learned through video clips and cover all the key points in the teaching materials, thereby mastering all the key points covered in each phase of the learning process.

Despite the existing research on the effectiveness of self-made videos in traditional and flipped language instruction, there remains a need for further investigation into their impact within the context of MOOC-based flipped classrooms. Given the established limitations of MOOCs and flipped classrooms in fostering effective communication, a critical component of language learning, this study aims to address this knowledge gap. By employing quantitative research methods and using a new video-based pedagogical framework, the present study seeks to understand the effect of self-made videos on the development of L2 speaking skills and course achievement within the MOOC-based FC model. The findings of this research could provide valuable insights for educators and learners alike, contributing to the ongoing development and refinement of this promising teaching and learning approach.

METHOD

Research Design

This study adopted a pretest-posttest quasi-experimental design, involving the administration of pre-tests, an intervention, and post-tests. This design was preferred because it allows for a controlled comparison of the effects of the intervention (self-made videos) on L2 speaking performance and course achievement. The use of pre-tests ensures that initial equivalence between the experimental and control groups can be established, mitigating potential selection bias. The design also facilitates the measurement of changes over time within and between groups, providing robust evidence of the intervention's impact.

The study was carried out in two class sections. To address the threat of researcher bias, the participants were assigned randomly into an experimental and a control group. Similarly, to deal with selection bias and to ensure there were no significant differences between the experimental group (implementing self-made videos) and the control group (not implementing self-made videos), tests and instruments were administered to both groups before treatment as pre-tests, because there were some irregular students, and some students had failed the previous year and decided to retake the same course for the second time. After eight weeks of intervention process was over, the same tests and instruments were administered to both groups as post-tests. Table 1 below includes information on the design of the research study.

Table 1. Research Design of the Study

	Experimental Group	Control Group
Pre-tests	X	X
Treatment	X	
Post-tests	X	X

Setting, Participants and Sampling

This study was conducted at a Turkish state university, focusing on pre-service English language teachers enrolled in the *Listening and Pronunciation I* course during the fall semester of the 2022-2023 academic year. The first author is an experienced instructor who has designed and implemented numerous courses in ELT using MOOCs and FL methodologies. The second author supervising the first author's Ph.D. on the current research topic is a seasoned researcher and educator in the field, with extensive experience supervising

graduate and post-graduate theses focused on educational technology and ELT. Their expertise in these areas has contributed to advancing research and practice in integrating technology-enhanced methodologies into language education.

The study included two cohorts of freshmen enrolled in the ELT program, which is responsible for training teachers of English in the Department of Foreign Languages Education (FLE) at the Faculty of Education. The participants were randomly assigned to one of two sections of the *Listening and Pronunciation I* course, forming the experimental and control groups. Being one of the obligatory courses in the first year of the ELT curriculum in Türkiye, the *Listening and Pronunciation I* course covers the fundamentals of listening and phonetics such as segmental and suprasegmental features of English phonology, vowels, consonants, stress in words, macro and micro listening skills, speech organs, IPA symbols, the practice of phonetic alphabet, and strategies to develop listening comprehension skills for learning and production purposes. The course is offered 2 hours a week for 14 weeks.

The MOOC content was in line with the course curriculum, ensuring consistency with the course book (Hewings, 2004). The MOOC which was offered online via FutureLearn was *English Pronunciation in a Global World* (Futurelearn, 2023). The MOOC was integrated into the compulsory *Listening and Pronunciation I* course curriculum for both groups. A MOOC-based FC model was implemented during the course period. The MOOC required maximum four weekly hours of work during the eight weeks of implementation.

The participants were freshmen pre-service English language teachers enrolled in the *Listening and Pronunciation I* course, including two classes that were selected and treated randomly as the experimental and the control group. Their ages ranged between 21 and 24 years. Initially, the study comprised a total of 85 students who constituted the sampling of the study. However, 20 participants were excluded from the study because they failed to take part in some of the treatment, sampling or data collection processes. As a result, the experimental group consisted of 33 participants, including 18 females and 15 males, while the control group comprised 32 participants, consisting of 22 females and 10 males. Due to a decline in the number of participants, the total number of students in both groups was reduced to 65 participants. The students in both groups could be considered technology-aware learners due to their familiarity with the Internet technology thanks to the experience they gained during the covid lockdowns. Despite this, though, only a few of the participants have reported taking a MOOC course before.

Owing to its suitability in examining the differences between two groups when considering the effects of an intervention, the sampling strategy used for the present study was convenience sampling (Gliner et al., 2011). Convenience sampling, which is a non-random sampling method, was appropriate for the current study, as indicated by Dornyei (2007) in his statements on convenience sampling, positing that “criterion of sample selection is the convenience of the researcher: members of the target population are selected for the purpose of the study if they meet certain practical criteria, such as geographical proximity, availability at a certain time, easy accessibility, or the willingness to volunteer” (p. 99). As a result, because the subjects were readily available and homogenous, and based on factors such as motivation, accessibility, availability, readiness and willingness, the participants of the present study were selected through convenience sampling.

Data Collection Instruments

An intervention was conducted to determine whether or not the implementation of self-made videos would lead to a significant improvement in the test scores (L2 speaking and course achievement) of the experimental group (implementing self-made videos) over the control group (doesn't) in a MOOC-based flipped learning environment. To this end, the data were collected through IELTS Speaking Band Descriptors Rubric (Appendix 1) and the achievement test of the *Listening and Pronunciation I* course (Appendix 2).

IELTS Speaking Band Descriptors

The IELTS Speaking Band Descriptors (British Council, 2023) is used to score candidates' speaking performance in tests. It is a well-established and internationally recognized assessment tool for evaluating L2 speaking performance. Its validity and reliability have been extensively documented in previous research (e.g., Berry et al., 2013; Li, 2019; Taylor, 2011). The rubric has been widely used in studies assessing speaking skills

in various EFL contexts, ensuring its appropriateness for this study. It consists of four dimensions: fluency & coherence = Dim 1, lexical resource = Dim 2, grammatical range & accuracy = Dim 3, and pronunciation = Dim 4. Each dimension consists of nine bands, where zero characterizes students not attending the exam, while 9 characterizes participants with highly developed sub-skills in all four dimensions. Participants are assessed on a descriptive scale based on their scores in these dimensions. These scores aim to describe the communication skills of individuals at a given level of English. The dimensions are simply referred to as dim1, dim2 etc. Two experts were assigned to rate the participants' performance using the IELTS speaking band descriptors. To further ensure reliability in this research, two independent raters with expertise in IELTS assessment were employed to evaluate the participants' speaking performance. Inter-rater reliability was calculated using Cohen's kappa, yielding a substantial agreement ($k = .85$), which indicates consistency in scoring across raters.

Achievement Test

The course achievement test was prepared by the researcher following the objectives of the *Listening and Pronunciation I* course, the content of the MOOC and the course book (Hewings, 2004). It was developed based on the course's official curriculum and learning objectives. The test was reviewed by a panel of two ELT experts to confirm its content validity and alignment with the targeted outcomes of the course. A pilot study was conducted with 20 students prior to the main study, yielding a Cronbach's alpha coefficient of .82, indicating high internal consistency and reliability of the test. The test consists of 50 multiple-choice questions that cover the concepts of intelligibility, credibility, and identity in English pronunciation, vowels, consonants, suprasegmental features in English (stress, intonation, etc.), and various English accents. Each question was graded on a scale of 0 to 2, with 100 being the best grade.

In this study, course achievement refers to students' overall performance in the *Listening and Pronunciation I* course, as measured by their achievement test scores. The test assessed students' mastery of key course objectives, including listening comprehension, accurate pronunciation, and the ability to apply theoretical knowledge in practical contexts. The achievement test was designed to align with the course curriculum and learning outcomes, ensuring content validity. It consisted of a combination of objective and subjective items, including multiple-choice questions, listening comprehension tasks, and oral assessments, which were scored using standardized rubrics to ensure reliability (Appendix 2).

Procedure

The study was conducted in the fall term of the 2022-2023 academic year. The data collection process started after obtaining the necessary permissions and getting the consent of the students via an informed consent form (Appendix 3). Tests and instruments were administered to both groups before treatment as pre-tests. The same tests and instruments were later given to both groups as post-tests after eight weeks of intervention process was over.

To collect quantitative data, IELTS Speaking Band Descriptors Rubric and the achievement test of the *Listening and Pronunciation I* course were administered to both groups as pre- and post-tests. Likewise, the classroom instruction and the complementary online course, the content of which was delivered in the MOOC, were given to both groups, which is compatible with the MOOC-based FC model. Both groups followed the same curriculum for the course. The implementation process, however, the purpose of which was to examine the impact of a series of students' self-made videos as a pre-class activity, was applied to the experimental group only, to examine how students' self-made videos affect their L2 speaking performance and course achievement. The study followed a three-phase design: pre-testing, treatment, and post-testing. The data collection process is illustrated in Figure 1 below.

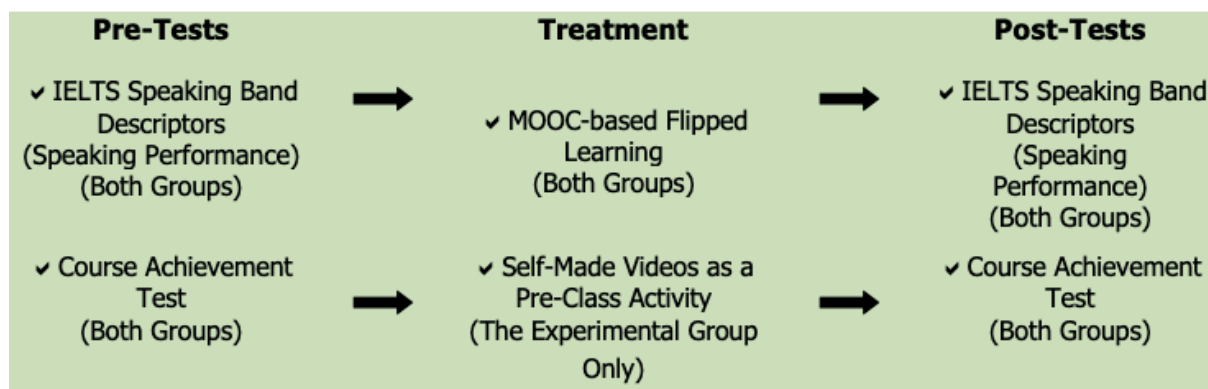


Figure 1. The Flow of the Data Collection Procedures

The data collection and treatment process started on October 3, 2022 and took 11 weeks to complete. In the first week, the participants were told about the details of the research, the importance of their participation during the implementation and their sincere answers on the questionnaire items. The participants in both groups were informed that a MOOC-based FC approach would be followed along the implementation process. Namely, they were told that the content delivery would happen through the MOOC at home, and the complementary face-to-face sessions would occur in the classroom, as required by the flipped learning approach. In the second week, the IELTS Speaking Band Descriptors Rubric and the achievement tests were administered to both the experimental group (implementing self-made videos) and the control group (not implementing self-made videos) as pre-tests over a period of five days. Both groups followed the same curriculum and MOOC-based FC model. However, the experimental group received the treatment, starting in the third week on October 17, 2022, and lasting for eight weeks. The treatment phase concluded in the tenth week on December 9, 2022. In the eleventh week, on December 12, 2022, the same tests and instruments were given to both groups and again administered over a period of five days as post-tests after eight weeks of implementation. Table 2 outlines the procedural phases of the data collection and implementation process.

Table 2. Timetable of the Implementation and Data Collection Procedures (2022-2023, Fall)

Weeks	Data Collection	Experimental Group	Control Group
Week 1 (Oct, 3-7)	Introduction, Orientation and Pre-data Collection Stage	X	X
Week 2 (Oct, 10-14)	Pre-Tests (Speaking Test and Course Achievement Test)	X	X
Week 3 (Oct, 17-21)	Implementation	X	
Week 4 (Oct, 24-28)	Implementation	X	
Week 5 (Oct-Nov, 31-4)	Implementation	X	
Week 6 (Nov, 7-11)	Implementation	X	
Week 7 (Nov, 14-18)	Implementation	X	
Week 8 (Nov, 21-25)	Implementation	X	
Week 9 (Nov-Dec, 28-2)	Implementation	X	
Week 10 (Dec, 5-9)	Implementation	X	
Week 11 (Dec, 12-16)	Post-Tests (Speaking Test and Course Achievement Test)	X	X

Pre-testing

Pre-testing process had two phases. First, the the course achievement test was administered to both the experimental and control group respectively on the first day of the second week before the treatment process started. The course achievement test was administered on the same day to both groups, and it took one hour to complete. Thus, the first phase of the pre-testing process was completed. As for the second phase, speaking tests were administered by two raters before the implementation. One of the raters was the instructor of the *Listening and Pronunciation I* course and at the same time the first author of this study, while the other was an EFL instructor offering speaking and listening skills courses at the foreign language schools at a state university. Each participant in both groups had around 10 minutes to perform the speaking tests. The raters benefited from a list of TOEFL speaking questions adopted from AECC (2023) (Appendix 4), using TOEFL exam's speaking topics (ETS, 2023). IELTS exam's speaking assessment rubric was used to evaluate participants' speaking performance. Thus, upon the completion of the pre-testing process, the eight-week implementation phase started on October 17, 2022.

Treatment

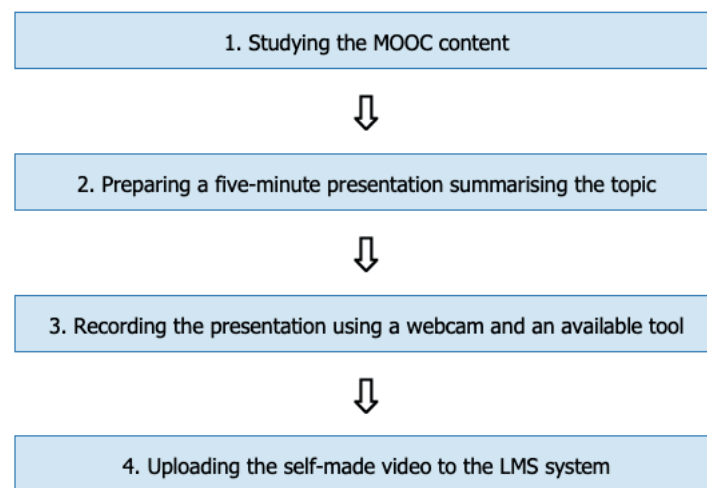
Both groups were instructed in a MOOC-based FC model by the first author of this study. The treatment process, however, was only applied to the experimental group to explore how students' self-made videos affect their L2 speaking performance and course achievement scores. The experimental group received initial training on using digital video recording devices, understanding new procedures, and utilizing technical support tools. The researcher provided four instructional videos on: 1) enrolling in a MOOC, 2) organizing and preparing presentations, 3) creating self-made videos using screen recording tools, and 4) uploading these videos to the university's Open Moodle Platform. These instructional videos were saved and kept available to the students on the MOODLE in case they should need them for future events. The students were also informed that they could contact the researcher and receive all the support they might need during the treatment process.

Throughout the eight-week intervention, participants in the experimental group were required to produce weekly self-made videos as a pre-class activity within the MOOC-based FC model. The treatment process was carried out in two phases: In the first phase, the students were required to record their presentations regarding the MOOC content using a webcam and any web tool available to them. They were expected to display their knowledge by integrating the MOOC content into their videos. In the second phase, they were required to upload their recorded videos to the LMS system of the university. They were also encouraged to review and comment on their own as well as their peers' self-made videos, following prompts provided by the researcher. The timetable of the treatment process, the topics in the MOOC, and the prompts given by the researcher are described in those variables distinctly in either a traditional below.

Each week during the treatment process, the participants followed the same procedure as a pre-class activity. First, they completed every step in the MOOC content of that specific week. Second, they transferred the content into a presentation summarising the topic they learnt in the MOOC and reflecting on their own video presentations as well as their peers' video presentations, which were presented in the previous week. Third, they recorded their presentations using a webcam and any available web tool. And last, they uploaded their videos to the LMS system of the university, following prompts provided by the researcher. Figure 2 outlines the weekly procedures followed during the treatment phase.

Table 3. Timetable, Topics in the MOOC and Procedures of the Treatment Process (2022-2023, Fall)

Weeks	Topics	Procedures
Pre-treatment (Oct, 3-14)	Training and Orientation Process	■ Integrating the MOOC content into their slides, the students made presentations on related topics on weekly basis displaying their knowledge and skills.
Week 1 (Oct, 17-21)	What is important in English pronunciation? 1	
Week 2 (Oct, 24-28)	What is important in English pronunciation? 2	■ Using these presentations, every week during the treatment process, they recorded themselves and their screen using a webcam and any web tool available to them.
Week 3 (Oct-Nov, 31-4)	English vowels 1	
Week 4 (Nov, 7-11)	English vowels 2	■ They were also required to integrate self-assessment, peer assessment, feedback and reflection talks as well as small learning and training units into their self-made video recordings.
Week 5 (Nov, 14-18)	English consonants 1	
Week 6 (Nov, 21-25)	English consonants 2	■ Lastly, each week they were required to upload their self-made videos to the LMS system and were encouraged to show the ability of self-orientation in the face of new tasks.
Week 7 (Nov-Dec, 28-2)	Suprasegmental features in English 1	
Week 8 (Dec, 5-9)	Suprasegmental features in English 2	

**Figure 2.** Procedures for Each Self-made Video Task

The MOOC chapters (Appendix 5) were aligned with the course book (Hewings, 2004) to ensure completion within the eight-week intervention period. Figure 3 details the topics, features, and course team of the MOOC.

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- Personal goals for English pronunciation
- English vowels
- English consonants
- Suprasegmental features in English (stress, intonation, etc.)
- English accents
- English pronunciation assessment

Students holding up speech bubbles with phonetic symbols: tʃ and ʊə.

Figure 3. Topics and Course Team of the English Pronunciation in a Global World Futurelearn Mooc (futurelearn, 2023)

During the eight-week treatment process, each student made a total of eight videos by reflecting critically on his/her own learning, working autonomously, and seeking information and support when necessary. They were able to practice their L2 speaking skills through their self-prepared presentations in which they shared their own opinions and organized their own thoughts. They were also provided by the researcher with some useful tips and guidelines to help them design and create effective presentations, as well as organize their content. Moreover, they had the opportunity to observe and monitor themselves by watching their own videos, edit their videos using video editing software, and make some modifications if necessary, or alternatively they could re-record themselves after self-reflecting upon their performances or learning processes before uploading their self-made videos to the LMS system. The treatment process ended once the students completed their self-made videos (each student/eight videos in total) in the pre-set time.

To ensure students engaged in critical reflection and autonomous work throughout the process, a structured framework was implemented. Students were required to submit weekly reflective logs alongside their videos, detailing their thought processes, challenges faced, strategies used, and learning experiences. These reflective logs were reviewed by the researcher to monitor their critical thinking and autonomy. Additionally, peer feedback sessions were incorporated, where students reviewed each other's videos and provided constructive comments, further encouraging self-assessment and independent learning. The LMS system was used to track the frequency and quality of student interactions, uploads, and revisions, providing insights into their engagement and autonomous efforts.

The Process in the Experimental and Control Groups

Pre-tests were administered to both groups before the eight-week treatment process started. Although the treatment was applied only to the experimental group, both groups were instructed in a MOOC-based FC model. The researcher combined classroom instruction with a MOOC, involving decentralized self-directed learning, which required the students in both groups to take initiative for their own learning and to take an active part in the learning process based on blended-learning concepts. Classroom instruction was complemented by virtual instruction, the content of which was delivered in the MOOC, which is compatible with the MOOC-based FC model. Each lesson was delivered in a blended learning approach in both groups. All aspects of flipped learning were implemented along the course. The availability of the learning content and the use of interactive e-learning modules in the MOOC made it possible for the students to collaborate with other learners and interact with the learning content before classroom instruction. Theoretical knowledge was subsequently consolidated in the classroom instruction that follows. During classroom instruction, all subjects were reviewed, and the researcher was able to allocate more time to content-related classroom discussions because less time was needed for organizational purposes. The content learned and practiced at home was used as a basis for classroom discussions, and then consolidated by increasing student participation in the classroom activities in both groups.

Both groups followed the same instructional techniques, assessment methods, training, methodology, program, materials and curriculum. The only difference between the groups was that the treatment process was only applied to the experimental group, during which they were required to record and upload their self-made videos to the LMS system to be examined by the researcher if they had an effect on students' L2 speaking performance and course achievement scores. Participants in the experimental group were required to demonstrate their understanding of course content in their weekly videos (Appendix 6), reflect on their own and peers' video presentations (Appendix 7), and provide feedback to peers. To enable the participants to effectively demonstrate their understanding of the course content in their weekly videos, the researcher provided clear guidelines and structured prompts to guide their video creation process. These prompts were designed to focus on specific aspects of the course content, ensuring that students addressed key learning objectives in their presentations. This process encouraged critical self-reflection, allowing participants to analyze their knowledge and communication skills for improvement in future presentations. The opportunity to view the videos as many as they wanted enabled learners to critically reflect on their own learning process, take the responsibility for their own learning, and provide feedback on their peers' presentations.

Unlike the experimental group, the control group was not required to record self-made videos related to the MOOC content. The students in the control group studied the course content at home and completed all MOOC activities as pre-class assignments. They were encouraged to actively participate in classroom discussions and submit weekly reports on their progress in the MOOC, including reflections, comments, and completed tasks. Additionally, the control group received regular feedback on their reports and participation in classroom discussions, which allowed the researcher to track their progress and ensure they remained on par with the experimental group in terms of learning opportunities and course engagement. This was done to ensure their readiness for classroom instruction, maximize learning benefits, and deepen their understanding of the MOOC content.

To ensure the validity of the experimental study, the researcher consulted two experienced ELT educators with expertise in MOOC-based flipped learning methodologies. These experts reviewed the study design, instructional materials, and implementation process to ensure alignment with established educational practices and research standards. However, while expert feedback was considered, the study acknowledges that no formal external validation was conducted for the entire experimental process. This limitation may have affected the comprehensiveness of the evaluation, and future research could address this by involving a panel of external reviewers throughout the study design and implementation process. Figure 4 illustrates the procedures followed by both groups.

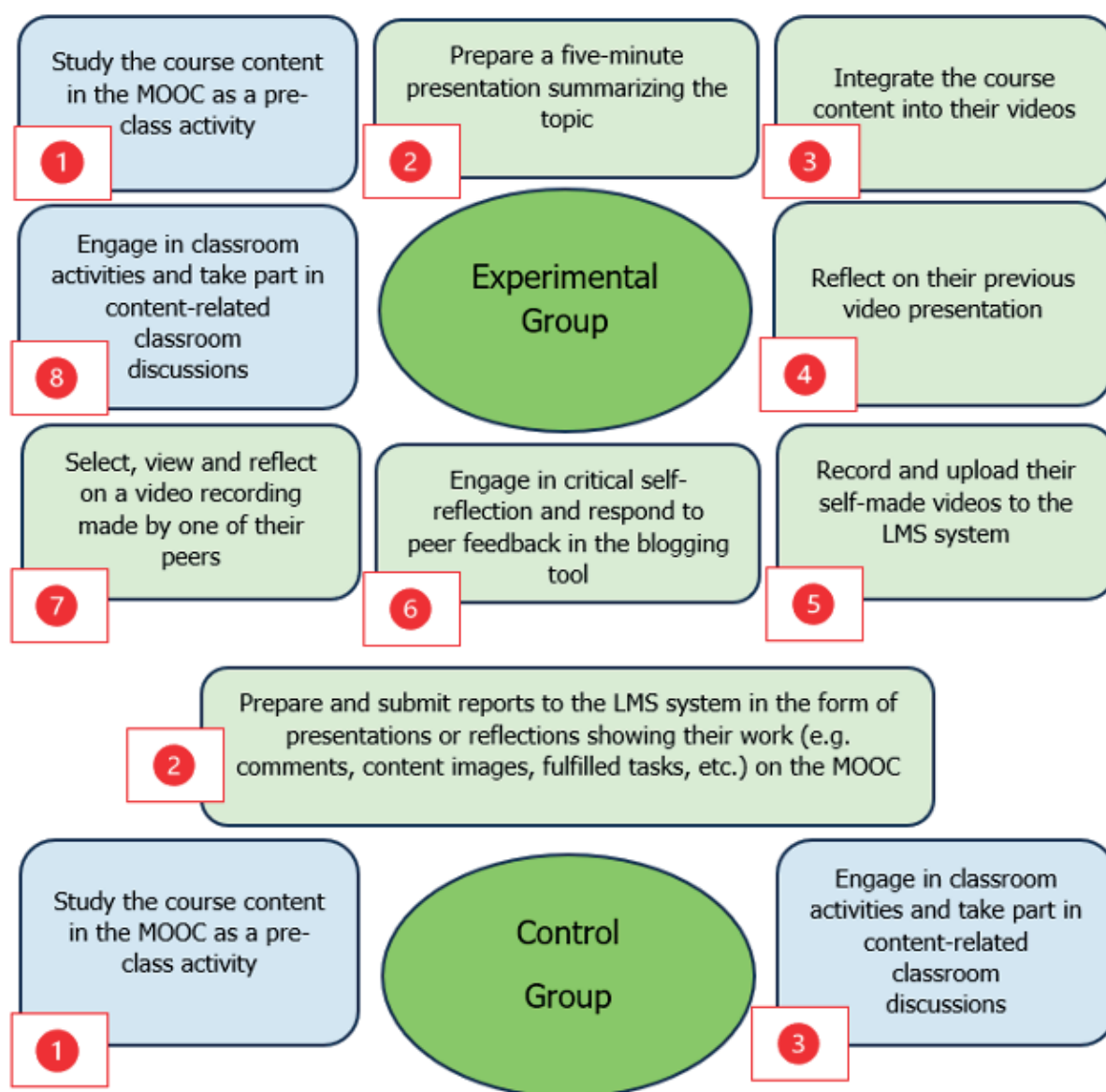


Figure 4. Procedures in the Experimental and Control Groups

The following section outlines the pedagogical model underlying the implementation of this study.

The Pedagogical Model for Self-made Videos

At the heart of the constructivist approach to language learning is the idea that learners are most successful when they are engaged in self-directed learning (Stoller, 2006). In accordance with this proposition, video-making aligns with the constructivist approach to language education, which emphasizes the importance of experiential, individual and autonomous learning and enables learners to make full use of their own potential (Brydon-Miller & Maguire, 2009; Sagorika & Hasegawa, 2020). In parallel with this, the pedagogical paradigm has undergone a significant shift in the field of language teaching. Instead of relying on a traditional, prescriptive approach to teaching, educators are increasingly embracing a more constructivist methodology (Lantolf & Thorne, 2006). As part of this shift, video-making has emerged as a valuable tool for language learners (Ruschoff & Ritter, 2001).

The implementation of self-made videos in this study was grounded in a pedagogical framework including four distinct stages: *presentation*, *personal reflection*, *peer reflection*, and *refinement*. These stages are designed to help pre-service teachers learn the content independently and construct their own meaning from generating

videos as a pre-class activity, improve their communication skills by practicing, reflecting on their strengths and areas for improvement, receiving feedback from peers, and making adjustments based on that feedback (Bower et al., 2011). The key principles of this pedagogical approach is outlined as follows:

1. Presenting allows pre-service teachers to practice and develop their communication skills.
2. Reflecting on their presentations helps pre-service teachers understand their own communication behaviors.
3. Comparing their presentations with others helps pre-service teachers develop a broader understanding of communication.
4. By reflecting on their own and others' presentations, pre-service teachers can improve their communication skills for future presentations.

The pedagogical model for self-made videos in this study is also grounded in the three domains outlined by Morreale et al. (1993): cognitive, behavioral, and affective. In the *cognitive domain*, effective communication requires understanding the process and its elements. By analyzing their own and peers' video presentations, learners can improve their cognitive skills, critical thinking, negotiation, and understanding of communication. The *behavioral domain* focuses on an individual's ability to convey their message effectively. Through practice and reflection, pre-service teachers can enhance their communication skills. The *affective domain* emphasizes the importance of motivation, feelings, attitudes, confidence, and enthusiasm in communication. Learners should reflect on their own and peers' video presentations to gain insights into their performance and learning. The pedagogical model for self-made videos is grounded in the pedagogical cycle illustrated in Figure 5.

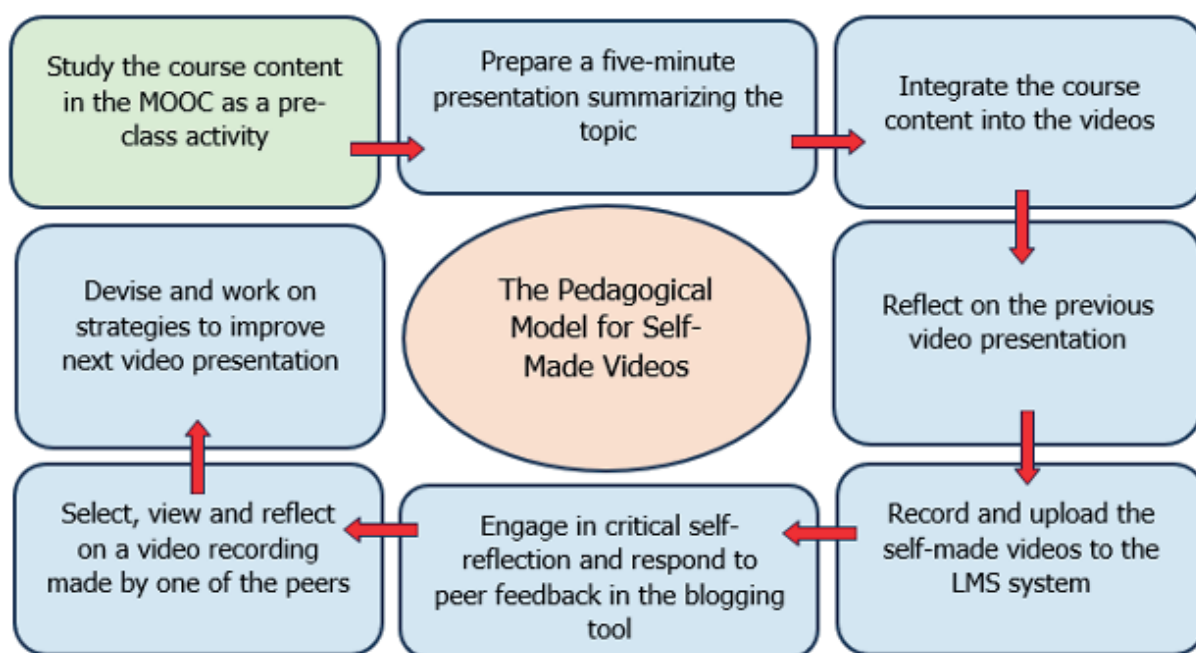


Figure 5. The Pedagogical Cycle Used for the Self-Made Videos

This is the pedagogical model for the self-made videos to have been implemented in the present study. It would be relevant, at this point, to provide a detailed description of the assessment method used in this model.

Assessment Method of the Pedagogical Model for the Self-made Videos

The pedagogical framework of the self-made videos used in the present study offers the pre-service teachers the opportunity to view, rate and reflect on their own presentations, and those of their peers. To minimize

potential bias in the evaluation process, several precautions were taken. First, a detailed rubric (see Appendix 8) with clear and objective performance criteria was used to standardize assessments. Second, prior to the intervention, the researcher underwent calibration training by reviewing and scoring sample presentations to ensure consistent application of the criteria. Finally, participants' self-assessments and peer feedback from the weekly online questionnaires were also reviewed to cross-check the researcher's evaluations and enhance the reliability of the overall assessment. To assess the pre-service teachers' learning and performance, a weekly online questionnaire adapted from Bower et al. (2011) was administered, asking the following question:

1. Please rate your previous presentation on a scale of 1 to 10.
2. What did you notice about your communication style after watching the video of your previous presentation, and how can you improve?
3. Please rate your current presentation on a scale of 1 to 10.
4. What improvements did you make in your current presentation?
5. What further improvements would you like to make in your future presentations?

Additionally, each presentation was evaluated by the researcher using the following criteria developed by Cavanagh et al. (2014):

- (1) The quality of overall presentation performance
- (2) The quality of body-language
- (3) The quality of voice
- (4) The quality of words used
- (5) The alignment between body-language, voice and words
- (6) The confidence of the presenter
- (7) The clarity of the presenter
- (8) The extent to which the presenter was engaging
- (9) The appropriateness of the presenter's presentation (p. 6).

These criteria involve two key aspects: *Modes of Communication* and *Constructed Impressions*. Modes of Communication refer to the tools used for communication, such as *body language*, *words*, *voice*, and *alignment*. Constructed Impressions, on the other hand, involve the qualities perceived by the audience, like *confidence*, *clarity*, *engagement*, and *appropriateness*. Before evaluating each individual performance criterion, an overall impression is given to avoid bias. This overall score is based on the researcher's initial assessment of the presentation. To ensure consistency in scoring, a scale of 0 to 10 is used for each criterion, with specific guidelines defining poor and excellent performance (see Appendix 8). The average of these scores determines the final score for each presentation.

Post-testing

The post-testing process began with the quantitative data collection at the end of the treatment process. Post-tests were similar to the pre-tests applied before the treatment. First, the course achievement tests were administered on the same day to both groups. Then, the speaking tests were administered by two raters to both groups to examine the effect of a series of students' self-made videos as a pre-class activity on their L2 speaking performance and course achievement scores.

Data Analysis

The statistical analysis of the quantitative data was performed using SPSS version 22. The analyses of the quantitative data for the experimental and control groups' pre- and post-test results regarding the speaking and achievement tests were found to follow a normal distribution. First, the items on the speaking test were analysed. The data from both groups' pre- and post-test results were tested for normal distribution and significance value for Shapiro-Wilk test and Kolmogorov Smirnov test was found to be below .05 for both groups, suggesting a non-normal distribution ($p < .05$). However, the skewness and kurtosis values were

acceptable for normality assumption, varying between -1.02 and .46 (see Table 4). As normality assumptions were supported with the speaking performance scores, the parametric Independent Samples T-test was applied to compare the speaking performances of the two independent groups. Sub-dimensions' scores were also calculated to measure the overall speaking performance of the participants.

Table 4. Test of Normality for Pre- and Post-test Scores (Speaking Test) of Both Groups

Tests	Groups	Kolmogorov-Smirnova			Shapiro-Wilk			Skewness	Kurtosis
		Statistic	df	Sig.	Statistic	df	Sig.		
Pre-Tests	Control	.191	32	.004	.870	32	.001	.24	-1.02
	Exp.	.227	33	.000	.859	33	.001	.46	-.78
Post-Tests	Control	.188	32	.006	.932	32	.044	.36	.10
	Exp.	.225	33	.000	.874	33	.001	-.21	-1.02

After the normality tests for the speaking scores were assessed, the scores of the two raters were compared to calculate the correlation and see the level of agreement between them. The correlation between the two raters for the pre-test scores was performed using the parametric Pearson Correlation Coefficient Test. The analysis revealed a strong positive linear correlation between the rankings of Rater 1 and Rater 2 for both the control group ($r = .80, p < .05$) and the experimental group ($r = .74, p < .05$), clearly proving a very high agreement between the two raters. The same analysis was conducted for the post-test scores. The calculated coefficient for the control group ($r = .75, p < .05$) and the experimental group ($r = .99, p < .05$) again suggests a strong positive linear relationship between the grades assigned by the two raters, indicating a considerable level of agreement between them. Based on the findings of Portney and Watkins (2009), coefficient values between .75 and .90 indicate a good level of reliability according to their established criteria for assessing the Pearson correlation coefficient. The average scores of two raters were calculated and the mean scores, calculated from the average scores of two raters, were adopted as the final grade to enhance the reliability of interpretation.

As for the achievement test, the data from both groups' pre- and post-test results were tested for normal distribution. The significance value for Shapiro-Wilk test and Kolmogorov Smirnov test was found to be above .05 for both groups, suggesting a normal distribution ($p < .05$). The skewness and kurtosis values were also found to be acceptable for normality assumption, varying between -1.17 and 1.07 (see Table 5).

Table 5. Test of Normality for Pre- and Post-test Scores (Achievement Test) of Both Groups

Tests	Groups	Kolmogorov-Smirnova			Shapiro-Wilk			Skewness	Kurtosis
		Statistic	df	Sig.	Statistic	df	Sig.		
Pre-Tests	Control	.122	32	.200*	.962	32	.315	.11	-.86
	Exp.	.105	33	.200*	.965	33	.353	.32	1.07
Post-Tests	Control	.112	32	.200*	.970	32	.513	.07	-.50
	Exp.	.117	33	.200*	.947	33	.109	.07	-1.17

As data from both groups were found to follow a normal distribution, an Independent Samples T-test was conducted to compare the differences in the course achievement scores of the two independent groups. Table 6 outlines the research questions, data collection methods, and data analysis techniques used in this study.

Table 6. Overview of Research Questions and Data Collection Procedures

Research Questions	Data Collection Instruments & Study Group	Data Analysis
1- Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers' L2 speaking performance?	Pre- & Post-Tests	Inferential Statistics (means and standard deviations) + Descriptive Statistics
	IELTS Speaking Band Descriptors	
	Experimental + Control Group	
2- Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers' course achievement?	Pre- & Post-Tests	Inferential Statistics (means and standard deviations) + Descriptive Statistics
	Course Achievement Tests	
	Experimental + Control Group	

FINDINGS

Findings Related to the 1st Research Question

Pre- and post-test results of both the experimental and the control group with regard to the speaking test were examined. Descriptive analyses were also conducted for the four dimensions of the speaking test with respect to the first research question below.

1st Research Question

Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers' L2 speaking performance?

To explore the effect of self-made videos as a pre-class activity on students' L2 speaking performance, the pre-test scores of both groups regarding the speaking test which was conducted as a pre- and post-test and administered by two raters were calculated and statistically analyzed before the treatment process started. To ensure more reliable results, the pre-test scores of the experimental and control groups' proficiency levels in speaking skills were analyzed through an Independent Samples T-test to determine whether there is a significant difference between the two groups. The total mean scores were calculated from the average scores of two raters. As indicated in Table 7 below, the control group has achieved a total mean score of 13.44, with a standard deviation of 2.44, while the experimental group's total mean score is 12.64, with a standard deviation of 3.09, suggesting a small mean difference in favor of the control group. Despite this difference, however, test results show that there were statistically no significant differences between the pre-test scores of both groups ($p = .696$, $p > 0.05$) prior to the treatment process.

Table 7. Comparison Between Pre-Test Results of Both Groups in terms of L2 Speaking Performance

Test	Group	N	M	SD	p
Pre-Test	Control	32	13.44	2.44	.696
	Experimental	33	12.64	3.09	

Independent Samples T-Test

To investigate the effect of the self-made videos as a pre-class activity on students' L2 speaking performance, experimental and control groups' pre- and post-test scores were calculated. Figure 6 below describes the total mean of the pre- and post-test scores of both groups.

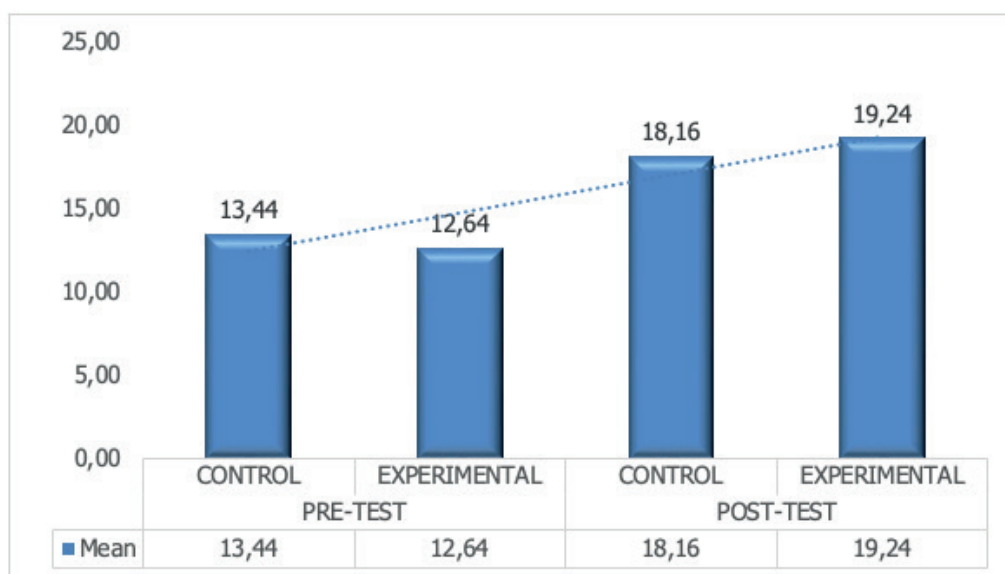


Figure 6. Mean Scores of Both the Experimental and the Control Group in Terms of Speaking Performance

As shown in Figure 6 above, the mean score of the experimental group ($M = 19.24$, $SD = 3.29$) is higher than that of the control group ($M = 18.16$, $SD = 3.09$) regarding the post-test scores. A parametric Independent Samples T-test was also conducted to determine whether the difference between the post-test scores of the two groups was statistically significant or not. Table 8 below shows the results of the Independent Samples T-test of the post-test carried out to both groups.

Table 8. Comparison Between Post-Test Results of Both Groups in terms of L2 Speaking Performance

Test	Group	N	M	SD	P
Post-Test	Control	32	18.16	3.09	.032
	Experimental	33	19.24	3.29	

Independent Samples T-Test

Table 8 indicates that there is a statistically significant difference between the post-test scores in favor of the experimental group ($t = -60606$; $p = .032$, $p < .05$). Thus, as regards the first research question “Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers’ L2 speaking performance?”, the test results suggest that the implementation has a significantly positive effect on students’ L2 speaking performance in a MOOC-based FC model.

Despite these results, though, to achieve a better understanding of self-made videos’ effect on students’ L2 speaking performance, a comparative analysis was conducted to determine the progress each group made by evaluating the mean difference between the pre- and post-tests of each group regarding the following four dimensions of the speaking test, which are simply referred to as dim1, dim2 etc.: a) Fluency & Coherence = Dim 1 b) Lexical resource = Dim 2 c) Grammatical range & Accuracy = Dim 3, and d) Pronunciation = Dim 4.

Hence, both groups were assessed on a descriptive scale based on their pre- and post-test scores in these dimensions. Moreover, an Independent Samples T-test was performed to compare and determine whether there is a significant difference between the pre- and post-test scores of both groups. The pre- and post-test scores were calculated from the average scores of two raters. Table 9 below shows descriptive analyses and the results of the Independent Samples T-test of the pre- and post-tests carried out to both groups.

Table 9. Comparison Between Pre- and Post-Test Results of Both Groups in terms of Four Dimensions of the Speaking Test

Pre/Post Tests	Group	N	M	SD	p
Pre-Dim 1	Control	32	3.25	1.02	.696
'Fluency & Coherence'	Experimental	33	3.15	1.00	
Pre-Dim 2	Control	32	3.25	.72	.353
'Lexical resource'	Experimental	33	3.06	.90	
Pre-Dim 3	Control	32	3.47	.88	.126
'Grammatical range & Accuracy'	Experimental	33	3.12	.93	
Pre-Dim 4	Control	32	3.47	1.05	.506
'Pronunciation'	Experimental	33	3.30	.95	
Post- Dim 1	Control	32	4.56	1.56	.032
'Fluency & Coherence'	Experimental	33	5.24	1.06	
Post- Dim 2	Control	32	4.34	.94	.071
'Lexical resource'	Experimental	33	4.64	.99	
Post- Dim 3	Control	32	4.31	.97	.193
'Grammatical range & Accuracy'	Experimental	33	4.67	.98	
Post- Dim 4	Control	32	4.94	.95	.487
'Pronunciation'	Experimental	33	5.09	1.23	

Independent Samples T-Test

As seen in Table 9 above, the experimental group outscored the control group in terms of the post-test scores and made better progress in each dimension when the progress each group made before and after the treatment is compared. However, the test results showed that although the post-test scores in each dimension increased in favour of the experimental group, they did not statistically differ after the treatment ($Sig > 0.05$), except for Dim 1 (Fluency & coherence) ($p = .032$, $p < 0.05$).

While the findings indicate a positive effect of self-made videos on L2 speaking performance, it is essential to consider potential limitations in interpreting these results. The statistically significant improvement in Fluency & Coherence (Dim 1) aligns with the active, reflective practice encouraged by the video-making process. However, the lack of significant differences in other dimensions suggests that specific sub-skills, such as lexical resource, grammatical range, and pronunciation, may require more targeted interventions or additional time for improvement to be evident. Furthermore, as the study focused exclusively on speaking skills, it is unclear whether the self-made videos had a broader impact on other language skills, such as listening or writing. Future research could explore whether the reflective and creative process involved in video production contributes to these skills and overall course success. This broader analysis could provide a more comprehensive understanding of the pedagogical value of self-made videos in language learning. However, it can be concluded that the implementation contributed to the participants' L2 speaking performance in each dimension, supporting the total mean scores of the speaking test as a whole.

As a result, in regard to the first research question: "Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers' L2 speaking performance?", it can be suggested that the implementation of self-made videos has a significantly positive effect on students' L2 speaking performance in a MOOC-based FC model.

Findings Related to the 2nd Research Question

Pre- and post-test results of both the experimental and the control group as regards their course achievement were investigated with respect to the second research question below.

2nd Research Question

Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers' course achievement?

Like the first research question, the statistical data from both groups were found to follow a normal distribution. Therefore, achievement scores were calculated and statistically analyzed using Independent Samples T-tests. To get more reliable results, the pre-test scores of both groups were analysed to see whether they were similar or different prior to the intervention. As indicated in Table 10 below, the mean score of the control group is 28.50 with a standard deviation of 11.00, while the mean score of the experimental group is 25.15 with a standard deviation of 7.98, showing a slight difference in favor of the control group prior to the treatment. However, as shown in the table, the results of the Independent Samples T-test indicate that there were statistically no significant differences between the pre-test scores of the groups ($p = .167$, $p > 0.05$), suggesting that students' course achievement levels were statistically similar prior to the treatment.

Table 10. Comparison Between Pre-Test Results of Both Groups in terms of Course Achievement

Test	Group	N	M	SD	p
Pre-Test	Control	32	28.50	11.00	.167
	Experimental	33	25.15	7.98	

Independent Samples T-Test

To determine the effect of the self-made videos as a pre-class activity on the course achievement of the students, it was necessary to find out whether there was a significant difference between the post-test scores of the students after the treatment. Therefore, experimental and control groups' post-test scores were statistically analyzed using an Independent Samples T-test. Figure 7 below describes the mean pre- and post-test scores of both groups.

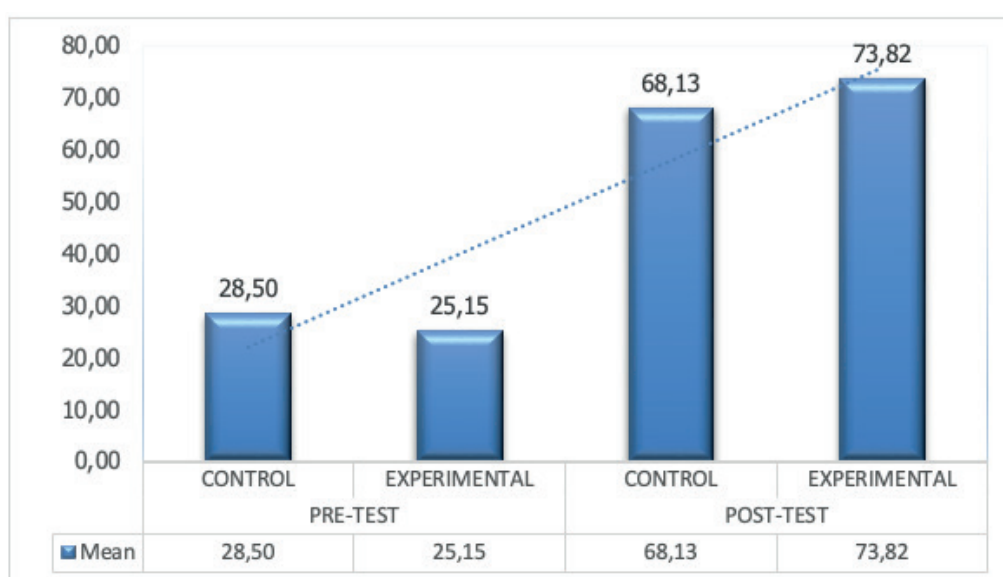


Figure 7. Mean Scores of Both the Experimental and the Control Group in Terms of Course Achievement

As indicated in Figure 7 above, the mean score of the experimental group ($M = 73.82$, $SD = 9.09$) is higher than that of the control group ($M = 68.13$, $SD = 10.55$) regarding the post-test scores. An Independent Samples T-Test was also conducted to determine whether the difference between the post-test scores of the two groups, which is in favor of the experimental group, was statistically significant or not. Table 11 below shows the results of the Independent Samples T-Test of the post-test carried out to both groups.

Table 11. Comparison Between Post-Test Results of Both Groups in terms of Course Achievement

Test	Group	N	M	SD	p
Post-Test	Control	32	68.13	10.55	.023
	Experimental	33	73.82	9.09	
Independent Samples T-Test					

Table 11 shows that the difference between the post-test results of the experimental and control groups is statistically significant ($t = -2.334$; $p = .023$, $p < .05$). In this regard, with respect to the third research question “Does the implementation of self-made videos in a MOOC-based FC model affect pre-service English language teachers’ course achievement?”, the statistical analyses of the test results suggest that the implementation of self-made videos has a significantly positive effect on students’ course achievement in a MOOC-based FC model.

DISCUSSION

Does The Implementation of Self-made Videos in A MOOC-based FC Model Affect Pre-service English Language Teachers’ L2 Speaking Performance?

The first research question sought to examine the effect of self-made videos as a pre-class activity on students’ L2 speaking performance in a MOOC-based FC model by exploring whether there was any statistically significant difference between the post-test scores of the students in the experimental and control group. The test results revealed a statistically significant difference between the students who implemented self-made videos as a pre-class activity and those who didn’t (see Table 8). Similarly, the descriptive analyses (see Figure 6) conducted to determine the progress each group made by evaluating the mean difference between the pre- and post-tests of each group regarding the four dimensions (see Table 9) of the speaking test provided enough evidence to suggest a significantly positive effect of the implementation of self-made videos on students’ L2 speaking performance in a MOOC-based FC model.

These results agree with the findings of several studies in the literature revealing that self-recording videos can generate positive effects on the L2 speaking performance of EFL learners (Encalada & Sarmiento, 2019; Naqvi & Al Mahrooqi, 2016; Shofatunnisa et al., 2021; Sun & Yang, 2015; Yeh, 2018). Similarly, a rich variety of previous research studies investigating the effects of MOOC and flipped instruction on L2 speaking performance found that the MOOC-based FC model can positively affect L2 speaking and communication skills for learners who have little exposure to a second language in traditional classrooms. (Ahmed et al., 2022; Castro et al., 2022; Gimeno-Sanz, 2023; Griffiths et al., 2015; Huang et al., 2022; Liu et al., 2022; Niu & Gao, 2022; Reparaz et al., 2020; Shih, 2010; Yasar, 2020; Zhang, 2022).

Since L2 speaking requires a more synchronous, interactive and co-constructive practices which allow for more interpersonal communication and social dialogue, Russell (2018) recommends communication practices such as establishing contact through brief conversations or exchanging of information on familiar topics, which would stimulate interaction, creative participation, motivation and interest among learners. However, considering the lack of willingness to communicate and the high levels of L2 speaking anxiety among EFL students, as reported by Pichette (2009), it seems advisable to promote self-produced videos for L2 learners to diminish the levels of stress and constraints arising from interpersonal communication and L2 speaking anxiety.

Additionally, the positive effect of the self-made video implementation in the current study seems to have helped initiate some specific improvements that cannot be realised immediately. An even much broader

effect could somewhat be restricted due to the limited period and small-scale implementation. Therefore, it seems that a more intensive implementation extended over a longer period would require a little more time and effort but would produce much better outcomes. Although the absence of real-time, face-to-face interaction and an immediate feedback mechanism have been identified as several limitations of MOOCs by Song et al. (2015) and Yousef et al. (2015), the effect of the student-generated videos was satisfactory as they allowed learners to work at their own pace and improved their L2 speaking skills in a MOOC-based FC model.

It appears that the self-recording videos in the present study encouraged the students to practice L2 speaking through improvisation without causing any needless anxiety or inconvenience. It seems that the self-recording videos in the present study encouraged the students to practice L2 speaking with relative ease and without apparent signs of anxiety or inconvenience, as inferred from anecdotal feedback and classroom observations. However, as no specific measurement tool was used to assess anxiety levels directly, this interpretation should be treated with caution and viewed as a subjective observation rather than an empirically verified outcome. Similarly, the student-produced videos seem to have been instrumental in helping students to speak at length with relative ease on familiar topics, as they were effective enough to bring about a statistically significant difference in favour of the experimental group. On the other hand, considering the relatively brief duration, the lack of two-way information flow, and the absence of interpersonal communication opportunities of the self-made video implementation, it could be argued that the significantly positive effect of the student-generated videos on the L2 speaking performance of the students was not in line with the extent of the short duration and low intensity of the implementation, which seems to be highly promising.

Does The Implementation of Self-made Videos in A MOOC-based FC Model Affect Pre-service English Language Teachers' Course Achievement?

The second research question set out to explore the effect of self-made videos as a pre-class activity on students' course achievement in a MOOC-based FC model by investigating whether there was any statistically significant difference between the post-test scores of the students in the experimental and control group. The test results revealed a statistically significant difference (see Table 11) in favor of the experimental group, suggesting that the implementation of self-made videos had a significantly positive effect (see Figure 7) on students' course achievement in a MOOC-based FC model.

These results correspond to the findings of numerous previous studies in the literature indicating the positive effect of the self-made videos on students' academic achievement (Azis et al., 2022; Freyn & Gross, 2017; Gareis, 2000; Haryanti, 2019; Hsu, 2014; Nagy et al., 2020; Rebong, 2022; Sun & Yang, 2015; van Wyk & van Reyneveld, 2021; Weinstein, 2006; Yang & Yeh, 2021). The positive effect of the experimental process on students' academic development is also supported by research studies that have compared different groups of individuals in a MOOC-based FC model (Ahmed et al., 2022; Ghadiri et al., 2013; Liu et al., 2022; Wang & Zhu, 2019; Xinying, 2017; Yasar & Polat, 2021; Zhang, 2022). However, there are studies, comparing the use of MOOCs in blended learning programs with traditional face-to-face courses, whose results do not agree with the findings of the present study, suggesting that there is no statistically significant difference in student achievement between flipped and non-flipped classes (Griffiths et al., 2015; Perez-Sanagustin et al., 2021; Wu & Luo, 2022).

The positive effect of the experimental process on the academic achievement of the students might be due to the fact that it helped them become aware of their own abilities as they played an active role in their own learning process through the self-recorded videos on regular basis. The content knowledge they acquired from the MOOC might have offered them opportunities to discover their capability to learn independently. Similarly, making independent decisions and being in control of their self-developed and self-constructed video content could have boosted their self-confidence and thus foster the development of skills inherent to self-regulated learning. As Zimmerman (1998) put it, taking an active and responsible role in one's own learning process could prove to have beneficial effects on learning. In a similar vein, Azis et al. (2022) found that displaying their knowledge by integrating the course content into their videos leads to students' greater skill and knowledge acquisition compared to regular teaching alone. Rebong (2022) also found that the use of self-video task as a supplement to teaching enhance students' academic achievements and increase their

learning motivation. Ahmed et al. (2022) also indicated that MOOC-based FC model can lead to better educational outcomes as it enables learners to monitor their own learning processes. It seems that the self-recorded videos have helped to overcome the lack of motivation and guidance of students caused by the lack of physical presence of instructors in the MOOCs.

The improvement in the experimental group's course achievement might be attributed to the intensive exchange of knowledge and experience in the MOOC, acting as catalysts for new ideas. Throughout the experimental process, students were actively encouraged to engage with the content and produce self-made videos by providing them with clear guidelines, detailed rubrics, and regular constructive feedback. Weekly reminders and motivational messages emphasized the importance of reflecting on and transferring their newly acquired knowledge into their videos. Moreover, peer interactions and teacher support during classroom discussions reinforced the students' commitment to practicing and enhancing their understanding through video tasks. As participants were continuously and consistently encouraged to practice and transfer these new ideas and knowledge into their self-made videos, it seems that the experimental process not only provided opportunities for acquiring fresh knowledge, but it also helped deepen the existing knowledge. This argument conforms to the findings of Encalada and Sarmiento (2019), who indicated that self-produced videos provide opportunities for learners to practice knowledge gained in the classroom. This supports the statements of Shofatunnisa et al. (2021) and Sun and Yang (2015), who reported that self-made video tasks enable learners to develop their learning processes and strategies. Encalada and Sarmiento (2019) also stated that self-made videos provide opportunities for learners to practice new theories and knowledge. In another study, Thongkoo and Daungcharone (2022) suggested that MOOC-integrated FC model allows learners to reflect on their newly learned knowledge gained in the MOOC and classroom.

Thus, it could be argued that the positive effect of the self-made video implementation in this study can possibly be explained by participants' growing perception of self-efficacy, which according to Bandura's (1986) social cognitive theory, is a fundamental precondition for operation of the learning process. Therefore, it is possible that the experimental process may have instilled the feeling of self-efficacy in the participants and thus contributed to the strengthening of their self-worth, which might have resulted in a significant increase in their academic achievement. Accordingly, Pajares (2002) stated that learners with a high expectation of self-efficacy tend to dedicate the time and effort needed towards achieving their personal and academic goals. Similarly, Moos and Bonde (2016) argued that a high sense of self-efficacy can make significant contributions to student learning by helping them apply more self-regulatory processes.

Finally, another factor which may explain the positive effect of the experimental process could be the continuous self-evaluation process that could provide the impetus for metacognitive strategies such as self-observation and self-evaluation of the thought and learning process. In this regard, the results of this study are in accordance with the findings of Flavell (1979), who highlighted that metacognition allows learners to plan their learning strategies and assess their learning activities by reflecting on their learning process. Similarly, Pintrich (2000) and Zimmerman (1989) stated that the ability of cognition and self-evaluation process by itself help learners regulate their behaviours and enhance self-learning. Hence, it seems likely that the participants in the present study were empowered to plan and implement their own individual learning processes independently through the self-made video implementation, which might have helped raise their individual self-awareness and motivation for self-learning. In a similar vein, many researchers support video-making as an effective pedagogy to promote metacognitive skills (Kim, 2019), learner autonomy (Rochmahwati, 2015), and 'a self-structured and self-motivated process of knowledge construction' (Ruschoff & Ritter, 2001, p. 231).

While the findings of this study highlight the positive effects of the self-made video implementation on students' course achievement, it is also important to acknowledge some challenges faced during the experimental process. For instance, several students initially reported difficulty managing their time and balancing the demands of creating high-quality video content with other academic responsibilities. This was particularly evident in the early stages of the process, as many were unfamiliar with the technical aspects of video production and struggled to structure their videos effectively. Furthermore, some students expressed feelings of stress associated with being evaluated on creative tasks, especially for those who lacked confidence in their video production or communication skills. Despite these difficulties, continuous teacher support, detailed rubrics, and constructive feedback were provided to alleviate these concerns. Additional peer collaboration and classroom discussions also helped students navigate these challenges and enhance their confidence and technical skills over time.

These challenges suggest that while the implementation was overall beneficial, it required careful scaffolding to ensure that students were not overwhelmed. Future studies could explore strategies to further support students, such as providing more extensive training on video production or allowing greater flexibility in task deadlines to accommodate individual learning paces.

CONCLUSION

The purpose of the present study was to examine the effect of self-made videos as a pre-class activity on pre-service English language teachers' L2 speaking performance and course achievement in a MOOC-based FC Model. The results indicated that the implementation of self-made videos as a pre-class activity had a significantly positive effect on students' L2 speaking performance and course achievement in a MOOC-based FC model, suggesting that self-recording videos seem to be effective enough to bring about a statistically significant difference in favour of the experimental group by yielding highly satisfactory results overall. These results support the view that learning is more effective when individuals become actively engaged in the subject matter and take more responsibility for their own learning.

This study contributes significantly to the existing literature by providing a video-based pedagogical framework that helps learners improve their L2 speaking skills and course performance in a MOOC-based FC model. This framework addresses the known shortcomings of MOOCs and FC approach in providing insufficient opportunities for L2 speaking practice. Unlike most previous video-based studies, which focused on traditional or flipped classroom settings exclusively, this study explores the use of self-made videos in the context of MOOC-based FCs. This highlights the potential benefits of this model as a future-oriented approach in higher education one of the goals of which is to promote socially and culturally aware communicative learners by prioritizing individual development in the face of increasing information technology and digital resources.

Pedagogical Implications

This study has several implications for current and future practices. First, it supports the idea that in addition to the teaching of subject-specific knowledge, guiding students towards self-organised and reflective learning should be a central goal of the modern pedagogical methods and future education systems. Second, it offers evidence-based guidance and acknowledges the importance of this new pedagogical method by demonstrating how could a MOOC blend, along with the implementation of self-made videos as a pre-class activity, help students creatively use knowledge from the MOOC, reinforce the subjects in the curriculum, and improve L2 speaking performance of individuals who have insufficient exposure to the second language in the classroom. Third, the study has confirmed previous findings and provided additional evidence that modern technologies and innovative teaching methods may require a fundamental restructuring of education systems. This restructuring would support learning as an active research process, rather than a passive reception of information through lectures. This study also presents a specific example of a techno-pedagogical framework using a flipped learning approach by supplementing traditional instructor-led content with online learning materials from a MOOC.

In conclusion, it is a well-known and strongly established fact that learning is no longer restricted to the classroom. Thanks to the widespread use of digital content and rapid advancement in information and communication technology, there is no division between distance and classroom education anymore. In this regard, by combining classroom-based, MOOC-based, and video-based active learning, the present study offers a new pedagogical framework that encourages learners to engage in more student-centered activities and motivates learners to demonstrate their abilities and creativity by fostering independent exploration.

Limitations and Recommendations for Future Research

This study has several limitations, including its short implementation period of eight weeks, small sample size, and lack of a control group without flipped instruction. Conducting similar studies over a longer period of treatment could shed more light on the effect of self-made videos on students' L2 speaking performance and course achievement. For instance, the short time frame may have limited students' ability to fully develop advanced self-regulation strategies, refine their video production skills, or reach their peak potential

in terms of L2 speaking proficiency. Additionally, longer exposure might have allowed for more sustained reflection and internalization of knowledge, which could have further enhanced the observed outcomes. On the other hand, the absence of a non-flipped control group limits the ability to isolate the specific contribution of the flipped classroom approach itself, independent of the MOOC-based structure and self-made video tasks. Without this comparison, it is difficult to determine whether the observed improvements in the experimental group's outcomes were primarily due to the flipped instructional design, the use of self-made videos, or the interactive elements of the MOOC-based framework. This limitation suggests the need for caution when generalizing the findings and underscores the importance of including a non-flipped control group in future studies to more clearly identify the unique contributions of the flipped approach to student learning outcomes.

Despite these limitations, the study's findings suggest several avenues for future research. First, further research could explore the effectiveness of the MOOC-based FC approach in different educational contexts and with diverse student populations. Second, investigating the impact of the approach on other learning outcomes, such as critical thinking and problem-solving skills, would provide a more comprehensive understanding of its benefits. Third, other studies may be conducted to investigate new, appropriate and alternative assessment techniques, such as individual learning plans and formative assessment procedures, within the framework of this model. Finally, focusing on specific study areas to explore the impact of self-made videos in enhancing student-centred learning model may reveal more information about the applicability of this pedagogical framework in different school levels.

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APPENDIX 1

IELTS Speaking Band Descriptors Rubric



IELTS Speaking band descriptors (public version)

Band	Fluency and Coherence	Lexical Resource	Grammatical range and accuracy	Pronunciation
9	- speaks fluently with only rare repetition or self-correction; any hesitation is content-related rather than to find words or grammar - speaks coherently with fully appropriate cohesive features - develops topics fully and appropriately	- uses vocabulary with full flexibility and precision in all topics - uses idiomatic language naturally and accurately	- uses a full range of structures naturally and appropriately - produces consistently accurate structures apart from 'slips' characteristic of native speaker speech	- uses a full range of pronunciation features with precision and subtlety - sustains flexible use of features throughout - is effortless to understand
8	- speaks fluently with only occasional repetition or self-correction; hesitation is usually content-related and only rarely to search for language - develops topics coherently and appropriately	- uses a wide vocabulary resource readily and flexibly to convey precise meaning - uses less common and idiomatic vocabulary skilfully, with occasional inaccuracies - uses paraphrase effectively as required	- uses a wide range of structures flexibly - produces a majority of error-free sentences with only very occasional inappropriacies or basic/non-systematic errors	- uses a wide range of pronunciation features - sustains flexible use of features, with only occasional lapses - is easy to understand throughout; L1 accent has minimal effect on intelligibility
7	- speaks at length without noticeable effort or loss of coherence - may demonstrate language-related hesitation at times, or some repetition and/or self-correction - uses a range of connectives and discourse markers with some flexibility	- uses vocabulary resource flexibly to discuss a variety of topics - uses some less common and idiomatic vocabulary and shows some awareness of style and collocation, with some inappropriate choices - uses paraphrase effectively	- uses a range of complex structures with some flexibility - frequently produces error-free sentences, though some grammatical mistakes persist	shows all the positive features of Band 6 and some, but not all, of the positive features of Band 8
6	- is willing to speak at length, though may lose coherence at times due to occasional repetition, self-correction or hesitation - uses a range of connectives and discourse markers but not always appropriately	- has a wide enough vocabulary to discuss topics at length and make meaning clear in spite of inappropriacies - generally paraphrases successfully	- uses a mix of simple and complex structures, but with limited flexibility - may make frequent mistakes with complex structures, though these rarely cause comprehension problems	- uses a range of pronunciation features with mixed control - shows some effective use of features but this is not sustained - can generally be understood throughout, though mispronunciation of individual words or sounds reduces clarity at times



5	- usually maintains flow of speech but uses repetition, self-correction and/or slow speech to keep going - may over-use certain connectives and discourse markers - produces simple speech fluently, but more complex communication causes fluency problems	- manages to talk about familiar and unfamiliar topics but uses vocabulary with limited flexibility - attempts to use paraphrase but with mixed success	- produces basic sentence forms with reasonable accuracy - uses a limited range of more complex structures, but these usually contain errors and may cause some comprehension problems	shows all the positive features of Band 4 and some, but not all, of the positive features of Band 6
4	- cannot respond without noticeable pauses and may speak slowly, with frequent repetition and self-correction - links basic sentences but with repetitious use of simple connectives and some breakdowns in coherence	- is able to talk about familiar topics but can only convey basic meaning on unfamiliar topics and makes frequent errors in word choice - rarely attempts paraphrase	- produces basic sentence forms and some correct simple sentences but subordinate structures are rare - errors are frequent and may lead to misunderstanding	- uses a limited range of pronunciation features - attempts to control features but lapses are frequent - mispronunciations are frequent and cause some difficulty for the listener
3	- speaks with long pauses - has limited ability to link simple sentences - gives only simple responses and is frequently unable to convey basic message	- uses simple vocabulary to convey personal information - has insufficient vocabulary for less familiar topics	- attempts basic sentence forms but with limited success, or relies on apparently memorised utterances - makes numerous errors except in memorised expressions	shows some of the features of Band 2 and some, but not all, of the positive features of Band 4
2	- pauses lengthily before most words - little communication possible	only produces isolated words or memorised utterances	cannot produce basic sentence forms	speech is often unintelligible
1	- no communication possible - no rateable language			
0	does not attend			

APPENDIX 2

The Achievement Test of the Listening and Pronunciation I Course

1. Which one is not a general pronunciation goal?
 - A. Intelligibility
 - B. Credibility
 - C. Nationality
 - D. Identity
 - E. Fluency

2. By looking at somebody's speech what can we guess about that person?
 - A. How rich she/he is
 - B. Where is she/he from
 - C. Is she/he attractive or not
 - D. How well educated she/he is
 - E. Her or his occupation

3. What does Rhoticity mean?
 - A. Pronouncing "r" silently
 - B. Not pronouncing "r"
 - C. Pronunciation of "r"
 - D. Pronouncing "r" everywhere
 - E. Stressing "r"

4. Which accent given below has a rhotic accent?
 - A. Australian
 - B. Wales
 - C. Ireland
 - D. New Zealand
 - E. South Africa

5. By Pronouncing which vowels one after another we can see the most differences in our Jaw?
 - A. i-a
 - B. u-o
 - C. e-a
 - D. æ-a
 - E. ə-ɑ

6. Which word given below is pronounced the same while has a different vowel?

- A. Burry
- B. Bone
- C. Friend
- D. Says
- E. Better

7. Which one of the words given below does not include a strut vowel?

- A. Launch
- B. Sun
- C. Tunnel
- D. Church
- E. Bus

8. Which word does not include? (ʊ)

- A. launch
- B. Dog
- C. Swan
- D. Gone
- E. Quality

9. Which word given below does include nurse vowel?

- A. Return
- B. Travel
- C. Geoffrey
- D. Rack
- E. Bur

10. Which one is the symbol of the goat vowel?

- A. æ
- B. ʊ
- C. ð
- D. ɨ
- E. θ

+ 40 questions

APPENDIX 3

Volunteer Information and Consent Form

Dear Volunteer Participant,

You have been invited to participate in the below-mentioned research planned within the scope of the PhD thesis in the Bahcesehir University English Language Teaching Doctorate Program. Before accepting to participate in this research, you should understand the purpose of the research and make your decision freely within the framework of this information. Please read the information below carefully if you have any questions, ask, and seek clear answers.

I- Type of Research: A quasi-experimental research (Mixed Method)

Purpose: To collect data on the effect of self-made videos by comparing Speaking and Self-regulated Learning (SRL) scores of two volunteer classrooms using the MOOC-based FC Model and contribute to the field.

What will be implemented: Participants will conduct face-to-face interviews with the researcher and there will be an 8-week implementation.

How it will be implemented: Participants will enrol in a free MOOC and prepare self-made videos as a pre-class activity. Then, they will join the complementary face to face sessions for eight weeks. They will share their views on the subject with the researcher online or face to face interviews. Quantitative data will be collected through a questionnaire and a speaking assessment rubric. The intervention will be performed with volunteers for 8 weeks, and the difference in pre-post and delayed treatment will be measured.

Method(s): Semi-structured and focus group interviews, interventions, and questionnaires.

Undesirable effects and risks, if any: In the research, participant information will remain anonymous, and data will be collected online and/or face to face. The volunteer has the right to defer from the study at any time. There are no estimated risks in the current study.

Duration: 8 weeks implementation

II- Rights of the Volunteer

- The volunteer has the right to refuse to participate in the research.
- The volunteer can withdraw from the study at any time, provided that he/she informs the researcher, or he/she can be removed from the research when deemed necessary by the researcher.
- The volunteer will not take any financial responsibility for the expenses to be made for the research, and no payment will be made to him.
- The researcher assures that the identity information of the volunteer will be kept confidential.

III- Voluntary Consent Statement

I read the text above, which shows the information that should be provided before the research. Oral explanations have been provided to me. I asked the researchers my questions about the issues that I thought were missing and got satisfactory answers. I believe that I fully understand all the written and oral explanations presented to me. I was given sufficient time to decide whether I wanted to participate in the study. Under these conditions, I declare that I accept the use of my personal information obtained within the scope of the research for scientific purposes, the presentation, and publication of it by the confidentiality rules, of my own free will, without being under any pressure or coercion.

Date:

The signature of researcher:

Email:

The name and signature of the volunteer:

APPENDIX 4

TOEFL Speaking Questions

TOEFL Speaking - General Questions

The TOEFL speaking section contains six tasks that judge your ability to communicate in English in an academic setting. The first two tasks are called independent speaking tasks, where you will be asked to speak your opinion about a familiar topic, and the last four tasks are called integrated speaking tasks, where you will need to read a text, listen to a conversation, or watch a video and then express your opinion or summarise the information.

Here are some sample questions that you might encounter during the TOEFL speaking section: Independent Speaking Tasks:

1. What is your favourite hobby, and why?
2. Do you prefer to study alone or with others?
3. What are the benefits of reading books according to you?
4. Do you agree or disagree with this statement that having a university degree is essential to succeed in life?
5. Which do you think is more important, saving money or spending money?

Integrated Speaking Tasks:

1. Summarise the main points made in the lecture on the effects of social media on society.
2. According to the passage you just read, describe the Merits and demerits of living in a large city.
3. Explain the two solutions the professor proposes to the problem of global warming in the conversation you just listened to.
4. Discuss the similarities and differences between the two paintings you saw in the video. During the speaking section, you will have 45 sec to prepare your response and 60 seconds to speak.

TOEFL Speaking - Popular Questions 2023

Here are some of the **TOEFL speaking topics with answers**:

1. Talk about a memorable experience from your childhood.
2. What qualities do you think a good leader should possess?
3. Define a place you have visited that you found interesting.
4. What are the advantages and disadvantages of using technology in the classroom?
5. What are the advantages and disadvantages of studying abroad?

TOEFL Speaking - Choice-Based Sample Questions

The TOEFL Speaking section evaluates your ability to speak and communicate effectively in English. One part of the test involves responding to choice-based questions where you must choose an option and explain your reasoning. Here are some **TOEFL speaking topics with answers**:

1. Would you rather have a job with a fixed salary or commission-based pay? Why?
2. Reading books or watching movies: what do you prefer? Explain your choice.
3. Would you prefer to travel by plane or train? Why?
4. Which do you think is more important: having many friends or a few close friends? Explain your answer.
5. Which is more important: studying hard or having a natural talent for something? Why?

When answering these questions, clearly state your opinion and provide specific examples and reasons to support your answer. Use appropriate grammar and vocabulary to convey your ideas effectively.

TOEFL Speaking - Agree or Disagree Questions

1. Agree or disagree: Television has had a positive effect on society.
2. Agree or disagree: Social media is harmful to personal relationships.
3. Agree or disagree: Working from home is better than working in an office.
4. Agree or disagree: Children should be allowed to use smartphones in school.
5. Agree or disagree: Money can buy happiness.

It would help if you aimed to speak for around 45–60 seconds, so try to organise your thoughts beforehand to ensure you have enough to say.

TOEFL Speaking - Preference Type Questions

1. Which do you prefer: watching movies at home or in a movie theatre? Why?
2. Do you prefer to have a small circle of close friends or a large group of acquaintances? Why?
3. Do you like to spend your free time indoors or outdoors? Why?
4. Which do you prefer: listening to music or watching TV? Why?
5. Would you prefer eating at a restaurant or eating at home? Why?

Practice responding to these questions to improve your speaking skills and feel more confident on test day.

TOEFL Independent Speaking Task - Sample Questions with Answer

Question 1: What are the merits and demerits of living in a big city?

Answer: Big towns provide opportunities for work, entertainment, and cultural experiences, with excellent public transport, diverse restaurants, and museums/theatres. However, they can also be overcrowded, noisy, and polluted, with high crime rates and expensive housing.

Question 2: Is it important for children to have a pet?

Answer: Yes, having a pet can teach children valuable lessons about responsibility, empathy, and companionship. Caring for a pet can help children learn to be gentle and kind and provide them with unconditional love and support.

Question 3: Why do you prefer to work in groups or alone?

Answer: I prefer working alone as I can focus better and be more productive. Working in groups can have advantages, such as brainstorming ideas and dividing tasks, but it can also cause distractions and difficulties in finding a suitable time for everyone's schedule.

Adapted from AECC (2023)

APPENDIX 5

Chapters of the FutureLearn MOOC

Week 1 What is important in English pronunciation?		Week 3 English vowels 1	
1.1.	Brainstorming about English pronunciation in a global world - Discussion	3.1.	Introduction to week 3: vowels - Video (06:37)
1.2.	Introduction to week 1 - Video (05:48)	3.2.	Brainstorming about vowels and intelligibility - Discussion
1.3.	English pronunciation features: intelligibility, credibility and identity - Article	3.3.	English vowels: intelligibility, credibility and identity - Article
1.4.	Sharing our English accents - Exercise	3.4.	The feature of vowel length explained - Video (01:16)
1.5.	Sharing our experiences speaking English - Exercise	3.5.	Different pronunciations of vowel length analysed - Discussion
1.6.	What English pronunciation features are difficult for you? - Exercise	3.6.	Minimal pairs with long and short vowels - Exercise
1.7.	What are your needs regarding English pronunciation? - Quiz	3.7.	A listening exercise on vowel length (before voiced/voiceless consonants) - Exercise
1.8.	Setting personal goals regarding English pronunciation - Discussion	3.8.	The TRAP vowel - Video (02:01)
	Making a recording of your English pronunciation - Assignment		Different pronunciations of the TRAP-vowel analysed - Discussion
Week 2 What is important in English pronunciation?		Week 4 English vowels 2	
2.1.	The word list and the reading passage for the recording - Article	4.1.	Minimal pairs with the vowel DRESS [e] and TRAP [æ] - Exercise
2.2.	Peer Assignment Review assignment - Review	4.2.	Listen and repeat: 55 words with the NURSE-vowel - Video (02:24)
2.3.	Peer Review Reflection assignment - Reflection	4.3.	Different pronunciations of the NURSE-vowel analysed - Discussion
2.4.	The notion of rhoticity explained - Video (05:16)	4.4.	Pronunciation and language change: the STRUT-vowel - Video (04:58)
2.5.	The word list in a non-rhotic and in a rhotic accent - Exercise	4.5.	Listen and repeat: 85 words with the STRUT-vowel - Video (02:42)
2.6.	The reading passage in a non-rhotic and in a rhotic accent - Exercise	4.6.	Different pronunciations of the STRUT-vowel analysed - Discussion
2.7.	Words in a rhotic accent and in a non-rhotic accent - Exercise	4.7.	Drag & drop: which vowel? - Exercise
2.8.	A fun exercise for practising (non)rhoticity - Discussion	4.8.	Listen and repeat: LOT words [ɒ] and THOUGHT-words [ɔ:] in British English (and American English) - Video (03:05)
2.9.	Ask your education questions online - Discussion	4.9.	Different pronunciations of the diphthongs FACE and GOAT analysed - Discussion
		4.10.	Listen and repeat: FACE and GOAT - Exercise
		4.11.	Reflection - Discussion

Week 5 English consonants 1		Week 7 Suprasegmental features in English 1	
5.1.	Introduction to week 5: consonants - Video (12:28)	7.1.	Introduction to week 7: suprasegmental features - Video (09:16)
5.2.	Brainstorming about consonants and intelligibility - Discussion	7.2.	Suprasegmental features in English: intelligibility, credibility and identity - Discussion
5.3.	English consonants: intelligibility, credibility and identity - Article	7.3.	Stress - Video (02:59)
5.4.	Consonant clusters - Video (01:52)	7.4.	Stress-timed versus syllable-timed stress - Discussion
5.5.	Different pronunciations of consonant clusters analysed - Discussion	7.5.	Listen and repeat: contrastive stress 1 - Audio
5.6.	Minimal pairs with consonant clusters - Exercise	7.6.	A quiz on stress - Quiz
5.7.	Aspiration - Discussion	7.7.	Stress analysed in commonly mispronounced words in English - Discussion
5.8.	Minimal pairs with and without aspiration - Video (01:33)	7.8.	Analysing and practising intonation - Discussion
5.9.	Clear and dark L - Video (01:48)		The phenomenon of linking discussed - Discussion
5.10.	A different pronunciation of clear L analysed - Discussion	7.9.	Week 8
	Week 6 English consonants 2	8.1.	Suprasegmental features in English 2
6.11.	Why are letters sometimes silent in English? - Article	8.2.	Practising fluency - Discussion
6.1.	Which letter is not pronounced? - Exercise	8.3.	Analysing the reading passage - Test
6.2.	Listen and repeat: 55 words with 'ch' - Video (02:03)	8.4.	Assessing your English pronunciation (British) - Exercise
6.3.	The deletion of word endings analysed - Discussion	8.5.	Assessing your English pronunciation (American) exercise
6.4.	Listen and repeat: words with 1-4 final consonants - Video (03:13)	8.6.	Making a second recording of your English pronunciation - Assignment
6.5.	Different pronunciations of 'th' analysed - Discussion	8.7.	The word list and the reading passage for the second recording - Article
6.6.	Listen and repeat: words and phrases with 'th' - Video (02:44)	8.8.	Peer Review Assignment - Review
6.7.	Listening exercise: /g/, /ʒ/ or /dʒ/? - Exercise	8.9.	Peer Reflection assignment - Reflection
6.8.	Listen and repeat: 50 items with /f/ and /tʃ/ - Video (02:59)		Reflection - Discussion

APPENDIX 6

Sample Video Recordings

Consonant Clusters and The Epenthetic Vowel

st- sk- sp-
start school sport

[se:peɪn]

asked = [askt]
[askɪd] ≠ [baskɪt]

And the vowel in the past tense -ed
adding schwa or epenthetic vowel.

ASPIRATION

P, T, K B, D, G

Voiceless Consonant
Burst of air Voice Consonant
No burst of air

Pie- Buy Track- Drag

Pill - Bill

PRONUNCIATION OF CONSONANTS

	Bilabial	Dental	Alveolar	Postalveolar	Palatal	Velar	Glottal
Plosive	p b		t d		k g		
Nasal	m		n		ɲ		ŋ
Fricative		f v	θ ð s z	ʃ ʒ		h	
Approximant			r		j		ɹ
Lateral approximant			l				

Approximants are called approximants because they are approximately vowels.

An egg → a/negg

fall in → fa/in

give up → gi/vup

While talking if a word ends with a consonant and the next word starts with a vowel native English speakers link those words together.

Grammatical Function Intonation

This function is used to create facts and questions by raising or lowering the voice.

To state a fact we lower our voice.

You have lent the groom 5,000 pounds...
...haven't you?

And you are in love with the bride...
...aren't you?

To ask a question we raise our voice.

You do believe me, don't you...
...don't you?

PHONETIC ALPHABET

The International Phonetic Alphabet (IPA) is a system where each symbol is associated with a particular English sound.

Long And Short Vowels /i:/

These are the voiceless consonants: Ch, F, K, P, S, Sh, T and Th

These are the voiced consonants: B, D, G, J, L, M, N, Ng, R, Sz, Th (as in the word "then"), V, W, Y, and Z

***Letter is pronounced long before voice consonant

***Letter is pronounced short before voiceless consonant

02

The Schwa

Most common vowel sound in English

Any vowel letter or combination of the vowel letters could be pronounced as schwa

Rhotic- Non-rhotic

Rhotic

- American Accent - Rhotic
- More intelligible

Non-Rhotic

- British Accent - Non -Rhotic
- "R" occurs following a vowel at the end of a word

Vowel length

short
I
ship

long
i:
sheep

CONSONANTS

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Palatal	Velar	Glottal
Plosive	p b			t d		k g		ʔ
Nasal	m			n		ɲ		ŋ
Fricative		f v	θ ð	s z	ʃ ʒ		h	
Approximant				r		j		ɹ
Lateral approximant				l				

APPENDIX 7

Sample Self- and Peer Reflections

Self-reflections	Peer-Reflections
"Seeing how my friends did their presentations helps me to see my flaws or how I can do better the next one." "At the end of the week 1, I felt really good. In my opinion, the best part of the MOOC is the recording part. I could recognize my mistakes thanks to recordings. I recorded my voice and then I listened the others and my mistakes were clear. I'm trying to fix my mistakes and I'll continue to try it over and over until they are fixed. As for the Melissa's presentation in the class, it was well studied. She mentioned the all details about the MOOC. I guess that's all I would say for week 1. Thanks." "It is definitely very useful for me, and apart from the material discussed in the class, we can study it by ourselves." "Although futurelearn is a great site, it is not easy for us to fully understand the subject on our own. However, by watching each other's presentations, we understand the topic of that week a little better." "When I was working on MOOCs, some parts were like, 'Yeah, I better put this on video.' I say. I would never have thought of that before when I was working normally." "At the same time, I became aware of the valid accents in English and the main differences between them. It was exciting to hear different speakers from many parts of the world and do the same work with them in the course." "It made me focus more on personal shortcomings in language learning." "Yes, it changed. The self-assessment parts provided what I should have done better." "During this week i have set a goal about my english pronunciation.I made contact with foreigner but it wasn't 22 of course,it was online and i just write my opinion about his pronunciation and vice versa.Thanks to this contact i learned some words' pronunciations like bear and beer." "In terms of transferring the content and having knowledge about the content, self-made videos are necessary." "Yes, I tried to focus on content. When it became hard to keep my attention alive I gave breaks." "Yes. We made presentation and it helped to make planning an setting goals." "We are taking a course which is called MOOC and this course is divided a lot of weeks and these weeks is divided a lot of sections. In the first week we have learned some words' actual meanings. These words are pronunciation, rhotic, non-rhotic, intelligible, credible, identity etc. Actually, I thought that I know these words, why should I do these kind of stuff but, when I did these steps, I could see that I didn't actually know	"While shooting a video, the information you transfer at that time must be in a certain order and visually supported." "You learn how to criticize yourself and not to repeat the same mistakes." "When studying from the MOOCs, the learning part is up to you. The person that has to take notes, listen effectively and do the exercises is you, not someone else. And that makes 'you' an independent learner." "I think it was necessary since you have to teach it to someone else you have to study harder." "I think it increased my self-confidence as it allowed me to have more control over the subject." "Thanks to your good pronunciation i understand the words' pronunciations better, and it helped me to understand rhotic and non-rhotic accents' pronunciation." "Your presentation is well but i think it is too long and you use all the materials from the websites that we learn the matters. I think we should also add our words and materials which we can find another platforms. If we do so, then we can compare other informations and see other examples and then can get the topic in a better way and more comprehensive." "I can say that I think you must have worked really hard to prepare such a nice and comprehensible presentation. You explained each subject in detail. I just didn't like how you explained everything at length, because long conversations bore me so much." "Your accent was really good, you spoke clearly and fluently. I liked your Power Point presentation as well. You clearly worked hard on it. I liked that you gave a lot of examples and showed us a lot of related pictures." "First, I would like to say that it's good to finally see one of my classmates face. I loved how you presented and how you really acted like a teacher and that there we were actually with you by asking questions and repeating yourself. The ppt was good too I just thought that if you worked on it more it would have been more attractive." "Your pronunciation was excellent and your speech was so fluent. Moreover, your presentation, and the way of narration were also perfect. I am amazed with your pronunciation." "You explained the points that needed to be explained, you did not prolong it unnecessarily. Your pronunciation was also very good and this is a very important future as the main topic of our lesson is pronunciation. You just looked a little tired to me. Other than that, I did not see anything that I did not like. It was a very illuminating presentation so thank you for this. Great job." "My favorite part was when I watch the video about the aspiration. In this video you picked a piece of paper to show the logic of aspiration. At the beginning, you brought the paper near to your mouth. Then, you pronounced some words that start with the letter 'p'. At last, you articulated some other words that begin with the 'b' letter. The result

APPENDIX 8

Guidelines Defining Poor and Excellent Performance

Modes/Characteristics		
	Poor Performance	Excellent Performance
Communication		
Body Language	• Moving around too much • Shuffling • Slouching • Rigid stance • Withdrawn posture • Defensive arm positioning (folded arms, hands in pockets) • Flapping hands • Wandering eyes • Shoulders hunched • Head down • Distracting/unclear gestures • Stiff gestures • Cold/unexpressive facial expression	• Natural • Appropriate volume/projection • Melodic variety/intonation • Clear enunciation • Appropriate pace
Voice	• Contrived • Too loud/soft • Monotone • Stammering • Unclear enunciation (e.g., heavy accent, mumbling) • Too fast/slow	• Natural • Appropriate volume/projection • Melodic variety/intonation • Clear enunciation • Appropriate pace
Words	• Unexpressive • Negative • Poorly organized/structured • Confusing meaning • Not inclusive • Inappropriate slang (e.g., kids, dropping 'g', gunna, you know) • Too many pausing/filling words ('ums' and 'ahs') • Poor use of humour	• Colourful/expressive language • Positive • Structured/organised • Clear meaning • Inclusive • Register relevant to audience • Positive use of humour • Use of strategies (such as rhetorical questions) to engage
Alignment	• Disparity between message and body/voice/words • (Messages mixed)	• Congruence between body/voice/words • (Messages aligned)
Constructed Impressions		
	Poor Performance	Excellent Performance
Confidence	• Appears anxious or apprehensive • Manner conveys nerves, lack of authority or connection • Inflexible – working from fixed script	• Appears relaxed and stable • Speaker manner conveys their knowledge and authority, their relationship with audience • Flexible
Clarity	• Meaning difficult to understand	• Meaning easily understood
Engagement	• Appears uninterested in presentation/lacks enthusiasm • Impression that audience would be bored, unmotivated, easily distracted, even alienated • Lacks impact • No interaction/does not connect	• Interested and enthusiastic • Anticipate that audience would likely be engaged, interested in presentation • Makes an impression • Interacts/connects
Appropriateness	• Content and delivery unsuitable • Talking to wrong level of audience (context)	• Content and delivery (language register) both suitable for a particular audience • Talking to the level of the audience and situation (context)

A NEW MODEL FOR BLENDED LEARNING IN ISLAMIC HIGHER EDUCATION: INTEGRATING PEER INSTRUCTION WITH JUST-IN-TIME TEACHING

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ABSTRACT

High-order thinking skills are crucial in pursuing competency mastery within Islamic higher education. A viable approach to attain these educational goals is implementing the Peer Instruction strategy. Nevertheless, a comprehensive model for peer instruction in blended learning environments still needs to be developed. This research seeks to create a model for instructional system design that outlines learning procedures, integrating the Peer Instruction strategy within a blended learning framework informed by a just-in-time teaching methodology. The built model is intended to guide instructors in creating learning to stimulate learners' higher-order thinking skills. The development process follows the formative evaluation procedure, consisting of several stages, such as selecting a design theory, designing an instance of the theory, collecting and analyzing formative data on the instance, revising the instance, repeating the data collection and revision cycle, and offer tentative revisions for the theory. The resulting product has also undergone several validity tests by experts, including instructional designers, blended learning experts, lecturers, and students. The product's effectiveness in improving critical thinking and problem-solving was carried out through a test instrument for students. Validation and effectiveness tests showed that this product was valid, practical, and effective in improving critical thinking and problem-solving skills.

Keywords: Instructional system design, peer instruction, just-in-time teaching, higher order thinking skills.

INTRODUCTION

The development of higher-order thinking skills (HOTS) poses a significant challenge for Islamic higher education institutions in Indonesia, primarily due to their reliance on conventional lecturing methods that emphasize rote learning over critical thinking (Hammad, 2014). Research indicates that many educators need more proficiency in HOTS-oriented pedagogies, leading to resistance against innovative teaching strategies (Br. Sinulingga & Dahlan, 2022). Consequently, they often revert to traditional methods, which are easier to implement, focusing on lower-order thinking skills (LOTS) through lectures and recitations (Aziz, Ibrahim, Shaker, & Nor, 2016; Azzahra Indriani, Munawaroh, & Garut, 2024). As a result, assessments mainly evaluate LOTS (Wigati, Mardeli, Astuti, Yuniar, & Ramdani, 2023).

Thus, an instructor is expected to facilitate HOTS achievement by providing a learning environment based on real problems (Degeng et al., 2021). One way is to choose suitable learning models and methods (Kuswandi, Surahman, Thaariq, & Muthmainnah, 2018). Peer instruction (PI) is a constructivist pedagogical method that allows active involvement in collaborative learning, thereby improving students' critical thinking skills. Applying the PI method allows students to develop their understanding of basic concepts toward deeper critical thinking (Kannan & Gouripeddi, 2018).

The varied blended learning (BL) model transforms university learning (Feng, 2023). The identical PI method is applied face-to-face, but the delivery system can change. Several studies have reported the application of PI in one of varied BL environments, namely Just-in-Time Teaching (JiTt) (G. Novak, Gavrin, Christian, & Patterson, 1999; Russell, 2006). Zou & Xie (2019) applied PI to the JiTT environment, finding that the model exceeded conventional models in students' writing skills, motivation, and critical thinking tendencies. Hung (2017), who tried to combine the application of PI in a JiTT environment assisted by the student response system (SRS), found that the treatment created interactive, communicative, and satisfying learning. Sayer et al. (2016) found that students' performance on the clicker questions increased after group discussion following individual clicker question responses in the JiTT class. Since its early development, the JiTT approach has often been combined with peer discussion in the classroom (G. Novak et al., 1999). Some of this empirical evidence implies that the implementation of PI in JiTT-based BL environments can be a learning strategy worth trying by lecturers in higher education.

Watkins & Mazur (2010) provide a rationale for integrating these two strategies. They argue that PI is an interactive learning technique to discuss understandable aspects of complex material. For optimal learning, students need to understand the material sufficiently before coming to class. The JiTT strategy perfectly complements the PI implementation because JiTT requires students to read the material and do assignments before class. Consequently, teachers can monitor learning progress while providing feedback so that they can adjust PI follow-up questions that target students' learning difficulties. Moreover, a report shows that integrating JiTT and PI has advantages over the conventional flipped learning approach. JiTT complements PI with instructors having information about students' independent learning progress before class (Clark, 2016).

The previous two paragraphs have presented several reports of PI implementation in JiTT. Several critical analyses conducted by researchers have found several conclusions. First, Watkins and Mazur's writing is still a rational narrative about the integrated efficacy of these two strategies. They do not describe the conceptual learning model, let alone its operational model. Second, Hung (2017) only describes the implementation of the PI strategy in the JiTT environment. It does not detail the activities that instructors and learners must carry out. The model is also not based on any learning theories in every aspect. In addition, the model's validity from the perspective of learning design and practicality has not been tested because the study report has not described the review process from relevant learning experts. Third, the article by Sayer et al. (2016) only reported the effect of implementing students' response systems for in-class conceptual clicker questions in JiTT classes that implemented the PI strategy. They did not explain precisely how they experimented. Therefore, their study cannot be used as operational guidelines for implementing the strategy in the JiTT environment.

The only procedural model as an operating framework is Zou & Xie (2019). Zou and Xie created a procedure for teachers when integrating PI strategies into the JiTT environment. However, the model has yet to be developed based on the leading learning principles in every aspect. In learning activities, the model does not refer to the learning principles as stated by leading theorists. (e.g., Gagne, Wager, Golas, & Keller, 2004; Landa, 1983; Merrill, 2013). In addition, the learning activities proposed also do not have the specific objective of developing learner competencies (see Anderson & Krathwohl (2001)). The model is also not based on the theory of blended learning environment development, which is the basic platform for the learning process. The built model did not undergo a model development process using a specific learning design model. The built model also did not undergo the validation-revision procedure from blended learning experts, instructional designers, lecturers and students as its main users. As a result, the feasibility aspect of implementing the learning design model still needs to be questioned.

Thus, the main objective of this study is to develop and produce an instructional system design (ISD) model in the form of guidelines or procedures that integrate PI strategies into JiTT-based BL. The resulting model is in the form of stages or syntax extracted from theoretical approaches, synthesis of relevant literature, and practical approaches to applying PI and JiTT strategies. In addition, the model built also considers several learning conditions that underlie the BL environment.

JUST-IN-TIME TEACHING-BASED BLENDED LEARNING

BL can be seen as aligning face-to-face learning with online learning. This learning mode allows for integrating technological innovations bridging online and face-to-face learning. A typical example is the combination of technology-based materials and face-to-face sessions implemented simultaneously (Chaeruman, 2011) so that learning can be done anytime and anywhere (Ulfa, Bringula, Kurniawan, & Fadhli, 2020).

Conceptually, BL can be defined in two perspectives, namely synchronous and asynchronous learning (Septantiningtyas, Degeng, Kuswandi, & Purnomo, 2024; Varkey et al., 2023). Synchronous learning is a learning activity that occurs simultaneously between learners and instructors. Asynchronous is a process of interaction between learners and all learning resources that occurs anytime and anywhere.

The BL concept utilizes the best learning conditions from synchronous and asynchronous aspects. Several researchers have recently proven the advantages of combining these two learning modes. Evans & Perry (2023) highlighted the interaction between asynchronous and synchronous online activities. Synchronous activities complement independent learning activities while students are in asynchronous sessions through correction and further exploration of the concepts discussed. Conversely, asynchronous activities build foundational knowledge that prepares students for interactive synchronous engagements. This combination gives students a more holistic learning experience, as they can reflect on asynchronous material before applying it to synchronous activities. Kelly & Lock (2021) utilized asynchronous and synchronous modes to overcome their limited teaching time. They developed teacher-created videos and regular written feedback to deliver material asynchronously, allowing students to learn independently. At the same time, limited synchronous sessions provided opportunities for class reflection and discussion, enhancing community interaction. In summary, blended learning creates a complementary and holistic learning experience, enabling students to build foundational knowledge independently while engaging in real-time interactions and reflection during synchronous sessions.

Experts have formulated several principles to guide instructors in planning learning activities in these two settings. Horton & Horton (2003) proposed the principle of an online learning flow consisting of three steps: absorb, do, and enact. Chaeruman et al., (2020) developed the principle of the BL model flow consisting of four steps: learning, deepening, applying, and evaluating (LDAE). The LDAE model can be illustrated in Figure 1.

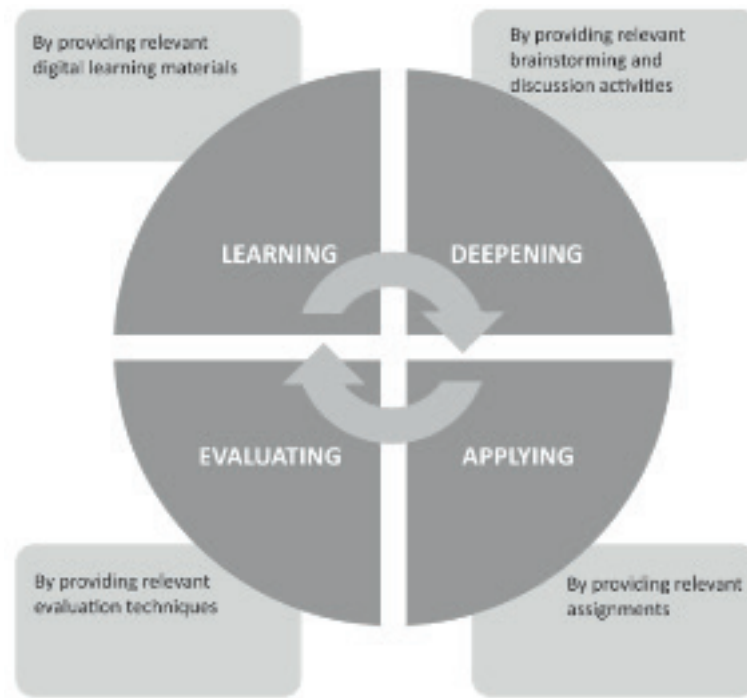


Figure 1. LDAE Model for Developing BL Activities

The learning path model includes four cycles: learning, deepening, applying, and evaluating. The LDAE model guides instructors to fill their BL learning activities in its four quadrants. For example, in the Learning quadrant, an instructor can provide learning content such as text, audio, visuals, videos, animations, simulations, games, and others. In the Deepening quadrant, an instructor can provide an online discussion forum or video conference, providing practice questions, and others. In the Applying quadrant, an instructor can provide problem-solving tasks so that learners can apply the concepts they have learned previously. In the Evaluation quadrant, an instructor can determine the success of BL by giving tests, collecting reports or products, reflection reports, and so on (Chang, 2019).

The LDAE model above will be the foundation for developing the ISD model in this study. The four quadrants indicate the activities proposed in the product being developed. Through this model, researchers can prescribe the activities that must be carried out by a teacher and all students when they are in the learning environment in the ISD model being developed. For example, in the asynchronous realm (see Figure 8), lecturers can provide material through LMS, Interactive Learning Videos, and others while students listen to the material. This activity is included in the learning quadrant. Then, students must complete several questions to test their understanding of the material. The students' activities in completing the questions are included in the deepening quadrant.

The JiTT (hybrid, flipped, or mixed learning) strategy allows an instructor to divide learning time into two sessions: synchronous face-to-face learning activities and asynchronous individual online learning tasks (Riskowski, 2015). Operationally, learners are required to deepen the material and work on assignments independently through asynchronous website technology. This activity is called a preclass activity and is a preparation stage for synchronously participating in class activities. In-class learning activities involve problem-solving (G. M. Novak & Beatty, 2017). Combining two main components of BL learning in the JiTT strategy is considered an ideal element in modern learning. Several experts have proven that optimizing pre-class and in-class activities can enhance the learning experience in BL. (Gross, Pietri, Anderson, Moyano-Camihort, & Graham, 2015; Liu, Liu, & Zhao, 2020; Zarrinfard, Rahimi, & Mohseny, 2021). Figure 2 illustrates the steps of the JiTT strategy.

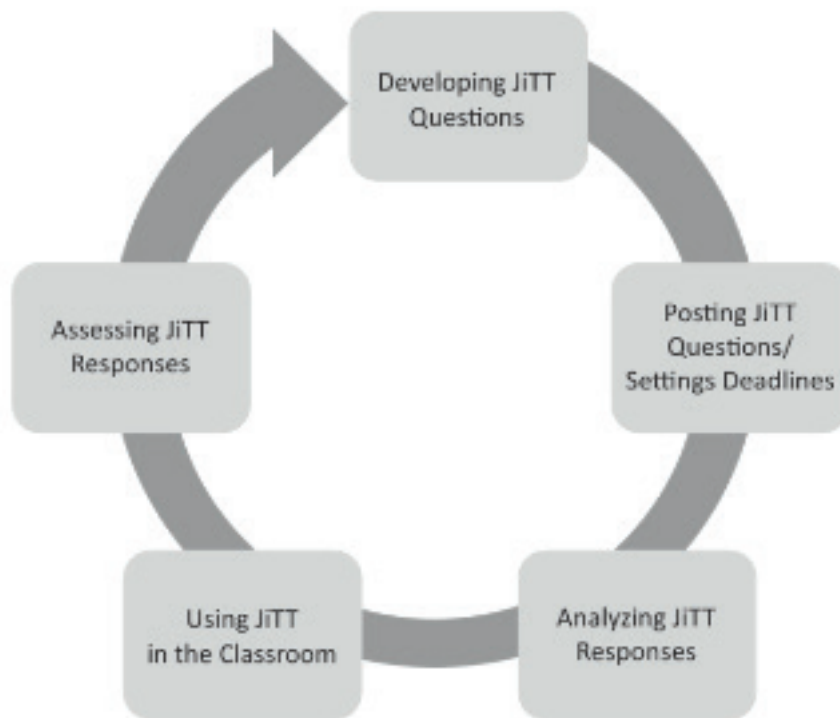


Figure 2. Prosedur Strategi JiTT Novak & Patterson (2010)

When the JiTT concept is adapted to the context of Islamic education, it is relevant to the principles of, among others, *tahqiq* (in-depth exploration) and *ijtihad* (intellectual effort). Both principles emphasize the aspect of in-depth preparation before implementation. The Islamic intellectual tradition encourages students to master basic knowledge, internalize it independently, and then discuss it with scholars to confirm the intellectual thinking of the students. The same thing is also reflected in the philosophical foundation of JiTT. It bases proactive learning activities on reflecting thoughts raised by pre-class questions in independent learning activities. This is the same as the concept of the *halaqah* (study group) tradition, which emphasizes critical dialogue and reflection (Nasr, 2006). Last, JiTT is a method that aligns with the perspective of teaching methods in the Islamic tradition because it encourages intellectual improvement based on deep understanding.

PEER INSTRUCTION

Peer Instruction (PI) is an instructional strategy that facilitates active collaboration among learners within the classroom environment. This method enhances the interactive nature of learning engagement and addresses challenging subjects students encounter (Cortright, Heidi L. Collins, & DiCarlo, 2005; Watkins & Mazur, 2010). PI fosters collaborative learning through in-class concept discussions. To maximize effectiveness, students need a basic understanding of the concepts, which can be supported by pre-class in JiTT activities. Thus, instructors can choose PI questions presented in class to address specific learning difficulties encountered by learners (Rowley & Green, 2015)

Unlike other constructivist strategies, which may focus solely on collaborative learning or project-based tasks, PI actively engages students in articulating their reasoning and confronting misconceptions through structured voting and discussion (Simon & Cutts, 2012). This method allows instructors to gauge student understanding in real time and adapt their teaching accordingly, enhancing the learning experience by making it more interactive and responsive to student needs.

PI emphasizes the collaborative aspect repeated between peer students through discussions, which is its unique feature. In PI, students are given conceptual questions designed to challenge their understanding of

the material. They then discuss with peers to refine or reinforce their understanding before the instructor provides a final explanation (Versteeg, Blankenstein, Putter, & Steendijk, 2019). Shortly, PI focuses on students discussing and solving conceptual questions in small groups, enhancing understanding through peer interaction and immediate feedback (Woods, 2013).

The PI strategy is well-suited for implementation in Islamic higher education because it supports fundamental Islamic values such as *ijtihad* and *shura*, emphasizing the importance of collective discussion and deliberation-based decision-making (Vasinayanuwatana, Wee, & Jeerawan, 2020). The PI encourages student engagement in critical dialogues that deepen understanding, reflecting the Islamic tradition of rational thought and communal reflection (Abdul-jabbar & Makki, 2024). PI becomes even more relevant in the context of blended learning because technology can be used to support the preparation phase before face-to-face classes, such as JiTT. Instructors can thus assess the difficulties students face and tailor PI discussions to their specific needs (Watkins & Mazur, 2010). This integration makes PI a practical and relevant approach to support the development of critical thinking skills in Islamic higher education.

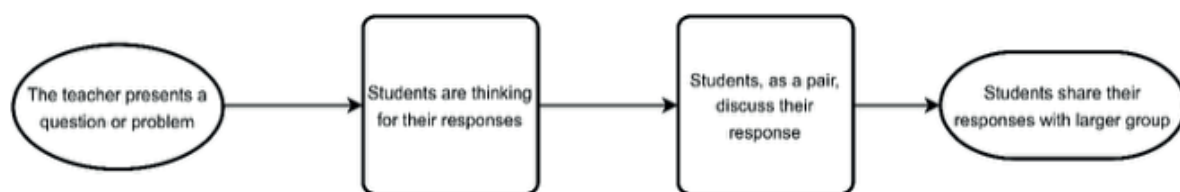


Figure 3. PI Strategy Procedure

The literature review results have yet to show the exact stages of implementing the PI process. However, some experts adopted the Think-Pair-Share strategy procedure (Cortright et al., 2005; Crouch & Mazur, 2001; Knight & Brame, 2018). In the PI strategy, an instructor poses a problem and gives students time to solve it independently. Then, the students discuss their answers in pairs before the pair submits theirs. Finally, the instructor can compare and discuss the responses built by each group to reach a consensus on the best answer (Kagan & Kagan, 2009). Figure 3 illustrates the PI process.

DEVELOPMENT OF LEARNING TECHNIQUES TO IMPROVE HOTS IN ISLAMIC HIGHER EDUCATION

Learning techniques in Islamic universities have undergone significant developments along with the demands to develop HOTS, which include critical thinking, creativity, and problem-solving skills. Islamic education traditionally emphasizes *ta'lim* (teaching) and *ta'allum* (learning) by focusing on memorizing and understanding religious texts. However, along with the changing paradigm of modern education, many Islamic universities have begun adopting a more constructivist learning approach, encouraging students to engage in higher-order thinking processes (Sumanti, Nunzairina, & Salminawati, 2024). For example, techniques such as Problem-Based Learning (PBL) and Collaborative Learning have begun to be implemented in various courses at Islamic universities to improve analytical and evaluation skills among students (Darmawan, Qomaruzzaman, Hanan, & Mauliddin, 2024).

Although PBL and Collaborative Learning have significantly improved HOTS in Islamic higher education, the PI integration model in JiTT developed in this study offers a more interactive and contextual approach. PI, introduced by Mazur (1997), focuses on student interactions to understand more profound concepts through peer-to-peer discussions. Integrating PI into JiTT allows students to utilize both learning modes: asynchronous to study the material independently and synchronous to discuss and solve problems with classmates. This supports the principle of *shura* in Islam, where collective deliberation and discussion are valued as wise decision-making methods (Ahmad, 2022).

METHOD

Research Design

The main objective of this study is to develop an instructional system design (ISD) model in the form of syntax or learning steps. The formative research method (Reigeluth & Frick, 2009) is the basis for developing and validating the developed ISD model. It consists of six stages, including 1) selecting a design theory; 2) designing an instance of the theory; 3) collecting and analyzing formative data on the instance; 4) revise the instance; 5) repeat the data collection and revision cycle; and 6) offer tentative revisions for the theory. However, Figure 4 represents the operational process.

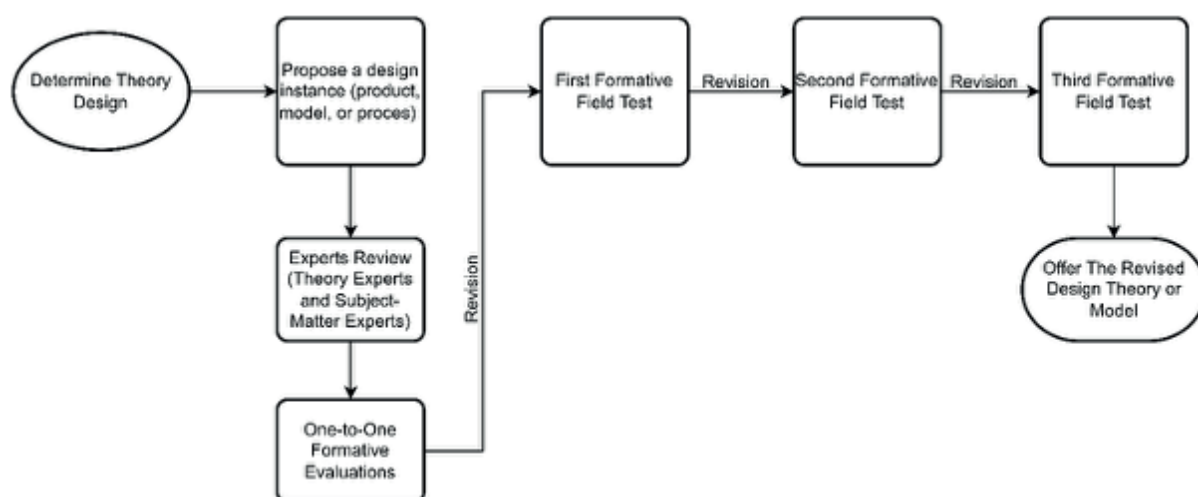


Figure 4. Formative Research Method Procedure

Based on the above procedure, after the researchers reviewed some relevant literature and theories, they established a design theory (in this case, PI and JiTT theories). In the second step, the researchers design an instance of the theory (the model of integrating PI theory into JiTT-based BL or the tentative ISD model). In the third step, the experts (three instructional designers, two BL experts, and lecturer representatives) review the tentative ISD model to validate the underlying issues regarding the underlying theories of the developed learning product and the practicality of its learning implementation). The review process by the experts uses interview techniques. Based on input from the third step, the researchers revise the model in the fourth step. In the fifth step, the revised ISD model undergoes three formative field Tests.

In the first formative field test, three experts (two instructional designers and one BL expert) and ten lecturers will validate the model's suitability to the underlying design theory. In the second formative field test, thirty students will test the practicality of the revised model to be implemented in regular learning. In the third formative-field test, forty students will test the efficacy of the developed ISD model to improve their HOTS. Finally, the final ISD model can be applied to a broader context.

Setting and Participants

This study was conducted in the Islamic Education Department at the Islamic University of Malang, Indonesia, in the even semester of the 2023-2024 academic year. The subjects consisted of five learning designers, two BL experts, and four experienced BL lecturers who conducted expert reviews and one-on-one formative evaluations. The researchers conducted three formative tests. The first field test involved two learning designers, a BL expert, and ten lecturers. The second involved 30 students. The third involved 40 students.

This formative evaluation selected learning designers and blended learning experts based on criteria. The main criteria for selecting participants included: (1) at least five years of experience in designing technology-based learning in higher education settings, (2) active involvement in blended learning projects for the

past three years, (3) active in conducting research and publications in the field of blended learning, and (4) Minimum of a doctoral degree in curriculum and instructional technology studies. Experts were obtained through a network of friends and professionals who are involved in the field of curriculum and educational technology.

Although the selection process was carried out carefully, the potential for bias remains. Most experts are from the researchers' limited professional networks, which could lead to bias in terms of representation. For example, learning designers in Islamic learning are only represented by three, while the remaining are from general learning designers. In addition, due to time and resource constraints, which may not fully represent the entire blended learning expert community.

Context

The model has been designed considering Islamic educational values, local cultural learning preferences, and students' previous Islamic educational backgrounds (input from madrasah aliyah and Islamic boarding schools). In more detail, PI supports the principles of *ijtihad* and *shura*, which encourage collective discussion and critical thinking so that students can construct their understanding through open dialogue. Meanwhile, JiTT is in line with the value of *ta'lim*, ensuring that the material taught is tailored to the needs of students on time. In addition, the model is adaptive to consider local cultural preferences that often prioritize memorization (especially for student input from Islamic boarding schools). It allows students to deepen their understanding of the religious context before discussing it synchronously. Integrating these two strategies is also very relevant in Islamic courses, such as *tafsir* and *fiqh*, where PI and JiTT can improve students' ability to criticize and understand complex theological or Islamic legal concepts.

Instruments

This study uses several measurement instruments (scales and tests) to obtain information about the developed product. The scale accesses responses from respondents (such as experts, lecturers, and students) regarding the feasibility and practicality of the developed product, as well as accessing the students' level of critical thinking tendencies (Sosu, 2013). The test, in the form of essay questions, assesses students' problem-solving abilities in classroom management.

The product feasibility, practicality, and critical thinking skills scale were validated with the help of three educational technology and assessment experts. The reliability of the three scales was tested using Cronbach's Alpha. The feasibility scale yielded a reliability value of 0.77, the practicality scale yielded a reliability value of 0.71, and the critical thinking skills scale achieved a value of 0.85, indicating high internal consistency (Taber, 2018). Regarding the essay test on problem-solving, inter-rater reliability was estimated, which gave a Cohen's Kappa of 0.76, which suggests good agreement among the evaluators.

Data Analysis

The research data is in the form of descriptive quantitative and qualitative data. Quantitative data was obtained by distributing questionnaire items regarding product feasibility and practicality, providing essay questions to measure problem-solving skills, and a scale of critical thinking skills. Qualitative data was from input and suggestions from experts, lecturers, and students.

For the quantitative data from the questionnaire to be more informative, data analysis uses the presentation of the values for each measurement with the formula 1 from Arikunto (2020).

$$P = \frac{\sum X}{\sum X_i} \times 100$$

Where :

P : Percentage

X : Respondents' answer scores for all items

X_i : The ideal score value in one item

100 : Constants

Interpretation of the analysis results for each instrument is:

Table 1. Eligibility Criteria (Akbar, 2017)

Achievement Level	Qualification
81% - 100%	Very valid, can be used without revision
61% - 80%	Quite valid, usable but needs a little revision
41% - 60%	Less valid, not recommended for use as it needs major revision
21% - 40%	Invalid, should not be used
0% - 20%	Very invalid, absolutely should not be used

To determine the extent of the product's effectiveness on HOTS, researchers conducted Cohen's d effect size analysis (Cohen, 1988) for paired samples using formula 2:

$$d = \frac{\bar{D}}{\sqrt{s_D^2}}$$

Where:

d : Effect size value

$\bar{D}$: The average difference between the two conditions (pretest dan posttest)

$\sqrt{s_D^2}$: Standard deviation of the sampling distribution of $\bar{D}$

Interpretation of the results of the Cohen's d effect size calculation:

Table 2. Interpretation of d values

Values of d	Interpretation of Effect Size
$d = .2$	Small effect
$d = .5$	Medium effect
$d = .8$	Large effect

FINDINGS

Propose Instance Design

The initial phase of formative research involves identifying a case that will inform the creation of the design theory. In this investigation, the design theory formulated serves as a provisional model for applying the PI strategy within a JiTT-based blended learning context. A design theory or model ought to closely mirror the foundational principles of a theory, aiming to reduce the influence of subjective intuition during its formulation. Consequently, the researcher established a more practical theoretical framework grounded in the design theory of the PI strategy and the JiTT-based blended learning strategy.

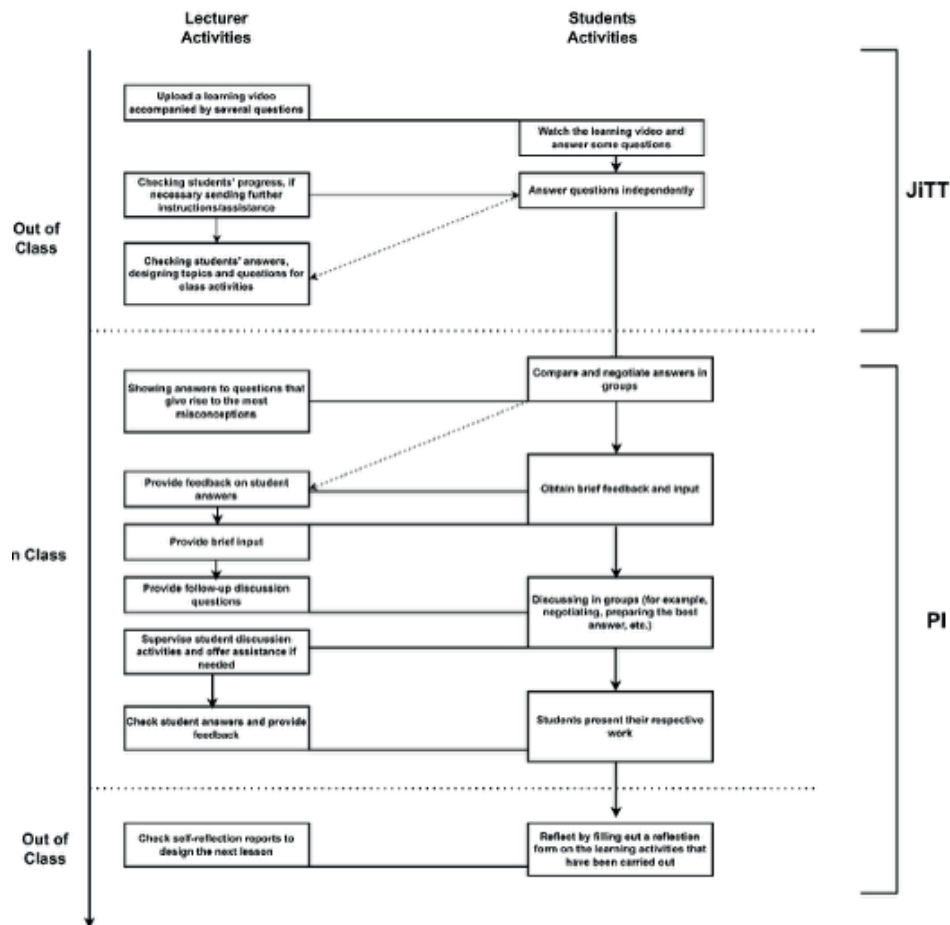


Figure 5. Tentative PI Learning Model in JiTT Environment

The researchers created a theoretical framework as an operational model, integrating PI design theory and JiTT-based BL design theory from leading scholars. They based their work on foundational concepts from outstanding contributors in PI learning strategies, models, and cooperative learning (Crouch & Mazur, 2001; Kagan, 2003; Kagan & Kagan, 2009; Mazur, 2014; Rowley & Green, 2015; Slavin et al., 1985; Zhang, Ding, & Mazur, 2017). The JiTT-based BL concept draws upon theoretical foundations established by various notable scholars (Gavrin, 2006; Maier & Maier, 2010; Marrs & Novak, 2004; G. M. Novak & Beatty, 2017; G. Novak & Patterson, 2010; Watkins & Mazur, 2010; Zou & Xie, 2019). Figure 5 shows the ISD learning model.

Referring to the tentative ISD model, an instructor can execute the PI strategy in a JiTT-based BL environment. First, in an out-of-class session, the lecturer uploads learning materials (text or video) and online tasks via a learning management system platform (Moodle, Google Classroom, Edmodo, Etc.) or interactive learning videos (such as EDpuzzle, PlayPosit, hapyak, Etc.). Then, the students attend to the material and respond to the assignments independently through the platform used. Second, the lecturer reviews the students' answers and documents their understanding and misperceptions of the concepts taught. This report will then be used to decide the starting juncture of learning activities in the classroom. Third, entering the class session, the lecturer commences the learning by revealing answers that indicate misconceptions. Then, the students formulate and submit revised answers in pairs. Fourth, the lecturer gives follow-up questions based on the prior discussion. At the end of the session, the lecturer invites the students to reflect on the learning activities and write them on a Google Docs sheet as a post-class learning activity. This tentative model (prototype) will then undergo improvements when entering the validation process by experts and users.

Validation of the Tentative Model

The second to fifth steps are part of an iterative formative evaluation process to validate and revise the tentative ISD model. After the tentative model has been developed, the next step is validation. The first validation is by experts (5 learning designers and 2 BL experts), followed by one-to-one formative evaluation (4 lecturers) and three field tests from users. The sequence of validation processes and the focus of the study can be described in Table 3.

Table 3. The Stages of Tentative Model Validation

The Stages of Tentative Model Validation			
No.	Validator Expertise	Total Person	Focus Scope
1	Instructional designer	5	The relevance of the model to learning theory, the model's systematisation, logicity, ease of the model to follow, and practicality.
2	Expertised BL Instructor	2	Design and integration of online and face-to-face components, clarity of structure and learning flow, engagement and interactivity, quality and accessibility of digital content, flexibility and adaptability, and evaluation and learning assessment.
3	Lecturer	4	Clarity and ease of instruction, technology and learning tools use, student engagement and participation, support and resources, and evaluation and learning assessment.

Experts from the three groups positively assessed the tentative model, noting its clear and logical flow that effectively encapsulates the foundational design theories. They affirmed its potential for implementation but provided additional suggestions for enhancement, detailed in Table 4.

Table 4. Notes for Improvement from Experts

Experts	Input Given
Instructional Designer 1	The activities developed are more integrated between the PI and JiTT concepts; Classroom learning in PI should involve problem-solving.
Instructional Designer 2	Each stage of the model has a target for achieving cognitive abilities.
Instructional Designer 3	Researchers need to provide more varied choices in each activity in the model syntax.
BL Expert 1	The developed model refers to the basic concept of BL as a support for implementing PI and JiTT strategies.
BL Expert 2	Learning activities are based on the basic principles of developing BL environmental activities.
Lecturer 1	Explicitly write PI sessions to the model.
Lecturer 2	Explains the meaning of the dotted lines in some model syntaxes.

Revision of the Tentative Model

The revision process began with feedback from the instructional designer. In response to Designer 1's suggestions, the researchers integrated pre-class activities into the JiTT framework as preparation for classroom tasks and reformulated follow-up questions into case-based inquiries to replace follow-up questions. Following Designer 2's insights, the researchers adopted a model for determining appropriate BL strategy from Chaeruman, Wibawa, & Syahrial (2018), illustrated in Figure 6.

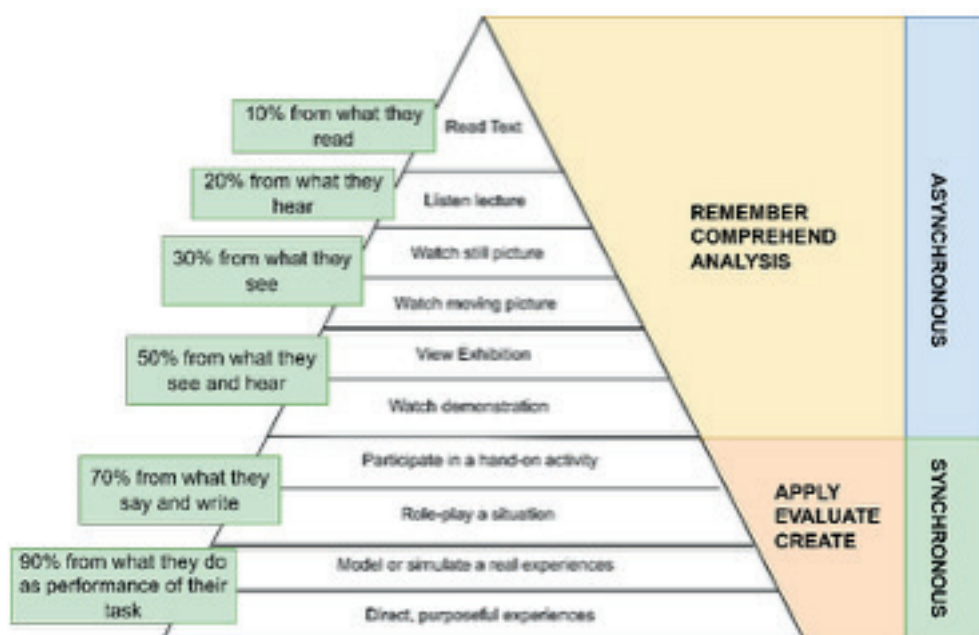


Figure 6. Model of Criteria for Determining Appropriate BL Strategy

Figure 6 guides researchers in targeting cognitive capabilities at each step of learning. For instance, when instructors provide material asynchronously, the activities are instructed toward proficiency of the material in remembering, comprehending, or analysing domains. Synchronously, each activity stage targets proficiency in the application, evaluation, and creation domains.

In addressing Designer 3's feedback, the researchers employed a conceptual framework established by Chaeruman & Maudiarti (2018) and Chaeruman et al. (2018) to formulate blended learning (BL) activities. They assisted instructors in developing learning experiences across the four quadrants of BL: Live Synchronous Learning, Virtual Synchronous Learning, Self-Directed Asynchronous Learning, and Collaborative Asynchronous Learning. The activities associated with the quadrants are detailed in Table 5.

Table 5. Learning Activities in Synchronous and Asynchronous Learning Settings

BL Setting			
Synchronous Learning		Asynchronous Learning	
Live Synchronous Learning	Virtual Synchronous Learning	Self-Directed Asynchronous Learning	Collaborative Asynchronous Learning
Learning Activities			
Lecture	Virtual class	Reading	Participating in discussion forum
Discussion	Audio-conference	Watching (video, webcast)	Online assignment (individual or group)
Practice	Video-conference	Listening (audio, audio cast)	Group research/project et cetera
Workshop	Web-based conference (webinar)	Online Study Simulation	
Seminar		Drill and practice	
Lab practice		Test/quiz	
Field trips		Journal/publication (wiki, blog, etc.)	
et cetera			

Table 5 helps researchers refine the model by adding supplementary activities at each stage. For example, after a preclass content presentation (JiT'T), suggested activities include reading articles, listening to podcasts, engaging in exercises, and completing quizzes.

The next phase involves adjustments based on feedback from two BL experts. Following the suggestions of BL expert 1, the researchers developed the blended learning environment using the conceptual framework by Chaeruman et al. (2020), as shown in Figure 7.

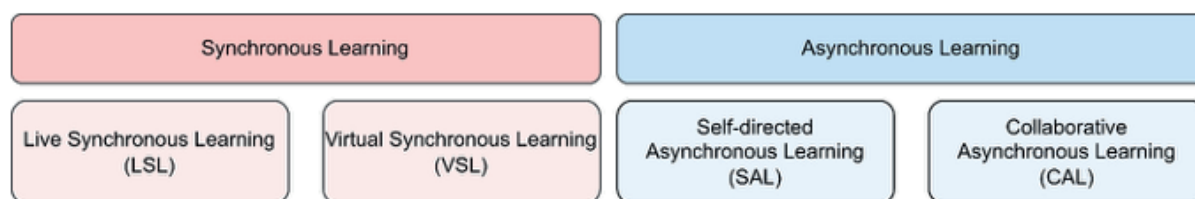


Figure 7. Conceptual Framework in BL Setting

Referring to Figure 7, the researchers revised the setting description in the initial model because there was information such as in-class and out-of-class activity stages. Then, the researchers changed the activity setting by referring to the conceptual framework of the BL setting, as in Figure 7. It becomes an environmental background for creating BL in the developed model. In the ISD model developed (see Figure 8), researchers have prescribed that the flow of learning activities starts from the *Asynchronous* dimension to *Synchronous* and ends back to *Asynchronous*.

In the *first Asynchronous dimension*, all activities are carried out through LMS and ILV. A lecturer delivers materials through LMS and questions in ILV. Then, the students study the material and work on the questions independently in ILV. These activities occur in the *Self-directed Asynchronous Learning* (SAL) realm. Then, the learning shifts to class, where the lecturer can give a problem, enabling students to apply the concepts learned in the previous SAL domain. These two activities occur in the *Live Synchronous Learning* (LSL) domain. Finally, after LSL domain activities end, the lecturer can give a reflection task on the learning process that has been carried out. In addition, the lecturer can also give a transfer of learning task, which requires students to work together to solve more complex problems to deepen their understanding. This last activity occurs in the *second Asynchronous dimension* (the *Collaborative Asynchronous Learning* realm).

To address Expert 2's contributions to foundational principles for activities in a BL environment, the researchers used the model flow by Chaeruman et al. (2020), which includes four phases: learning, deepening, applying, and evaluating (see Figure 1). This model helps instructors organize activities by learning stages. For example, during the pre-class stage (self-directed asynchronous learning), they can select tasks that improve students' comprehension of the material.

In the one-to-one formative evaluation, the researchers incorporated the "pairing" activity into the PI activity based on Lecturer 1's feedback. In response to Lecturer 2's suggestions, they removed the "dotted arrows" from the model. The revisions based on the experts' recommendations are detailed in Table 6.

Table 6. Revisions Summary

Experts	Revisions Made
Instructional Designer 1	a. Placing pre-class activities in JiTT as a warm-up session for concept application activities in PI class; b. Asking questions in the form of cases (problems).
Instructional Designer 2	Using the Model of Criteria for Determining Appropriate BL Strategy (Chaeruman et al., 2018) to determine learning targets.
Instructional Designer 3	Using a conceptual model to design various BL activities from Chaeruman et al. (2018) and Chaeruman & Maudiarti (2018)
BL Expert 1	Applying A conceptual framework of BL setting from (Chaeruman et al., 2020)
BL Expert 2	Applying the flow model principle (LDAE) from Chaeruman et al. (2020)
Lecturer 1	Write down PI activities explicitly in a particular session.
Lecturer 2	Remove diagonal dashes in model syntax.

The Revised Tentative ISD Model

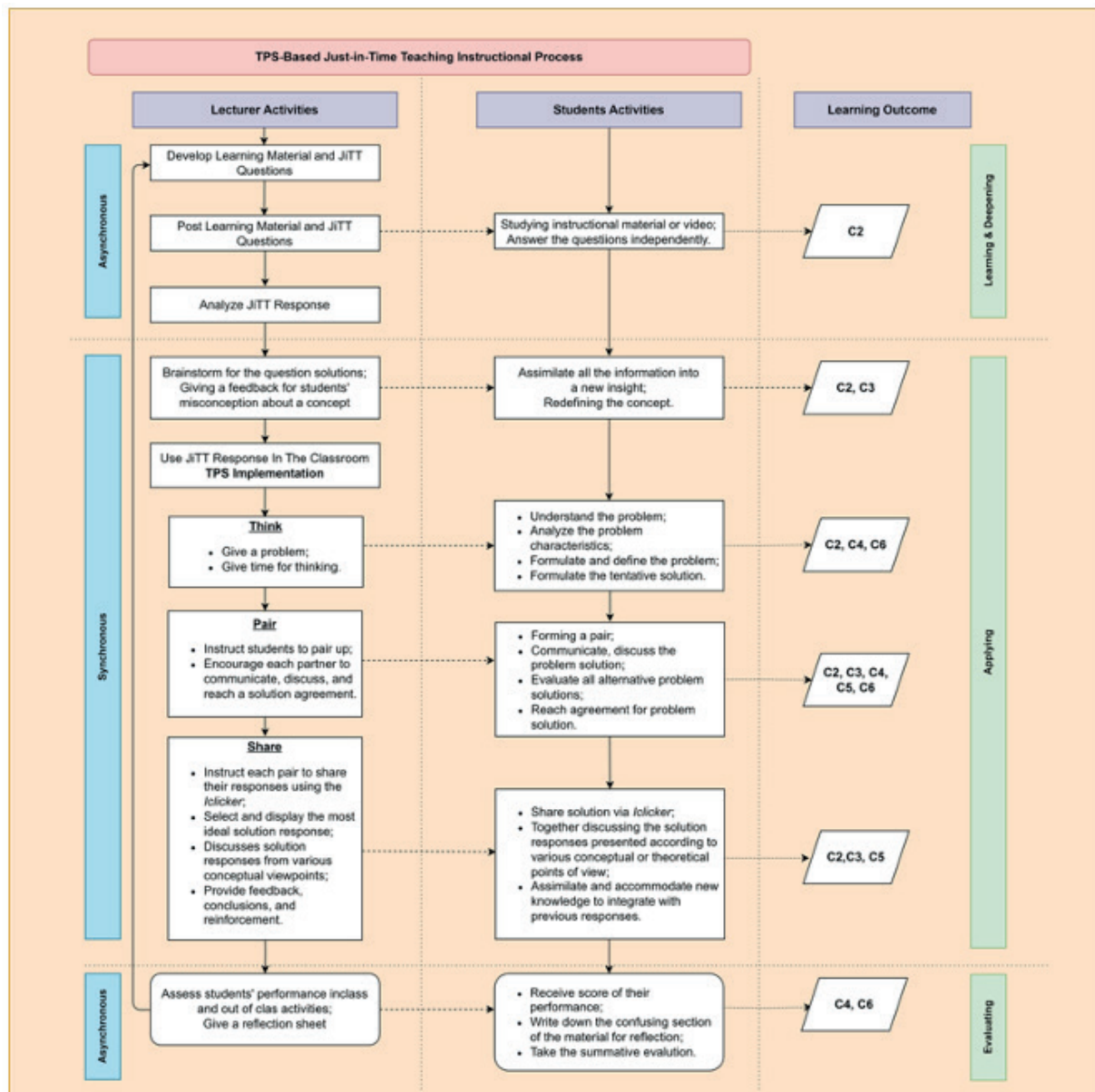


Figure 8. ISD model of PI strategy implementation in JiTT-based BL environment

Figure 8 illustrates the revised ISD model. The model can be briefly explained through the following steps:

- A lecturer creates learning resources and assessment questions, which are then uploaded to the LMS or ILV. Students then independently engage with the content and respond to the questions.
- The instructor evaluates the students' responses and subsequently aligns their comprehension to inform the development of classroom learning.
- The instructor will address students' misunderstandings based on their comprehension levels and reformulate their conceptual frameworks.
- The educator presents a relevant problem, and students then consider potential solutions.
- The instructor pairs the students for a discussion to find the best solution to the problem.
- The instructor asks each pair to present their solution using the SRS platform (like Iclicker or Socrative) and then reviews all responses to identify the best solution.
- The instructor asks students to document their learning experiences and challenges, and an evaluation is conducted after all instructional content is completed.

First Field Test

The revised ISD model will be assessed by two instructional designers and a BL expert, along with ten lecturers teaching three course types: three on learning strategies, four on classroom management, and three on citizenship education. The experts did initial validation, followed by the lecturers' validation. Findings from the experts' assessment are detailed in Table 6.

Table 6. The Feasibility Test Results of the Developed ISD Model

No.	Aspects Assessed	Score			Maximum Score
		Validator 1	Validator 2	Validator 3	
1	Relevant to learning theories	4	4	4	15
2	Relevant to BL concept	4	4	4	15
3	Provide a framework	5	5	4	15
4	Logic and systematic	5	5	5	15
5	Understandable and easy to follow	4	4	5	15
6	Systemic as an instructional model	5	4	4	15
7	Operational enough as a framework	4	4	4	15
Overall		31	30	30	105

Table 6 shows that experts rated the product's feasibility at 87%, indicating high viability within a learning system design model or theory perspective (see Table 1). Additionally, ten lecturers will validate the product's practical application, with results summarized in Table 7.

Table 7. The Practicality Test Results of the ISD Model by Lecturers

No.	Aspects Assessed	Mean Score	Category
1	The steps in this model are logically and systematically arranged.	95	Very valid
2	This model can increase student involvement in the learning process.	92	Very valid
3	This model encourages active interaction between teachers and students.	90	Very valid
4	This model supports various student learning styles.	80	Quite valid
5	This model is flexible and adaptable to various learning contexts.	78	Quite valid
6	This model is adjustable to individual student needs.	85	Very valid
7	This model encourages creative and innovative learning methods and techniques.	90	Very valid
8	The resources needed to implement this model are easily accessible.	84	Very valid
9	This model encourages students to think critically in solving problems.	91	Very valid
10	I would recommend this model to other fellow lecturers.	80	Very valid
Overall		86,5	Very valid

Table 7 indicates that the lecturers assigned a score of 86.5% to the product, signifying that it was evaluated as highly feasible regarding its practicality (refer to Table 1).

Second Field Test

At this stage, thirty students will assess the practicality of the ISD model for use in daily learning activities. Table 8 describes the results of the ISD model practicality test.

Table 8. Results of the Practicality Test of the ISD Model by Students

No.	Aspects Assessed	Mean Score	Category
1	The steps to be taken in this model are easy to follow.	87	Very valid
2	The learning method in this model helps me understand the learning material better.	80	Quite valid
3	This model encourages me to be more actively involved in learning activities.	94	Very valid
4	This model increases my motivation to learn.	87	Very valid
5	The resources required in this model are easy to access and use.	86	Very valid
6	This model helped me develop critical thinking skills.	85	Very valid
7	This model is flexible and can be adapted to my learning needs.	89	Very valid
8	I am satisfied with the learning experience using this learning model.	90	Very valid
Overall		86,5	Very valid

Table 8 indicates that students provided an evaluation score of 86.5%, suggesting that the product was highly feasible (see Table 1).

Third Field Test

This session evaluates the effectiveness of the ISD model in improving students' HOTS, specifically problem-solving and critical thinking. The study involved 40 students in a classroom management course, assessing problem-solving through essay questions and critical thinking using the Critical Thinking Disposition Scale (Sosu, 2013).

The evaluation followed a paired-sample t-test, revealing a significant difference in students' problem-solving and critical thinking abilities before and after instruction using the ISD model. The model's impact on these variables was measured using Cohen's d-effect size test (Cohen, 1988).

Figure 9 shows the score changes from the pretest to the post-test for problem-solving and critical-thinking variables, with the ISD model's impact assessed using formula 2. The statistics for problem-solving ability are $\bar{X}_1 = 59, \bar{X}_2 = 70, s_1 = 19, s_2 = 21$, and an effect size of 0,549 is obtained to fall into the medium criteria (see Table 2). The statistics for critical thinking ability are $\bar{X}_1 = 63, \bar{X}_2 = 79, s_1 = 19, s_2 = 21$, is obtained so that it falls into the significant criteria.

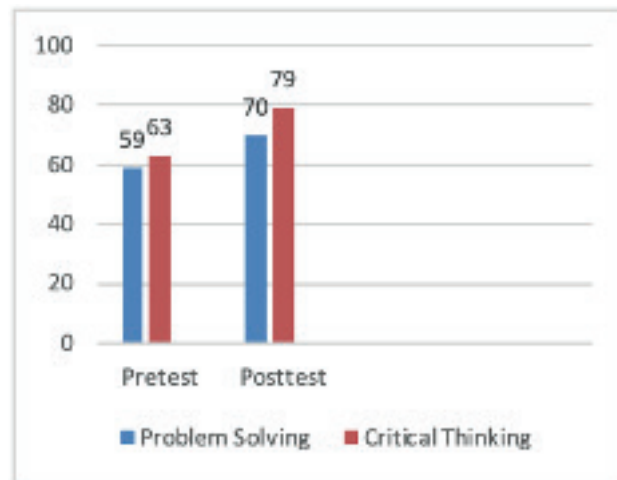


Figure 9. Differences in pretest and post-test scores for the variables problem-solving skills and critical thinking skills

DISCUSSIONS

Developing an ISD model requires a context-specific theoretical foundation. Therefore, ISD model developers must reference relevant theories during construction (Reigeluth, 2009). In this study, researchers developed a PI learning model within a BL environment using the JiTT strategy, a variant of the BL model.

Chaeruman et al. (2020) identified two main categories of BL: synchronous (further divided into live synchronous learning and virtual synchronous learning) and asynchronous (divided into self-directed and collaborative asynchronous learning). Similarly, Ulfa et al. (2020) describe BL through four dimensions: Onsite Synchronous Mode, Virtual Synchronous Mode, Personal Asynchronous Mode, and Collaborative Asynchronous Mode. These frameworks serve as a foundation for implementing the JiTT environment.

Learning activities in the JiTT strategy occur in four domains (G. Novak & Patterson, 2010). The First is developing effective questions. The Second is uploading the questions and setting a response time limit. The third is analyzing learners' JiTT responses. In this session, an instructor evaluates students' understanding of the material. The instructor can find and map the students' thinking skills. Information from this session becomes the basis for designing learning activities in the classroom. These three sessions are included in pre-class activities.

Pre-class activities are generally conducted asynchronously, using SAL or CAL mode. In SAL mode, instructors use various LMS or ILV platforms. In CAL mode, learners can create discussion groups to carry out activities. However, researchers implement learning activities in SAL mode in this ISD model.

The Fourth focuses on using the JiTT strategy in classrooms, applicable in LSL or VSL formats (Ismail & Abdulla, 2019; Rowley & Green, 2015). An instructor bases their teaching on students' pre-class activities, often using PI and concept tests with multiple-choice questions to enhance understanding (Sayer et al., 2016; Watkins & Mazur, 2010). Li et al. (2021) implemented PI in LSL with a mobile chatbot for polls and discussions, while Rowley & Green (2015) created an interactive peer discussion to develop students' knowledge. Alfadda et al. (2022) proposed a scenario for PI within JiTT, encouraging instructors to ask thought-provoking questions for engaging discussions.

According to the researcher above, the PI scenario has various variations, but one concept is typical: the discussion process. The discussion applied can be factual-conceptual questions or problem-solving. In other words, the syntax and content of the strategy are flexible. Therefore, the developed ISD model wants to provide a complete or patent concept in terms of syntax and learning content.

The PI activities in this framework focus on the TPS strategy, emphasizing problem-solving to enhance learning. Currently, there are no standardized protocols for applying the PI strategy in the JiTT context, and

some researchers equate PI with TPS (Mundelsee & Jurkowski, 2021; Ragan, 2024). Studies have shown that TPS effectively improves problem-solving skills (Alsmadi, Tabieh, Alsaifi, & Al-Nawaiseh, 2023) and promotes critical thinking (Ganatra et al., 2021).

The JiTT strategy's basic concept, which combines pre-class activities (asynchronous) with direct learning in class (synchronous), requires theoretical consideration in its application. Instructors must harmoniously align the time and proportion of the two modes (Nurrijal, Setyosari, Kuswandi, & Ulfa, 2023). There is no definite measure of when and how long each learning mode lasts. Therefore, it is an art to harmonize synchronous and asynchronous learning activities to provide a maximum learning experience (Varkey et al., 2023).

This ISD model, based on Chaeruman et al. (2018) model (in Figure 6), evaluates time and focus in synchronous and asynchronous activities. It shows that as learning objectives become more complex, learner engagement increases, and greater sensory and motor involvement leads to more emphasis on activities and longer durations for each learning mode.

Instructors refer to the level of thought involvement for each learning target to determine the emphasis of activities and duration at each stage of the ISD learning model. For example, at the "Pair" stage, where there are five learning targets (C2-C6), an instructor and students can devote a lot of time and activities to it.

Instructors need a structured learning path in both synchronous and asynchronous environments to support applied learning activities. This path guides interactions among instructors and students (Sarac & Dogan, 2022), among students (Lin & Wang, 2024), and between students and content (Kumar, Saxena, & Baber, 2021) while outlining the sequence of activities in the ISD model. Scholars have proposed various frameworks for BL. For example, Machumu et al. (2018) highlight group work, online collaboration, and assessments, while Sitthiworachart et al. (2021) present Kolb's learning cycle, which includes concrete experience, reflective observation, abstract conceptualization, and active experimentation. Chaeruman et al. (2020) suggest a learning path of learning, deepening, applying, and evaluating (LDAE) activities, which serves as a foundation for planning and developing learning activities within the ISD model.

The selection of LDAE as a template for activities in the BL environment is very appropriate for several reasons. First, the pre-class activities (JiTT sessions) used as a preparation stage for learners in learning and measuring conceptual understanding (Rowley & Green, 2015), are considered relevant to the sequence of Learning and Deepening concepts. Then, entering the classroom learning session, which requires learners to apply the concepts they have learned in pairs to solve problems given by the instructor (Liberatore, Morrish, & Vestal, 2017; Zou & Xie, 2019), is considered relevant to the "Application" activity. Meanwhile, the reflective activities and summative evaluation at the end of learning are relevant to the "Evaluation" activity (Chang, 2019).

CONCLUSION

This research produces a learning product in the form of an ISD model in a systematic learning syntax form that guides instructors in Islamic Colleges to integrate the PI approach in a JiTT-based BL environment. The product is built from interrelated learning components that form a procedure. These components come from various learning and teaching theories, e-learning BL concepts, Etc. The learning and teaching theories that underlie this model are taken from theories closely related to the development of active, collaborative learning, critical thinking, and problem-solving.

The final ISD model results from improvements in the validation test process by experts from various fields, instructors, and students from several courses. The results of the validation test from several learning designers, the practicality test of the ISD model by several lecturers and students, and the effectiveness test of the ISD model in improving HOTS overall showed very decent results.

This study significantly contributes to instructors and policymakers in higher education, especially in Islamic colleges. It provides a practical model combining constructive strategies such as PI into a JiTT-based BL environment, which enhances students' cognitive engagement. It supports the development of fundamental Islamic values such as *ijtihad* and *shura*, emphasizing the importance of collective discussion and deliberative decision-making. It engages students in reflective discussion, emphasizing rationality and collective reflection, aligning with the Islamic intellectual tradition.

Although the final ISD model has been proven effective in improving HOTS, its effectiveness has yet to be tested in mathematics and science learning. However, basic guidelines for implementation in both areas can follow this path. When the final ISD model is used to develop problem-solving in mathematics, an instructor can use warm-up questions (JiTT) to review mastery of key concepts before class. Students discuss complex problems during the PI in class, sharpening their insights through collaboration. In science, an instructor can assign assignments before lab (out of class in JiTT) that allow students to conduct real-world experiments. Other researchers can test the model's potential to enhance HOTS in computational and experimental fields such as physics and chemistry, allowing for a broader potential of the model.

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THE EMPTY CLASSROOM: EXPLORING NON-ATTENDANCE IN ONLINE FRENCH LANGUAGE CLASSES

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ABSTRACT

Although distance education offers flexibility and accessibility to students, dropout represents significant hurdles that adversely impact the success of programs. This study investigates the experiences of Anadolu University preparatory class students of French Language Teaching Programs during the 2022-2023 spring term, aiming to understand the issue of non-attendance within the framework of distance education. A qualitative phenomenological design was employed, utilizing thematic analysis to analyze data collected through semi-structured interviews with 13 students. The results indicate that non-attendance is attributable to a combination of internal, external, and personal factors. Internal aspects include accessibility to registered courses, the perceived simplicity of online assessments, diminished social integration, and psychological issues such as stress, anxiety, and decreased motivation. Psychological distress and a reduction in intrinsic motivation were identified as major impediments. External factors include the absence of attendance mandates, insufficient technical infrastructure, and suboptimal home environments. The removal of the attendance mandate reduced external motivation, while unreliable internet connections and unsupportive home settings hindered students' class attendance. Additionally, personal attributes like inadequate self-discipline and ineffective time management contributed to absenteeism. To address these issues, pedagogical recommendations include increasing interactive course design, fostering social connections through collaborative technology, and enhancing institutional technical support. Moreover, ongoing instructor training in digital pedagogy and targeted interventions for students with low motivation are essential. Ultimately, recommendations were formulated based on the findings to improve engagement and retention in online language courses.

Keywords: Dropout, distance education, language education, motivation, French.

INTRODUCTION

Distance education has become an integral part of the mission of higher education institutions as a means to provide access to education for all individuals (Belanger and Jordan 2000; Carr 2000; Kearsley 2000). Despite its long-standing use alongside formal education, the significance and role of distance education were not recognized until recently as indicated by Bozkurt and Sharma (2020) the COVID-19 pandemic in 2019 compelled all educational institutions to transition to remote operations and implement emergency remote teaching. Consequently, the distance education system has emerged as a viable alternative to the formal education system, attaining equal significance to face-to-face education in individual learning. Distance education can be defined as a framework that eliminates spatial and temporal constraints alongside institutional oversight, where learning and teaching environments are tailored to the latest technological advancements, prioritizing the individual and social attributes of participants while delivering mass education of a specified quality (Karatas, Karatas, & Kaya, 2012). The absence of temporal and spatial limitations mentioned in this definition is thought to make distance education accessible to everyone, but despite this spatial and temporal flexibility, it is possible to state that one of the biggest problems in distance education is the phenomenon of non-attendance or dropping out of the courses. According to Bozkurt and Elibol (2023), despite the increasing demand for distance education, institutions experience problems

arising from low retention rates in distance education. Likewise, Muljana and Luo (2019) emphasize that despite the popular demand and advantages, online learning has problems due to low retention rates. Moore and Fetzner (2009) argue that the completion rates of online courses are 10-20% lower than traditional courses, and postgraduate graduation rates are only 56%.

With the rising prevalence of online education, comprehending the factors contributing to student non-attendance is essential for enhancing course design and retention techniques. Understanding the causes leading to student non-attendance is crucial for improving course design and retention strategies in the context of the increasing popularity of online education. This study is significant since it examines preparatory class pupils in a foreign language program, a demographic where active participation and interaction are essential for language learning. In contrast to general education programs, language acquisition requires ongoing engagement and practice, making absence far more harmful. This research aims to analyze the variables of non-attendance in remote French language education to provide specific suggestions for enhancing student engagement and instructional design.

RELATED LITERATURE

Importance of Class Participation

One of the most important factors affecting students' academic achievement, learning processes and overall educational experiences is their level of engagement. Participation enables students to be actively involved in the course content, interact with their teachers and peers, and assume more responsibility in their learning processes. Regular attendance reinforces knowledge acquisition by ensuring the continuity of the learning process and increases students' academic motivation. Therefore, in educational research, student engagement is considered as one of the main determinants of academic achievement and learning effectiveness. Many studies indicate that there is a direct correlation between student engagement and student performance (Kirby and McElroy, 2003; Stanca, 2006; Horn and Jansen, 2009; Martin, 2012; Filsecker and Kerres, 2014; Wang and Degol, 2014 Serrano and Andreu, 2016; Oriol-Granado et al., 2017). Students' physical and cognitive involvement in the classroom environment allows them to participate more effectively in learning processes (Moore et al., 2003). Fredricks, Blumenfeld, and Paris (2004) show that students who attend regular classes receive higher grades and increase their academic achievement compared to students who are absent. Kassarnig et al. (2017) found that regular class attendance positively affects students' long-term academic performance by increasing knowledge retention. Crede et al. (2010) argue that as students' engagement in the course increases, the positive trend in their academic achievement becomes evident. Students' active participation in the lessons provides a better understanding of the topics covered in the course and provides a strong foundation that supports their academic development in the long term. Class participation not only increases the effectiveness of the educational process, but also contributes to the development of students' academic self-regulation skills, and as a result, their success in learning processes is positively affected (Raoofi et al. (2012).

Relationship Between Learning Process and Participation

Engagement enables students to understand the learning process and process knowledge in depth. Fredricks et al. (2004) considered engagement in three dimensions: behavioral engagement, affective engagement and cognitive engagement. Behavioral engagement refers to the student's active participation in classroom activities, while affective engagement is related to the social bonds that the student establishes with teachers and peers. Cognitive engagement refers to the student's mental investment in the learning process and critical thinking skills (Fredricks, 2015). Supporting these three dimensions in a balanced way increases the academic success of the student and the efficiency of the school (Christenson, Reschly & Wylie, 2012). Class participation is critical not only for academic achievement but also for psychological and social development. Students who participate develop a stronger sense of belonging and have a positive attitude towards school (Wang & Holcombe, 2010). In the social context, classroom interactions enable students to feel peer support and help them become more engaged in the learning process (Eccles & Wang, 2012). Li and Lerner (2011) state that students with low engagement have higher stress levels, experience academic anxiety and tend to withdraw from school over time.

Participation and Challenges in Online Courses

The development of digital technologies has brought major changes to educational systems and online education has been widely adopted by many educational institutions. While online education offers students a learning environment that is independent of time and space, it also brings challenges such as lack of social interaction, loss of motivation, and a study pattern that requires independence (Skinner & Pitzer, 2012). While learning in the traditional classroom environment is based on social interaction, immediate feedback and a structured teaching plan, the lack of these elements in online education can negatively affect student engagement (Moore & Fetzner, 2009). Decreased student engagement in online courses is among the main factors that negatively affect the learning process (Moore & Fetzner, 2009). In this context, innovative approaches in educational design are needed to ensure sustainable engagement in online education (Kuo et al., 2014; Lin et al., 2017). The use of interactive learning materials is of great importance to increase students' engagement in online courses. Studies by Beldarrain (2006) and Fornara & Lomicka (2019) show that video lectures, simulations and interactive digital content encourage student engagement. In particular, the concept of social presence is recognized as one of the key components that strengthen student engagement in online education (Whiteside et al., 2017). In this context, the Community of Inquiry (CoI) model developed by Garrison et al. (2001) emphasizes the importance of factors such as cognitive presence, social presence and instructional presence in online learning environments.

Feedback mechanisms are also of great importance in terms of student motivation. Lawson & Lawson (2013) state that providing timely and structured feedback to students enables them to participate more in the learning process. Fredricks (2011) suggests that instructors should adopt various learning strategies to increase student-student and student-instructor interaction. In particular, it is stated that synchronous interactive lessons (e.g. live video lectures) increase student engagement, but asynchronous lessons (e.g. video recordings and text-based forums) offer more flexibility to the student (Biasutti, 2011; Junn, 2021; White, 2014). Another factor affecting student engagement is the student's self-regulation skills. Zimmerman (1990) states that success in online education largely depends on the student's self-regulation and time management skills. However, research shows that most of the students who learn online do not have enough of these skills (Schulze & Scholz, 2018). In particular, Zoom fatigue causes students to lose their attention in long-term online courses and negatively affects their engagement levels (Lee, 2020). Therefore, it is recommended that course designs should be divided into short but effective learning sections to ensure effective participation in online education (Zhang et al., 2021).

The Importance of Participation in Online Language Classes

Foreign language education is a process that requires direct and meaningful interaction (Long, 1996). In this context, participation in online language courses is seen as a critical factor for students to improve their language proficiency. Lantolf & Thorne (2007) state that language learning is largely based on interaction and this interaction should be maintained in online environments. However, low student interaction in online language courses is a factor that directly affects the learning process (Russell, 2020). Studies by Gonzalez-Lloret (2020) and Lomicka (2020) show that building social presence in online language classes supports the language learning process and increases students' motivation. However, Fornara & Lomicka (2019) and Lord & Lomicka (2014) found that social media platforms and microblogging services are effective in increasing social bonding and interaction in online language learning environments. Students' interaction with each other in online language classes is of great importance for speaking practice and language production (Gass, 1997).

Teacher presence is also a determining factor in increasing student engagement (Garrison et al., 2000). Comas-Quinn et al. (2012) argue that online language teachers should not only be knowledge transmitters but also guides, moderators and support providers. In particular, it is stated that synchronous language classes are more effective than asynchronous language classes because they provide instant feedback to students and allow them to practice speaking (Beldarrain, 2006; White, 2014).

However, it is emphasized that the lack of student-student interaction in online language courses may cause students to feel lonely in the learning process (Schulze & Scholz, 2018). Russell (2020) states that student anxiety increases in the online environment and this may negatively affect course participation. In this context,

Carbajal-Carrera (2021) suggests that emotional regulation techniques (e.g., emoji use, emotional check-ins) in online language courses can increase student motivation. Student engagement in online education is a critical element in terms of academic success and effectiveness of the learning process. Especially since online language courses require a communication-based learning process, student-student and student-teacher interaction is of great importance (Long, 1996; Lantolf & Thorne, 2007). Research shows that increasing social presence in online education positively affects students' motivation and academic achievement (Gonzalez-Lloret, 2020; Lomicka, 2020). Creating interactive learning materials, (Lawson & Lawson, 2013), providing clear and consistent teacher feedback (Fredricks, 2011), and increasing activities such as group work and discussion forums among students (Reeve & Tseng, 2011) are of great importance to increase student engagement in online education. In conclusion, in order to increase student engagement in online language courses, educators should focus on interactive materials, tools that support social presence, and strategies to increase student motivation in instructional design. Taking these elements into consideration will enable students to have a more effective learning experience in online courses and will positively affect their long-term academic success.

Although online education offers advantages such as flexibility and accessibility, it has higher absenteeism rates compared to traditional face-to-face education (Carr, 2000; Levy, 2007; Tello, 2007). The problem of absenteeism has serious consequences at both individual and institutional levels and directly affects the effectiveness of the education system (Willging & Johnson, 2004). Martinez (2003) defines student persistence as the successful progression to different stages of an educational program, while Kerka (1995) considers this concept as students' adherence to the educational program in line with their goals. In this context, the concepts of "persistence" and "retention" are often used interchangeably in the literature (Hagedorn, 2005; Hart, 2012). Rovai (2002) emphasizes that preventing absenteeism is an important criterion in determining the effectiveness of higher education programs. The factors affecting students' attendance in online courses can be analyzed under three main headings as individual, institutional and technological factors (Boateng & Boadu, 2013; Rashid et al., 2015; Budiman, 2015).

Main Causes of Absenteeism in Online Education

While online education offers significant advantages in terms of providing equal opportunities in education and expanding access, high rates of absenteeism remain one of the biggest challenges of this system (Carr, 2000; Willging & Johnson, 2004). Absenteeism not only affects individual student achievement, but can also threaten the academic effectiveness and sustainability of educational institutions (Levy, 2007). There are many factors that determine student engagement in online learning environments. These factors can be analyzed under three main headings as individual, institutional and environmental variables. These factors need to be analyzed in detail in order to increase students' academic success and commitment to online courses (Lee & Choi, 2011; Levy, 2007; Osborn, 2001). Students' previous academic experiences, time management skills and self-regulation strategies are among the factors that greatly affect their success in online education (Dupin-Bryant, 2004). In particular, it is stated that students with previous online education experience can adapt to a new online course more easily and tend to attend classes regularly (Osborn, 2001; Xenos, Pierrakeas, & Pintelas, 2002).

Time management and self-regulation skills are also important factors that directly affect students' participation in online courses. It is emphasized that students who cannot manage their time effectively have difficulty in online courses and this causes them to disengage from the courses (Pierrakeas et al., 2004). Bawa (2016) and Parker (1999) argue that intrinsic self-regulation skills and students' perception of locus of control are directly related to academic achievement and this situation becomes more evident especially in online learning processes. Students' self-efficacy perception is also a psychological factor that determines their participation in the online education process. Morris et al. (2005) and Holder (2007) show that students who are successful in online education have a high self-efficacy perception and can direct the learning process more independently. Similarly, Ivankova and Stick (2007) show that students with high levels of self-efficacy take more responsibility in the academic process and have higher completion rates.

It is seen that the support mechanisms offered by the institution play an important role in students' adaptation to the online education process (Boston et al., 2011; Ivankova & Stick, 2007). In this context, the structure of the course content, the difficulty level of the program and instructor support stand out as factors that

affect students' commitment to the program. Orientation programs are one of the most effective factors that increase participation in the online learning process. Clay et al. (2009) and Cheung & Kan (2002) state that it is critical for students to go through an appropriate preparation process in order to be successful in online courses. Effective design of orientation processes helps students to adapt to online learning platforms more easily and increases their attendance rates. Instructor support is also a determining factor in students' academic processes. Bocchi et al. (2004) show that instructors' regular communication with students and monitoring their academic processes strengthen students' commitment. Likewise, Ivankova and Stick (2007) argue that guidance role of instructors towards students should be strengthened and especially the effective implementation of feedback mechanisms increases student achievement.

Environmental factors are among the external factors that determine the extent to which students can continue their academic processes. These factors include work and family responsibilities, social support mechanisms and cultural factors (Packham et al., 2004; Pierrakeas et al., 2004) and family responsibilities constitute an important barrier to participation in online courses. Working students have difficulty in maintaining their academic processes due to their workload and this situation causes high rates of absenteeism (Willging & Johnson, 2009). Packham et al. (2004) state that successful students are able to balance academic and professional obligations effectively and this contributes to academic success.

Family support is another important factor that directly affects students' academic achievement and participation in online education (Park & Choi, 2009). It has been shown that students with high family support can maintain their academic processes more consistently, have lower absenteeism rates and are more motivated to the learning process (Hart, 2012). Finally, cultural factors are seen as an important determinant of participation in the online learning process. Bozkurt and Akbulut (2019) state that cultural diversity should be taken into account in online learning processes and that designing culturally sensitive education programs will enable students to better adapt to the process. The fact that online education platforms accept students globally necessitates an approach that takes into account the learning processes and interaction styles of different cultural groups.

The factors affecting participation in the online education process are shaped by a combination of individual, institutional and environmental components. Individual factors such as academic experience, time management and self-regulation skills are the most fundamental elements that determine how much the student will stick to the online learning process. Factors such as institutional support mechanisms, course design and instructor feedback stand out as incentives for students to continue their academic processes. Environmental factors include variables such as the student's working conditions, family support and cultural context and indirectly affect academic success.

SCOPE OF THE STUDY AND PURPOSE OF THE RESEARCH

In this framework, it is thought that this study will help to reveal the reasons for absenteeism of individuals who do not participate in distance language education. The limited number of studies examining the participation rates and reasons for absenteeism in distance language education at public universities in Türkiye increases the importance of this research. In this study, the concept of absenteeism is not considered in the traditional sense of "dropping out" or "not participating in the educational process at all". Contrary to this situation, which is frequently seen in distance education, the students included in the sample of the study maintain their enrolment but do not attend the courses consistently. For example, for a course in which 50 students are enrolled in total, only 7 students actively participate in online courses.

In this context, the main purpose of the research can be summarized as follows:

- To determine the main reasons for low participation rates in distance language education,
- To analyze the impact of institutional, individual and environmental factors on student engagement,
- To provide suggestions for reducing absenteeism and increasing participation in distance language education.

This study aims to contribute to the development of strategies to increase participation in distance language education and to create mechanisms that support student success.

Research

1. Which factors are related to the non-participation of FLT Programme preparatory year students in distance language education?
 - 1.1. What is the impact of the institution and lecturers on attendance?
 - 1.2. What is the effect of the changing examination system on student absenteeism?
 - 1.3. How do students' individual characteristics (motivation, learning strategies, self-regulation, etc.) affect their participation in distance courses?
 - 1.4. What is the effect of technological infrastructure on participation in distance education courses?

METHOD

This study aims to examine the reasons why students enrolled in FLT Program preparatory classes do not continue online education. In order to achieve this aim, a qualitative research design was adopted. Qualitative research allows for an in-depth examination of individuals' experiences, perceptions and the contextual factors that shape these experiences. In particular, this study was conducted within the framework of phenomenological research method. Phenomenology is an appropriate approach to investigate and explain phenomena that are known but not fully understood (Yildirim & Simsek, 2013). The phenomenological research method allows individuals to express their understanding, feelings and perspectives on a particular phenomenon based on their own experiences (Rose, Beeby & Parker, 1995). In this context, the study aims to provide an in-depth analysis to understand students' reasons for not attending online preparatory class courses. In the study, the institutional, individual and technological factors that affect students' attendance will be analyzed and the basic dynamics related to attendance in online education will be revealed. Focusing on the subjective experiences of students, this approach aims to uncover the underlying meanings and patterns that shape participation in the online education process.

Research Group

The population of this study consists of 50 students enrolled in Anadolu University School of Foreign Languages FLT Program preparatory classes in the spring semester of 2022-2023. The sample of the study was determined using convenience sampling method. Convenience sampling is a non-probabilistic sampling method that allows the researcher to select accessible and willing participants (Creswell, 2014). In order to ensure homogeneity in the sample selection, only students enrolled in the French Language Unit who showed low attendance to the courses were included in the study. The absenteeism rates of the participants ranged between 1% and 15%, and these students either did not attend any classes or attended only a few classes during the semester. The selected participants represent a specific group of students who have difficulties in participating in online courses and provide an opportunity to analyze the main topic of the study in more detail.

Data Collection Tool

This study uses a semi-structured interview form as a data collection tool, which was developed in line with the researches examining the factors that cause course dropout in online education and the related literature review. Semi-structured interview method is a data collection technique that is frequently used in qualitative research and allows the researcher to collect information about a specific topic, while providing participants with the opportunity to express their own experiences, thoughts and opinions in detail (Creswell, 2014). In the process of preparing the interview questions, the related literature was analyzed and the main themes in the previous studies on absenteeism in online education were determined. In addition, expert opinion was sought to increase the validity and reliability of the form. In line with the expert evaluations, the questions were made clear and understandable and organized in a way that students could easily respond. The interviews were conducted in Turkish because the sample of the study consisted of preparatory year students studying at a state university in Türkiye. However, students were also allowed to respond in French when necessary in order to express their answers more easily. The complete interview questions are presented in the Appendix.

Data Collection Process

This study aims to examine the reasons why students in the FLT Program preparatory classes do not attend online language classes. Qualitative research methods were used in the study and semi-structured interviews were conducted to determine students' reasons for not attending the courses. After obtaining the necessary permissions, the interviews were conducted on the Zoom® platform and recorded with the consent of the students. The voice recordings were transcribed, and themes and sub-themes were determined. These data were then analyzed with the MaxQDA® coding tool as it offers advanced coding and analysis tools for large data sets, facilitates establishing relationships between themes, and enables visualization of qualitative data by supporting analyses such as conceptual maps, code clouds and graphs. The findings were analyzed in detail and suggestions were developed to solve the problems that emerged.

Validity and Reliability

Miles and Huberman's (1994) inter-coder agreement formula was used to ensure the external validity and internal consistency of the research. This formula is expressed as $\Delta = C \div (C + \partial) \times 100$ where Δ represents the dependability coefficient, C denotes the number of topics/terms with agreement, and ∂ signifies the number of topics/terms without consensus. Δ : Reliability coefficient, C: The number of codes agreed upon by the coders, D: Represents the number of codes with disagreement between coders. It is accepted that the agreement between the coders should be at least 80% (Miles & Huberman, 1994).

The main reasons for using this formula in the research are to increase consistency between coders, to produce reproducible results and to contribute to the systematic analysis of qualitative data. In qualitative research, consistent coding of the same data by different researchers is critical. This formula helps to ensure the objectivity of the coding process. At the same time, coding is expected to yield similar results by different researchers to increase the reliability of the research. Since qualitative data are often based on subjective judgements, it offers a quantitative approach to test coding reliability. In this context, an academic expert in the field of open and online education was used as a second coder in the study. Two randomly interview forms were recoded and the consistency between the coding was calculated using Miles and Huberman (1994) formula. As a result, a coding agreement of 87% was obtained for the student interview form and the data were accepted as reliable. In addition, LeCompte and Goetz (1982) state that direct quotations from the data obtained by descriptive method will increase internal reliability in qualitative research. In this direction, direct student quotations obtained during the analysis process were used

Table 1. Sample Coding

Participant Discourse	Code	Theme
"I can't wake up in the morning, for example, no matter what time I go to bed."	Lack of Time Management	Personal Factors
"I was a little less participative in online courses because it made me a little nervous."	Anxiety and Stress	
"There may be constant noises at home or noises from my siblings."	Physical Learning Environment	Environmental Factors
"internet problems, were sometimes disconnections."	Technical Infrastructure Problems	Environmental Factors
"Since the exams are online, it provided convenience, so I don't agree much."	Online Exams and Participation	Academic Factors

FINDINGS

This section presents the details of the data analysis conducted to determine the reasons for the lack of participation in online foreign language courses. Within the scope of the study, semi-structured interviews were conducted with thirteen students who were not enrolled in the FLT Program and the data obtained were coded based on Miles & Huberman (1994) thematic analysis model. During the data analysis, the themes, categories and codes identified in Yilmaz's (2020) doctoral thesis on the reasons for dropout in open and online education were taken as reference. However, the reason for using this approach is that Yilmaz's study provides an up-to-date and comprehensive model that addresses the reasons for student dropout in the context of open and online education. At the same time, in order to increase the validity of the research, an existing classification in the literature was used to analyze the data in a systematic way. Finally, it was observed that the reasons expressed by the students participating in the study largely overlapped with the factors in Yilmaz's model. However, in case the model did not completely overlap in the data context or some factors remained miscellaneous, open coding method was also applied while determining the themes and codes and unique codes were added

Table 2. Themes, Categories and Codes

Themes	Categories	Codes	Number of People Indicating	Number of Codes	Total Percent.
Internal Factors	Accessibility	Technical and Equipment support	2	2	84.6%
		Keeping Course Records	9	12	
	Exams	Reliability of exams	4	5	30.8%
		Social integration	Need for socialization	6	
		Instructor-student interaction	2	2	61.5%
		Psychological situation	Anxiety	5	
		Depression	1	2	92.3%
		Personal stress	1	1	
		Loss of intrinsic motivation	6	6	
	External Factors	Course Design	Lessons are not interactive	3	4
Obligation of camera using			1	1	
Quality of the course resources			1	1	
External barrier		Teaching environment	5	6	76.9%
		Quality/adequacy of technical infrastructure	5	5	
Motivation		Social situations creating uncertainty	2	2	92.3%
			10	14	
		No attendance obligation			
Personal Qualities	Self-organization	Self-discipline	7	10	69.2%
		Time management	2	2	

After conducting an analysis of the table 2 presented above, the reasons for students not enrolling in foreign language classes through distance education may be categorized into three groups: internal factors, external factors, and personal qualities.

Internal Factors

Analyzing the internal factors, it becomes evident that the accessibility of courses, examinations, social integration, and the psychological state of the students are crucial. Upon analysis of course accessibility, it can be asserted that a contributing factor to student non-attendance is the consistent maintenance of

course records. 9 students stated that the recording of the courses eliminated the obligation of attendance and therefore they did not participate in the lessons. Similar to the epidemic period, students were allowed to participate in foreign language classes delivered via distance education, both synchronously and asynchronously. As indicated by STU 4 *"Also, now that the courses are recorded and especially when the problem of absenteeism is lifted, there is inevitably a comfort because the courses are also recorded. In other words, even if we do not attend, we can somehow make up the lessons."*(STU-4)

Furthermore, participants emphasize that the recordings cause them to miss class. They argue that by watching the lecture recordings, they can make up the subject covered in the lesson they did not attend. The fact that the examinations were administered online was a relief to the participants. Several students said that online tests were more comfortable and that they could more readily get outside assistance. As a result, they stated that they did not feel obliged to attend the classes. *There are also resources and we are a bit more relaxed because we will have a lot of materials to help us. That's why I don't attend the lectures much. I mean, I don't feel obliged to attend sometimes. Because as I said, can I handle it myself, Yes, I can handle it."*(STU-5)

When it comes to attending courses, it is possible to say that this circumstance makes it more comfortable for the majority of the students. 5 Students also underlined that the anxiety they felt in online tests was less than in face-to-face exams. *"The fact that the exam program continued online provided me with a great comfort, and I thought, "I don't have to go; can I handle it if I don't go? "Because when it is online, that stress is a little more eliminated. [...]"*

A significant intrinsic aspect contributing to non-attendance is the necessity for students to engage socially during the distant education process. 6 students involved in the research reported difficulties with socialization in distance education courses: *If the lessons were 100 face-to-face, I would continue completely, because I really like learning languages and studying, and if they were 100 face-to-face [...] I was participating a lot in the lessons; I got a lot of efficiency, but when it was like this, I lost motivation and I couldn't get efficiency from the lessons.* (STU-7)

The students reported greater enjoyment in in-person lessons, noting that their motivation in language learning was enhanced by one-on-one interactions with peers. They also indicated that teacher-student engagement positively influenced their motivation. *"...Being face-to-face made the lessons more fun, more participatory. I think spending time with the lecturers and friends and learning the lessons in that way contributed more to us."*(STU-3)

Another important factor influencing students' decision to discontinue distance foreign language education for intrinsic reasons is the psychological state of individuals throughout the course duration. Students reported experiencing difficulties in attending classes, attributing these challenges to stress, anxiety, and a decline in intrinsic motivation stemming from their disconnection from social interactions.

Within this theme, a significant number of students (5) expressed the anxiety they feel when participating in online courses alone, such as: *"When the attendance decreased, I didn't want to attend the lesson with only a few people. I felt under more pressure, and this was happening, so I was anxious."* (STU-6)

Students reported experiencing anxiety and stress, particularly in situations where attendance in lessons is low. Simultaneously, they refrain from engaging in the courses as they encounter a decline in motivation stemming from both the distance education format and their own personal challenges.

"Since the first time I was exposed, I have realized that the classroom environment in the virtual environment makes me very nervous and I cannot focus on the lessons in any way and therefore I stopped attending the lessons because I could not overcome this fear." (STU-12)

In addition to feeling anxious during online courses, students may experience a decrease in enthusiasm to participate in classes. This effect significantly improves student efficiency in courses. Students reported that despite their familiarity with online courses, their interest waned, leading to lower attendance. *"In terms of not continuing the lesson, I mean, I couldn't get myself motivated; I couldn't wake up in the morning for example."*(STU-6)

Analysis of intrinsic components indicates that students' motivation diminishes as a result of their psychological state. *"As I said, I am normally a person who already has anxiety disorder. I also go to therapy for this, and for this reason, I lose motivation very easily. Because I have a structure that gives up very easily."* (STU-7)

Apart from the issues mentioned above, 2 of the students who could not attend the courses due to internal factors stated that they needed technical and equipment support. One student stated that the equipment support provided by the institution was not sufficient.

"An old computer of a professor has been given. I am grateful, but it is not very good, because it was a bit difficult to use the battery and so on."(STU-8)

External Factors

Upon analyzing the external factors contributing to student absenteeism, the primary determinants are absence of attendance requirements, detrimental course environment, insufficient technical infrastructure, and lack of interactivity in the courses. The majority of students conveyed favorable assessments on the quality of the resources utilized in course design. Only a single student proposed the diversification of materials utilized in the course. The elimination of the attendance requirement resulted in a loss of external motivation for students (10 students). As stated, STU 5, *"I mean, the fact that it is not compulsory, that is, the absence of absenteeism, is the biggest reason for not attending, because it provides us with a great comfort."* (STU-5)

It can be stated that this situation has negatively affected students' motivation for online language courses.

"Well, as I said, I lost my motivation at the beginning, but I was still attending the classes despite that lack of motivation, but then I said when the absenteeism disappeared. Then it will not affect my progress at all." (STU-7)

The analyzed data revealed extrinsic challenges that led to student course dropouts. The majority of participants (5 students) were required to pursue their education in the cities where their families resided. In households lacking enough family support and housing several individuals, challenges may emerge in establishing an appropriate course environment. *"...After we came home, some of our relatives were staying with us because our house was undamaged. That's why it was so crowded. I couldn't attend class either. I could not create a working environment."* (STU-13)

Because of this setting, the students were unable to participate in the class under favorable conditions, which resulted in a decline in their motivation to fully engage with the lecture. *"My family life is a bit complicated; I take the responsibility at home. Being in Istanbul and dealing with family members in the family home. Family life also has such an effect on my loss of motivation."* (STU-7)

The aforementioned arguments indicate that inadequate organization of students' learning surroundings adversely impacts attendance. The quality of the technical infrastructure is a paramount concern in distance education. Both teachers and students require a robust internet infrastructure to effectively engage with and comprehend the courses. Issues within the internet network may lead students to discontinue online courses as indicated by STU-1: *"The problems related to the course were mostly because of my internet connection."*(STU-1)

In addition to the abovementioned external obstacles that caused them to drop the distance education foreign language courses, some students stated that their interest in the courses decreased due to the social situation, and their motivation to continue the courses decreased for this reason. STU 7 and STU 9 indicated that the economic and political circumstances in the country significantly demotivated them, leading to a greater interest in these issues than in their lessons. *"Something else happened that demotivated me. I lost a lot of motivation before and after the elections. You know, I had it before, but after that time I lost it completely. I was very much interested in that issue."* (STU-7)

"The agenda of the country changes very often. We have to follow something all the time. The elections and the earthquake disaster, I think these also affected me a little psychologically." (STU-9)

Consequently, they experienced a loss of motivation and did not attend classes.

Personal Qualities

Ensuring attendance in distance education is also related to self-discipline (7 students) and time management (2 students). Especially in cases where there is no attendance obligation, the student's inability to manage his/her own education and training life may be directly related to dropping out or not attending the courses.

Students stated that they did not attend classes because of the lack of attendance obligation. *“First of all, attendance is not compulsory. Because it does not add an obligation and we can watch the lectures afterwards. That’s why I don’t attend”* (STU-3)

“I mean, the most difficult thing for me was getting up early in the morning, it was very difficult. You know, the requirement for absenteeism was entirely eliminated, and I’ll look at the videos later.” (STU-6)

It is possible to say that students who do not attend classes have some problems in terms of self-discipline and time management. Most of the students stated that they did not attend the lessons because they could not wake up in the morning.

DISCUSSION

The study’s results about the non-attendance of French language teaching students indicate that a combination of intrinsic, extrinsic, and individual variables influences attendance levels. While the flexibility and technological advantages of distant education enhance students’ learning experiences, they have also fostered a comfort zone that detrimentally impacts their willingness to participate in courses. This section provides a comprehensive analysis of the data to elucidate the dynamics behind student behavior.

Internal Factors: Accessibility, Psychological Challenges and Social Integration

The availability of teaching materials stands out as a crucial internal factor influencing absenteeism. Providing recorded courses for asynchronous viewing, although it seems advantageous, it has resulted in a decline in their participation in online courses. The statements of the participants show that the comfort provided by course recordings at some point causes students to move away from the learning process. These findings reveal that while the ease of access in distance education makes a positive contribution on the one hand, it can have negative effects on the commitment to learning on the other hand. By postponing the lessons, students lose motivation and weaken their connection with the lessons. This aligns with findings by Moore and Fetzner (2009), who suggested that excessive flexibility in distance learning may lead to procrastination and disengagement. Consequently, the rising dropout rates underscore the unintended consequences of flexible learning systems, as noted by Bozkurt and Sharma (2020). Similarly, students cease their participation. This leads to a decline in motivation and academic achievement. Observations indicate a decline in student motivation during the distance education process, attributed to both intrinsic factors and external influences. Consequently, it can be concluded that the students ceased their attendance in the courses. Numerous studies (Parker, 2003; Kinnunen and Malmi, 2006; Levy, 2007; Lee and Choi, 2011; Tinto, 2017) indicate a significant correlation between both internal and extrinsic motivational decline and course attrition. Osborn (2001) posits that students with lower motivation levels are at a higher risk of dropping out.

Psychological obstacles like anxiety, worry, and diminished motivation also present significant challenges. Participants indicated that the seclusion of online courses heightened their anxieties. According to the results of the research, students experienced loneliness, stress and loss of motivation during the distance education process. It is seen that students’ anxiety levels increase in courses with low attendance and this situation reinforces their decision not to attend the courses. Especially In a setting without social connection, students diminish their interest in classes and experience a decline in academic production. These results highlight the significance of psychological support systems in distance education. Universities should provide psychological assistance for students to address emotional challenges such as loneliness and anxiety. This observation aligns with Rowai’s (2003) assertion that psychological distress significantly influences persistence in distance learning. Additionally, decreased motivation in online environments is related to a lack of social stimulation. Tinto (2017) posits that intrinsic and extrinsic motivation substantially affect student attendance. This effect significantly improves student efficiency in courses. Zimmerman (1990) argued that students encountering psychological barriers frequently exhibit a more significant decline in self-control.

Research findings indicate that in-person contacts are essential to students' learning processes. Studies show that social presence and learner-learner and learner-instructor interactions have a significant impact on student retention and satisfaction (Kuo et al., 2014; Lin et al., 2017; Whiteside et al., 2017). Social connections and direct communication serve as significant motivators, particularly in the context of language acquisition. Students reported a deficiency in social connection during remote education, which diminished their motivation. As indicated by Yang et al., (2013) social connections in in-person courses greatly influence the learning process and overall motivation. Budiman (2015) claims that a traditional classroom environment, social interaction between instructors and peers is an important factor in supporting student motivation. Since such social support may be limited in online courses, students need to be self-motivated. Social interaction plays a critical role in keeping students engaged in the learning process the findings align with Tinto's (1975) theoretical framework, highlighting the connection between academic and social adjustment in enhancing student retention. He claims a significant relationship between student attendance and both social and academic integration. Burns (2013) highlights the significance of fostering connection in the online learning environment. Adams, et al. (2013) observed that insufficient social interaction diminishes students' sense of belonging and engagement. They also highlighted that the excessive influx of information in online settings poses a challenge to establishing meaningful connections. This creates challenges for students in forming social and academic connections. This finding reveals that social ties and interaction are indispensable in language learning. Especially in an interaction-oriented field such as the teaching profession, students' loss of social ties may negatively affect their professional development.

In the context of distance education, it is of utmost significance that examinations are carried out in a dependable manner (Gunduz and Karaman, 2019). Exams can be taken by students who are able to acquire assistance from outside sources. However, since there is a lack of active usage of test security technology, it is difficult to keep track of the students when they are answering questions throughout the exam. Students' evaluations of online exams emphasize that they experience less stress compared to face-to-face exams and that this situation eliminates the necessity to attend classes. The flexible structure of online exams and the use of resources reduced the need for students to actively participate in the lessons. Students do not feel the need to go to the lectures, thinking that they can get external support in the exams.

These findings indicate that the connection between the examination system of distance education and learning processes has weakened. Students' motivation to learn decreases with the decrease in the pressure on exams and this situation negatively affects the attendance rate.

External Factors: Organizational Guidelines and Technological Obstacles

The absence of an attendance obligation policy is regarded as a significant external factor. Participants recognized that the absence of attendance regulations impacted their decision to miss lessons. They stated that the attendance requirement is a source of motivation and that the removal of this requirement is one of the most important factors that reduce attendance. This clearly shows the effect of extrinsic motivation on learning. This trend has also been observed by Hart (2012). Finding that extrinsic incentives such as attendance standards are important for maintaining participation, Lee and Choi (2011) noted that systematic policies are consistent. Evaluating and enhancing retention rates in digital learning environments. The elimination of the attendance obligation resulted to students assuming more responsibility for supervising their own learning processes. Nevertheless, it is acknowledged that many students have challenges in meeting this obligation.

Technical barriers, including inadequate internet connectivity and an unsuitable home environment, represent a significant factor contributing to absenteeism. The situation shows that the sustainability of distance education depends to a great extent on the technical infrastructure. This finding aligns with the work of Gunduz and Karaman (2020), who emphasized that insufficient technological infrastructure serves as a significant obstacle to engagement in distance education, as suggested by McAuley, et al. (2010) the digital divide significantly affects students' participation in online courses. Technical problems in accessing online courses (e.g., internet outages, system crashes) can negatively affect student attendance (Adedoyin & Soykan, 2023, in particular, students living in economically disadvantaged regions face difficulties in accessing technological infrastructure and are at risk of being disconnected from educational processes (Yukselturk et

al., 2014). The environment in which students reside significantly influences their participation in distance learning courses. In order for students to attend class regularly, they need to create a clear study plan, follow the course materials in a specific order, and fulfill their own responsibilities (Rashid et al., 2015). Hart (2012) emphasizes that issues arising from an inadequate learning environment in congested home settings may impact retention rates, and he demonstrates a linear association between parental support and school attendance. Oliveira et al. (2017) in their research emphasize that although online education is an attractive option, especially for students with family responsibilities, it is also a factor that increases absenteeism rates (Oliveira et al., 2017) as it mentioned by the students of tis present study. Overcrowded familial settings, insufficient peaceful study areas, and domestic obligations hindered students' ability to concentrate on their academic pursuits. The results indicate that optimizing students' physical settings is essential for the effectiveness of distant education. Facilitating calm study environments and offering technical equipment assistance, particularly for underprivileged students, might enhance attendance.

Personal Qualities: Self-Discipline and Effective Time Management

One reason student did not attend the sessions was their lack of self-discipline and time management skills. The not compulsory nature of attendance requires that students take responsibility for their own educational progress. Nevertheless, several students encountered challenges in this procedure and subsequently lost their enthusiasm to participate in lessons. Pierrakeas et al. (2004) draw attention to the importance of the relationship between time management and dropping out and point out that individuals who manage their time well have higher attendance rates. Zimmerman (1990) argues that students who take an active role in their education typically demonstrate significant self-discipline and possess clear motivations for enrolling in courses, emphasizing the complex interplay between motivation and the learning experience. Attributes of students specifically, self-discipline and effective time management play crucial roles in maintaining one's presence in an academic environment. Research shows that effective time management skills positively affect learners' retention, whereas difficulties in time management are strongly associated with early online education dropouts (Ivankova & Stick, 2007; Stanford-Bowers, 2008; Nichols, 2010; Traver et al., 2014) and self-regulation skills play a critical role in students' commitment to learning processes (Gomez, 2013; Lee et al., 2013; O'Neill & Sai, 2014). The absence of a structured timetable in online education heightens the obligation to oversee student learning endeavors. This aligns with Zimmerman's (ibid.) findings on self-regulated learning. Individuals exhibiting higher levels of self-discipline are likely to navigate the complexities of distance education more effectively. Parker (2003) highlights the significance of intrinsic motivation and effective time management as key factors in forecasting student success within the online learning context. Students who demonstrate a deficit in self-discipline frequently find themselves facing issues related to absenteeism. Kinnunen and Malmi (2006) highlight the significance of self-regulation skills in the context of online education. Suggesting that students with low time management and organizational abilities face an increased risk of decline, Morris, Wu, Finnegan (2005) argued that these personal characteristics have a greater impact on the opportunity to persist academically, especially in a self-directed learning environment. The given situation highlights the significance of students' self-regulation abilities in remote learning. Students with poor time management skills may have difficulty following course material regularly, may miss homework assignments, and may be pushed out of education as a result (Schulze and Scholz, 2018). Many students find it difficult to manage their own learning process in online learning environments. As stated by Duckworth et al. (2019), students with high self-control are more loyal to their study programs and can manage their time more effectively by avoiding distractions. This enables them to complete their academic tasks on time and efficiently.

CONCLUSION AND RECOMMENDATIONS

This study aims to elucidate the factors contributing to course attrition among students engaged in distance language education. The results derived from the interview analysis were elaborated upon in the preceding section. These findings indicate that the availability of recorded lessons for asynchronous access diminishes the real-time participation of students who do not attend the French preparatory courses, despite the intention to enhance flexibility. Students said that they could sustain their foreign language study by consistently reviewing these recordings.

A number of students tended to withdraw due to insufficient social integration in online courses. The absence of social integration, a critical issue in distance education, significantly contributes to student course attrition. Furthermore, online courses must be structured to maintain optimal levels of interaction between students and between students and instructors. Students expect lecturers to develop effective communication, implement appropriate course design, and give timely feedback (Yilmaz, 2019). Burns (2013) emphasizes that course design significantly influences the decision to withdraw from or persist in the course. The inadequate organization of the educational environment is a contributing factor to student attrition. The absence of a structured home environment and insufficient familial support hinders pupils' successful engagement with their education.

A primary reason for students to withdraw from the course is a decline in motivation. Students experience a decline in motivation due to intrinsic and external factors, leading to course withdrawal. Upon analyzing the students' expressions, "loss of motivation" emerges as one of the most frequently employed terms. Ultimately, attributes like self-discipline and time management among students underscore the significance of personal accountability in online education. Students who experience difficulties with these skills are prone to withdrawing from the classes, particularly in the absence of external mandates like attendance.

Recommendations

This research provides important findings for understanding the reasons for students' absenteeism in online French language education program. The results suggest that various strategies should be implemented to increase students' participation in online courses. Among these, increasing interactivity in course design, strengthening social ties, improving technical support, and training for instructors to increase their digital pedagogical skills stand out.

This present study analyses in detail the intrinsic, extrinsic and individual factors affecting student retention in distance education and provides recommendations for educational institutions, instructors and students themselves. For educational institutions, the research findings will contribute to the revision of curricula and assessment processes in order to increase participation in online courses. It will help instructors to understand how students lose motivation in online courses and how non-interactivity becomes a problem. It will also contribute to the students' awareness of how they can overcome the difficulties encountered in the online learning process and will provide students with a perspective on how important self-regulation skills are. French language learning is a process that requires intense interaction by its very nature. In order to ensure students' active participation in the online learning environment and to reduce absenteeism rates, the following suggestions have been developed. Course contents should be supported with visual and audio-visual materials, not only text-based, and should be diversified to appeal to different learning styles of students. Interactive learning methods such as group work, discussion forums and virtual classroom activities should be used to encourage student participation. Even if asynchronous learning opportunities are offered, synchronous courses should be made compulsory or more attractive

Encouraging student-student interaction: Peer co-operation is of great importance in language learning. Platforms (e.g., virtual chat groups, student clubs) should be created to enable students to communicate with each other. Increasing teacher-student interaction: Feedback mechanisms should be created where students can communicate with their teachers individually and teachers should provide more individual guidance to students. Organizing virtual cultural activities: Students' interest in language and culture can be increased by organizing virtual trips, film screenings or cultural events related to French-speaking countries

Support mechanisms should be provided for students experiencing technical problems such as lack of internet or hardware. In order to minimize technical problems in accessing courses, regular technical support should be provided to students and user manuals should be prepared. The accessibility of the university or institution's digital learning platforms should be increased, and user-friendly interfaces should be designed. Regular training programs should be offered for instructors to increase their competence in online learning tools and pedagogical approaches. Guidance programs should be established to ensure that instructors are more aware of how to increase student motivation and interactivity.

Limitations of the Study

This research is limited to students enrolled in a specific university's French preparation program and cannot be directly generalized to all distance education systems. The research focused only on the views of students; the perspectives of lecturers, administrative staff or managers were not adequately addressed. The number of students in the sample is limited and a more comprehensive study may enable broader generalizations to be made. The study covers only a specific period and does not provide precise information about long-term learning trends.

In conclusion, this research provides important findings for understanding the reasons for students' absenteeism in online French language education. Solutions such as increasing interactivity in course design, strengthening social ties, improving technical support mechanisms, and enhancing instructors' digital pedagogical skills can help reduce absenteeism rates. Moreover, further research analyzing the views of different stakeholders (students, teachers, administrators) in detail would contribute to making online foreign language education processes more effective.

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MOODLE USABILITY ASSESSMENT METHODOLOGY USING THE UNIVERSAL DESIGN FOR LEARNING PERSPECTIVE

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ABSTRACT

The application of the Universal Design for Learning framework favors the creation of virtual educational environments for all. It requires the development of accessible content, a usable platform and the use of flexible didactics and evaluations that promote the constant motivation of students. The present study aims to design a methodology to evaluate the usability of the Moodle platform based on the principles of Universal Design for Learning. It recognizes the importance of accessibility, usability and the availability of Assistive Technologies in an inclusive virtual education that meets the needs of students. We developed and applied a methodology to assess the level of usability of Moodle, taking into account that they integrate Assistive Technologies or are used for MOOC contexts. We employ the mixed design research framework to evaluate a MOOC-type educational program. We conclude that Universal Design for Learning principles and guidelines are positively valued by students and have a positive impact on certification rates.

Keywords: Distance education and online learning, evaluation methodologies, lifelong learning, special needs education, teaching/learning strategies.

INTRODUCTION

It is essential to consider inclusive Virtual Education as a high-impact strategy to improve the coverage, relevance and quality of education at all levels and types of training. Virtual Learning Environments (VLEs) are web-based systems that facilitate online communication, collaborative work, the sharing of various types of resources or educational materials, assessment and student monitoring (Cassidy, 2016; Caprara & Caprara, 2022). Designing VLEs for all means recognizing different populations, including students with functional diversity or disability, so not only the characteristics of the platform must be kept in mind, but also the particularities of the pedagogical materials, which can become barriers to learning if not properly designed (Crisol, Herrera and Montes, 2019; Fermin-Gonzalez, 2019; Vilaverde, 2020; Chidiadi, 2024). Likewise, it must be recognized that these students face technological, pedagogical and attitudinal barriers, negatively affecting their academic performance and success, therefore educational environments accessible to all must

be guaranteed since this transformation contributes to a more just society (Ntombela, 2020). Inclusive education and digital literacy are two key elements in quality education. UNESCO (2022) emphasizes that the teacher must recognize the appropriate use of technologies in harmonizing the needs and particularities of each student. It is important to formulate and implement a wide range of learning strategies that respond precisely to the diversity of students. One of the paradigms that is gaining more strength every day, showing successful experiences at different educational levels, is the Universal Design for Learning (UDL). According to the Center for Applied Special Technology (CAST) (2018), UDL focuses on the design of flexible and versatile educational curricula, with diverse materials and media so that everyone has access to learning. UDL takes advantage of the great benefits of technological media, such as: versatility, transformation capacity and generation of connections. E-learning offers a wide range of possibilities to promote Education for All, which is why it is widely used.

According to the World Health Organization (WHO) (2018), Assistive Technologies (AT) are systems and services related to software that provide help and support, allowing people to lead a productive and independent life and to be part of the social, labor and educational environment.

Accessibility and usability promote the possibility for users to use learning platforms and educational digital content according to their needs, participating equitably in digital educational environments. Designing virtual learning environments for all implies recognizing different populations, including students with functional diversity or disabilities, so it is necessary to keep in mind not only the characteristics of the platform, but also the particularities of the pedagogical materials.

This research developed as a doctoral thesis, provides a methodology for the evaluation of usability in LMS (Learning Management System), Moodle v.2.x and v.3.x environments, which could well be transferable to other LMS environments, since it seeks to improve the VLE, in terms of usability and accessibility for all. It is important to mention that the v.2.x platform instance used corresponds to that used by the University of Granada in Spain, while the v.3.x instance is the one used at the Universidad del Atlantico in Colombia, for the academic year 2019/20. As part of the evaluation, the design and use of a MOOC training action (implemented in the Moodle v.3.x platform) has been provided, incorporating the opinion of users in their different roles and recognizing the importance of education for all and universal learning. This experience opens the way to verifying the applicability of UDL principles as a key element to offer virtual educational programs for all, recognizing the importance of accessibility and usability of AT-supported environments.

Education for all, or Inclusive Education, is an educational approach that values diversity as an element that enriches the teaching-learning process and therefore the development of the human being. It is associated with values such as participation, equity, equality and justice, which transcend the attitudes of teachers, students and the community in general (Haug, 2017; Robinson-Pant, 2020; Page, Anderson & Charteris, 2023). Inclusive Education promotes learning for all, including students with special educational needs, by enabling equal opportunities, removing barriers, and through presence, participation and progress in physical and virtual contexts. Students with special educational needs require additional or different support to what is normally available in the teaching-learning process for other individuals of similar age (Florian, 2019).

Authors such as Kent, Ellis and Giles (2018), Rogers-Shaw, CarrChellman, and Choi (2018) and Oswald, Adams and Hiles (2018), point out the importance of the universal design approach in e- learning, arguing that it provides adaptations that favor the academic performance of students, especially those with special educational needs. The UDL framework invites the design of learning environments commensurate with the increasing diversity of learners encountered in online courses (Rogers-Shaw, et al., 2018).

The three principles of UDL consist of promoting multiple forms of representation, expression and involvement (CAST, 2018). Figure 1 graphically presents the three UDL principles and their guidelines.

UDL is an approach that addresses the challenge of making all students expert learners and is widely used at various levels, including university (Dickinson and Gronseth, 2020; Frumos, 2020; Griful-Freixenet, Struyven and Vantieghem, 2020; Bray et al, 2023). When choosing UDL implementation strategies, it is recommended that its principles be introduced gradually, starting by replacing undervalued activities to keep students and teachers excited about learning (Rao, Edelen-Smith and Wailehua, 2015).

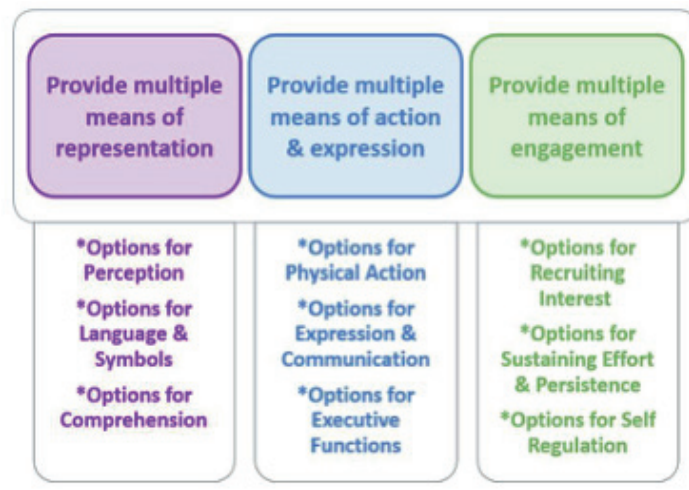


Figure 1. UDL Principles and Guidelines (CAST, 2018).

Technological accessibility and usability are vital for an information and knowledge society. Web accessibility refers to the possibility for all users, including those with functional diversity, to perceive, understand, navigate and interact with web contents, thanks to the fact that they follow design guidelines that allow access to people with a wide range of hearing, movement, visual and cognitive abilities (Abuaddous, Jali, & Basir, 2016).

Usability is a broader concept than accessibility; therefore, for a resource or page to be usable, it must be accessible in the first instance. However, despite the fact that accessibility, usability and integration of technologies are seen as reasonable practices, they are not always used in online courses (Edwards and Boyd, 2018). Assessing the accessibility of digital educational resources and online learning platforms is very important to ensure education for all, especially for students with disabilities (Alahmadi and Drew, 2017; Edwards, 2019).

Assistive Technologies – which for this case are technologies used to favor accessibility – designate/determine the systems and services related to programs for assistance, which allow people to lead a productive and independent life and be part of the social, labor and educational spheres (WHO, 2018). ATs enable access to educational information and content and to learning platforms themselves (Alahmadi and Drew, 2017).

Research, such as that undertaken by Wu (2015), Mironova, Amitan, Vendelin and Vilipöld (2016), Fidalgo and Thormann (2017) and Coleman and Berge (2018), shows that the accessibility needs, requirements and preferences of participants in virtual courses hosted on LMS platforms are diverse and that simplifying navigation is of great help (Rao, Edelen-Smith and Wailehua, 2015). In addition, Chatterjee, Juvele and Jaramillo (2017), Houston (2018) and Bray et al. (2023) describe the application of UDL principles in VLE, specifying that they offer alternatives for information presentation, interaction, expression and involvement with online learning and incorporating emerging technologies such as immersive education and simulators. Rogers-Shaw et al. (2018) and Ciasullo (2018) state that Inclusive Virtual Education is possible if it is designed with a methodology that involves knowing the students, developing accessible content, having a usable platform, and includes flexible didactics and evaluations that promote constant student motivation.

There are several standards and norms to consider in the design of a web page, which seek to make it more accessible. Yet although there are specific recommendations, this does not guarantee that web designers take them into account (Armano, Borsero, Capietto, Murru, Panzarea and Ruighi, 2018). To evaluate the accessibility of web content, two methods are used, one automatic and the other manual, which complement each other. The automatic analysis allows detecting accessibility problems through the use of tools, which are not infallible and have limitations, so it is necessary to perform a manual analysis with the participation of experts. The Moodle platform has been the subject of analysis in different distribution versions, regarding its accessibility (Moreno, Iglesias, Calvo and Delgado, 2011; Calvo, Iglesias and Moreno, 2014). Since then, the scope of measurement has been extended from accessibility to a broader concept such as usability.

In a usability test, the user is presented with the product and asked to use it intuitively or is asked what he/she thinks it can be used for (Krug, 2000). No single method should be used, but rather they are combined for best results. The Moodle platform has been evaluated using usability principles in several of its versions (Kakasevski, Mihajlov, Arsenovski and Chungurski, 2008) evaluated and compared the user experience when using different Moodle modules, giving recommendations for teachers and students that make it possible to improve authentication tasks, learning resources, assignments and communication. In 2013, Daneshmandnia carried out a usability evaluation on Moodle v.2.4. through expert inspection, revealing positive responses regarding the possibilities of this LMS. This result coincides with that found by Kipkurui, Wanyembi and Ikoha (2014), who identified that the learnability of the platform affects its usability. Orfanou, Tselios and Katsanos (2015) propose the use of the SUS scale (Brooke, 1996) to evaluate the perception of usability of Moodle platform users, finding that it is at a satisfactory level according to the students who participated.

METHOD

As can be seen in Figure 2, this study has been developed using a mixed design, which allows a series of systematic, empirical and critical processes that involve collecting qualitative and quantitative data. It was designed as a multi-method study adapted to our needs, contexts, circumstances and resources, in order to achieve a better understanding of the analyzed phenomenon (Hernandez-Sampieri, Fernandez-Collado and Baptista-Lucio, 2014; McKim, 2017).

The objective is to analyze the viability of Moodle v.2.x and v.3.x for applying the UDL, based on an evaluation of its accessibility and usability. The objective itself is framed within the design of the evaluation of an educational program. The responses of this evaluation may or may not directly judge the value of an object, which in this case corresponds to the usability of two Moodle platforms. One platform is at the University of Atlantico (UA) in Colombia, using version 3.3, and the other is at the University of Granada (UGR) in Spain, with version 2.7. Both platforms reflect the two production environments that the Moodle.org community makes available to centers and institutions, generally referred to as Moodle v.2.x and v.3.x.

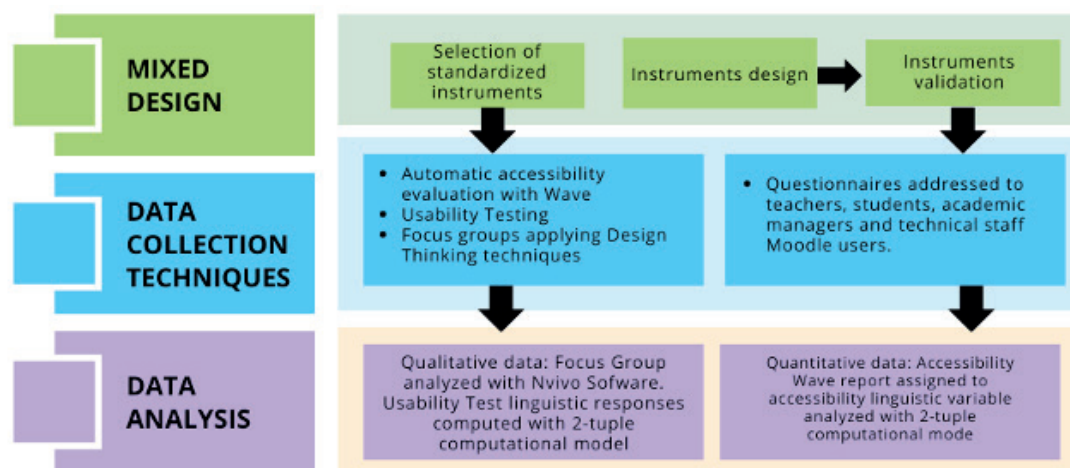


Figure 2. Design-based mixed research cycle

Participants

Given the mixed characteristics of the study, it was necessary to have different samples to collect the relevant qualitative and quantitative data. In particular, the users considered are all strata of the same universe, i.e., with experience in the use of the LMS Moodle platform, since these selections reflect different levels of interaction with the platform. Due to the instruments used, it was necessary to define different sampling techniques, also taking into account that one of the characteristics of mixed methods is the possibility of combining different sampling techniques that make it possible to solve the problem statement (McKim, 2017).

- First sample. This was composed of 9 people belonging to the coordinating and technical team of the Moodle platform in the two universities studied. All the participants work in the IT and e-learning areas, and most of them have between 6 and 20 years of experience.
- Second sample. This comprised a type of volunteer participant, i.e., individuals linked to undergraduate studies at the two institutions, who shared their experiences in the Usability Test (UT) of the Moodle platforms. There were 213 voluntary participants, 126 people from the University of Atlantico and 87 from the University of Granada.
- Third sample. This was formed by usability experts from both institutions – professionals in IT who are familiar with the platforms but who are not currently directly linked to the departments that administer them. There were 3 experts from the University of Atlantico and 4 from the University of Granada, for a total of 7 people.
- Fourth sample. This was made up of Moodle platform users in their role as student teachers or technical team members. A total of 22 people participated in these groups, which will be explained below.
- Fifth sample. This consisted of 531 participants on the MOOC course held at the University of Atlantico, who answered the second and fourth questionnaires to evaluate this educational program. Of this sample, 21 participants stated that they had some type of functional diversity; 50 had entered the educational system late; 30 had difficulties in mathematics; 6 had difficulties in reading and writing; 7 had attention deficit disorder with or without hyperactivity; and 1 had autism spectrum disorder.

Data Collection and Analysis

Considering the mixed design of the present study, different types of data collection instruments have been designed, which are presented in Table 1 and detailed below. Template files and also data from our case study are publicly available as a GitHub repository, at <https://github.com/ari-dasci/OD-Moodle-Usability-Assessment>

Table 1. List of instruments used in this research and type of data

Instrument	Type of data
An AT Matrix	Qualitative
Report from Wave accessibility evaluation tool	Quantitative
Usability Testing	Mixed
Focus groups	Qualitative
Seven questionnaires	Quantitative

Assistive Technology Matrix

The objective of our Assistive Technology (AT) matrix is to systematize in an organized way the evidence found on the search for free and online technology, susceptible to be used in the VLEs by teachers and students. Such AT are intended to improve the tasks of communication, reading, writing, mathematical exercises, accessibility and organization. The information collected in the matrix is qualitative and its results became an annex to one of the questionnaires addressed to the technical team that manages the Moodle platform. The 24 selected AT instances are classified into communication technologies, accessibility, reading, writing, mathematics and time organization.

Web Accessibility Evaluation

For the automatic evaluation of accessibility, the Wave tool was selected. The tool loads the web page, and detects and marks accessibility errors on it. When these errors are clicked upon, a detailed report is given, thus facilitating understanding. For its interpretation, we used the Website Accessibility Conformance Evaluation Methodology (WCAG-EM) 1.0, a methodology that determines the accessibility level of a web page according to Web Content Accessibility Guidelines 2.0. This is a flexible support resource that does not define additional requirements, nor does it determine a specific tool for its application, and it allows self-evaluation and evaluation by third parties (W3C, sf). In the following GitHub resource, you can read our analysis for PRADO and SICVI 567 that encompasses both Wave accessibility reports.

Usability Testing

For the evaluation, the MOOC course title Inclusive educational contexts: design for all people was hosted on both LMS platforms, and the 12 review pages of the course were defined and organized according to the tasks to be used in the usability test.

Focus Group for Moodle Users

Focus groups, also called discussion groups, are sessions in which topics are discussed in depth. These consisted of meetings of people where meanings were constructed in a collaborative way, guided by a moderator. In this case, positive and negative aspects were discussed, as well as suggestions for improvement of the UA's Moodle platform. The focus group was structured by means of two techniques proposed by Design Thinking, the Journey Map and the Feedback-Capture-Grid. These techniques are methods that make it possible to analyze and discover people's needs, under the paradigm of universal design, and which therefore may help to improve the design of a MOOC course. We had the participation of 22 people from the UA, belonging to the fourth sample described above. More information is given in our report.

Questionnaires

In the search for a reliable, valid and objective process, three main stages were carried out: design, validation and piloting. These stages led to the final version of the questionnaires. The validation process of seven questionnaires was carried out using the online modified Delphi Method and with the participation of ten expert judges. All of them are professionals in the field of education and engineering with extensive experience in the field of virtual education and inclusive education. The experts' evaluations were analyzed quantitatively and qualitatively. The pertinent qualitative modifications were made, and in order to evaluate the internal consistency of the questionnaires, a pilot test was applied. We then carried out Cronbach's Alpha on its results. The Cronbach's Alpha index ranges from 0 (0%) to 1 (100%), where the minimum expected was 0.8 (80%), and it showed the degree of concordance of the questionnaire responses. The values obtained in the questionnaires were higher than 80%, thus demonstrating their internal consistency (Bujang, Omar and Baharum, 2018).

The total set of questionnaires is listed in Table 2, and their template can be downloaded at the GitHub repository. It is important to mention that a five-term Likert scale was used to answer the questionnaires: strongly agree, partially agree, indifferent, partially disagree, strongly disagree.

Table 2. Target audience and purpose of each questionnaire

Instrument	Purpose
Q1: Moodle Managers	To determine the opinion regarding the attention to diversity in the VLE and the integration of AT tools in Moodle and how these can favor its usability.
Q1: Technical administrators	Determine the opinion regarding the integration of AT tools to the Moodle platform and how these can favor its usability.
Q2: Moodle user teachers	To determine the opinion about the usability of the Moodle platform of users with experience in the teaching role.
Q2: Moodle user students	Determine the opinion about the usability of the Moodle Platform of users with a student role.
Q3: Usability experts	Determine the opinion regarding the usability of the Moodle Platform. Evaluate 10 usability dimensions or attributes: Web Accessibility, Identity, Navigation, Efficiency, Effectiveness, Help, Content, Easy to Remember, Satisfaction, and Resource Accessibility.
Q4: MOOC participants with experience in teaching	Determine the opinion regarding the application of UDL principles in their pedagogical practice in virtual learning environments.
Q4: MOOC Moodle participants	Determine the opinion regarding the MOOC course Inclusive Educational Contexts: Design for All, which was designed under the principles of UDL.

The instruments used in the research enabled a broad analysis of the usability of the Moodle platform and how the application of the UDL in VLE can meet the needs of users of this type of technological tool. It was important to discover the usability of the Moodle platform in its v.2.x and v.3.x versions from the perspective of users with teaching, student and administrative roles, as well as to carry out usability evaluations using automatic tools and taking into consideration the opinion of experts. In this study, the Wave automatic accessibility evaluation tool and the Q3 questionnaire were used to obtain an evaluation on accessibility and usability, respectively.

It was also important to learn the opinion of managers and technical staff who administer Moodle platforms about online AT tools that could be integrated into the LMS platform to improve learning conditions and promote education for all. The Q1 instrument was used to collect information from both groups of users. Furthermore, we needed to find out the opinion of the MOOC course participants, before and after, in order to learn about their experience on the Moodle platform and to determine if the MOOC, designed under the principles of the UDL, fully met its purposes and was adapted to the needs of the participants. All the instruments used shed light on the usability not only of the Moodle platform in two of its versions, but also the course that was hosted on it and designed under UDL principles, with an emphasis on the Q2 and Q4 questionnaires. The quantitative data were collected with the Wave accessibility assessment tool, the questionnaires and the UT, while the qualitative data were processed using NVivo 11.

Assessment under the Computing with Words Paradigm

Computing with Words (CW) is a methodology that uses human perceptions and opinions to reason and calculate instead of numerical measures. CW has the ability to optimize the approach experts use to calculate assessments of decision-making problems. To complement the use of CW, it is necessary to use linguistic variables. A linguistic assessment was carried out to provide an overall estimate of all the results obtained by applying the instruments, based on fuzzy set theory (Zadeh, 1965), which is widely used for the processing of qualitative data, based on the methodology of computing with words (Mendel, Zadeh, Trillas, Yager, Lawry, Hagrass and Guadarrama, 2010). Thanks to this methodology, algorithms can be developed that operate with data expressed by means of linguistic variables, although this research focuses only on the assessment and not so much on their processing.

Fuzzy linguistic valuation makes it possible to represent qualitative aspects, based on linguistic variables, which do not have numerical values but words expressed in natural or artificial language (Zadeh, 1975). Each linguistic value is characterized by a label and a meaning, where the label is a word that belongs to a set of linguistic terms, and the meaning is what it refers to and can be interpreted depending on the context.

In this research we use a term set S of $n = 6$ that gives domain to the usability linguistic variable, with $S = \{worst, poor, good, very\ good, excellent, unmatched\}$. In this way $s_i \in S$, $i = (1, \dots, n)$ is a valid output of the Brooke System Usability Scale (SUS) questionnaire (Brooke, 1996). A valid computational model which allows to operate with a linguistic variable is the 2-tuple fuzzy representation (Herrera & Martinez, 2000). For instance, *usability* $y = s_2$ (which is poor) is a better approximation of the computed SUS score in the range 0, 100. This questionnaire is simple, since it has an input of a 10-item scale that allows a global evaluation of usability. Linguistic rating is adopted in this study because it allows the comparison of platforms in terms of usability values expressed as human perceptions and opinions, which are more understandable than numerical measures.

FINDINGS

The results give an account of the analysis carried out from the application of the instruments. They allow us to recognize the perspectives of different users of the Moodle platform, as well as the results of the accessibility and usability tests.

Applicability of Assistive Technologies in Moodle

We created a TA matrix resource to collect 24 solutions that cover different potential needs for users. The purpose was to find online AT tools that could be made available to Moodle platform users, in order to

improve the Moodle platform configuration for usability. Among the AT tools selected are interpretation services in Spanish Sign Language and Colombian Sign Language, optical character recognition (OCR) tools, dictation tools, text to audio converters and vice versa, grammar checkers, dictionaries, and mathematical equation editors, among others.

The analysis of the results of the Q1 questionnaires showed that only one coordinator, corresponding to 20%, agreed that teachers requested support in the use of ATs to assist students with special educational needs. However, the lack of appropriate use of these tools by the coordinators of the virtual education services was evident. Fifty percent of the members of the technical team recommended the integration of six specific online ATs, such as the sign language interpretation service, the relay center, the RAE dictionary, Pomodoro, and the two online equation editors. Similarly, 75% agreed on recommending the Checklist for Moodle. All respondents stated that the incorporation of ATs into the Moodle platform favors inclusion and stated that they require training to learn how to use them.

Usability Assessment

Usability refers to the ease of use of the Moodle LMS platform. To be usable, it must be accessible in the first place, so it is pertinent to evaluate the accessibility of the v.2.x and v.3.x versions.

Accessibility Evaluation Results

Wave was used as an online service for web site accessibility evaluation and was applied to Moodle v.2.x and v.3.x instances. The tool was applied to the five groups of tasks and pages to which the user has access.

Table 3 synthesizes the metrics obtained for the v.2.x instance in terms of errors, alerts, features and accessibility according to tasks. The accessibility column indicates the global labels obtained according to the level of compliance with the standards proposed by the W3C. The usability column, added by us, allows us to provide a linguistic interpretation of usability according to all the results. This assessment is given by the researcher when reviewing the results of the automatic reports. For the case analyzed, it has a negative impact on usability, since it is not accessible to people with functional diversity, and is not very usable in general. It was observed that the pages with the highest number of errors are those related to grade tracking, edit profile and glossary activity, with 96, 74 and 72 errors respectively.

Table 3. Report by Wave in Moodle v.2.x

Task type	Task	Page	Errors	Alerts	Features	Accessibility	Usability
Platform Login	Moodle login	login-dialog	16	13	8	A	Poor
	Find Course	home-page	49	22	33	A	Poor
	Course access	course-page	46	121	156	A	Poor
Account settings	Change preferences	edit-profile	74	84	161	A	Poor
Course view	Content access	content-fetching	39	29	93	A	Poor
	Access to news	page-fetching	39	33	101	A	Poor
Communi-cations	Forum access	forum-main	39	31	94	A	Poor
	Send a message	messaging	56	43	116	A	Poor
	Chat participation	blogging	41	27	87	A	Poor
Activities	Task access	task-view	46	29	89	A	Poor
	Questionnaire access	questionnaire-view	7	29	97	A	Poor
	Glossary access	glossary-view	72	35	93	A	Poor
	Rating follow-up	rating-view	96	48	101	A	Poor
Total			620	544	1229	A	

Table 4 shows the results of the Moodle v.3.x evaluation. It was observed that the pages where the highest number of errors, alerts and features were concentrated were the course home page with 103 incidents, profile editing in preferences with 71, and messaging with 49 errors reported. The errors detected by the tool indicated accessibility problems that need to be corrected, as they pose difficulties for the end user.

Table 4. Report by Wave in Moodle v.3.x

Task type	Task	Page	Errors	Alerts	Features	Accessibility	Usability
Platform Login	Moodle login	login-dialog	6	5	4	A	Poor
	Find Course	home-page	31	28	29	A	Poor
	Course access	course-page	103	83	121	A	Poor
Account settings	Change preferences	edit-profile	71	31	60	A	Poor
Course view	Content access	content-fetching	10	24	21	A	Poor
	Access to news	page-fetching	10	30	33	A	Poor
	Forum access	forum-main	9	23	19	A	Poor
Communi-cations	Send a message	messaging	49	32	51	A	Poor
	Chat participation	blogging	10	21	14	A	Poor
	Task access	task-view	14	25	17	A	Poor
Activities	Questionnaire access	questionnaire-view	7	18	13	A	Poor
	Glossary access	glossary-view	37	23	17	A	Poor
	Rating follow-up	rating-view	12	27	23	A	Poor
Total			362	370	422	A	

Usability Testing

To carry out this evaluation, a course was organized in Moodle v.2.x and v.3.x platforms and 28 tasks were defined for this test. The success of the completion of each task was recorded (if achieved/not achieved), as well as the time in seconds used and the emotion generated in the participant when he/she faced that task. This value is given by the linguistic variable *emotion* = {*positive*, *neutral*, *negative*}. A total of 213 users with the role of students participated, of whom 15 reported having special educational needs such as hearing, visual or organic disabilities and late entry into the educational system.

Table 5 presents a summary of the tasks that participants successfully completed in both versions of the Moodle platform and the average time it took them to complete them expressed in seconds. The emotion column shows the most predominant and estimated average results for each task. Lastly, the column labeled usability has been graded based on the results obtained and using the fuzzy linguistic approach.

Table 5. Summary by Task Accomplishment at UGR and UA: Average Time of Duration (ATD) and the linguistic variable *emotion* = {negative (-), neutral (0), positive (+)}.

Task type	Task	Estimated	Success		ATD		Emotion		Usability	
			v2x	v3x	v2x	v3x	v2x	v3x	v2x	v3x
Platform Login	1. Moodle login	20-30 s	100%	100%	27 s	52 s	0	+	Unmatched	Unmatched
	2. Find Course	20-30 s	90%	100%	42 s	49 s	0	+	Unmatched	Unmatched
	3. Course access	10-20 s	100%	98%	7 s	4 s	0	+	Unmatched	Excellent
Technical Support	4. Locate FAQ	40-50 s	88%	55%	49 s	60 s	0	-	Unmatched	Poor
	5. Contact form	60-90 s	90%	25%	30 s	174 s	0	-	Unmatched	The worst
	6. Change language	60-90 s	93%	70%	21 s	104 s	0	+	Unmatched	Very good
Account settings	7. Set preferences	60-120 s	90%	90%	72 s	85 s	0	+	Unmatched	Excellent
	8. Upload image	60-120 s	84%	78%	100 s	39 s	0	+	Excellent	Very good

Content access	9. Access to news	20-60 s	77%	86%	63 s	142 s	0	+	Excellent	Excellent
	10. Download a file	40-80 s	98%	93%	29 s	80 s	0	+	Unmatched	Excellent
	11. Directory download	50-90 s	94%	78%	30 s	95 s	0	+	Unmatched	Very good
	12. Follow link	20-60 s	96%	77%	26 s	74 s	0	+	Unmatched	Very good
	13. Embedded video	20-60 s	96%	88%	25 s	48 s	0	+	Unmatched	Excellent
	14. Viewing a page	40-80 s	92%	90%	34 s	66 s	0	+	Unmatched	Excellent
	15. Page Reading	40-80 s	92%	87%	38 s	81 s	0	0	Unmatched	Excellent
Communi-cations	16. Page Displaying	40-80 s	92%	85%	37 s	72 s	0	+	Unmatched	Excellent
	17. Send a message	50-90 s	92%	81%	41 s	116 s	0	+	Unmatched	Very good
	18. Chat participation	60-120 s	73%	79%	73 s	107 s	0	0	Very good	Very good
	19. Submit assignment	60-120 s	98%	76%	54 s	129 s	0	+	Unmatched	Very good
	20. Answer questionnaire	60-120 s	100%	87%	50 s	116 s	0	+	Unmatched	Excellent
Activities	21. Add to glossary	60-120 s	99%	78%	120 s	150 s	0	+	Unmatched	Very good
	22. Set up groups	60-120 s	94%	11%	57 s	108 s	0	-	Unmatched	The worst
	23. Adding to forum	90-120 s	87%	80%	93 s	110 s	0	+	Excellent	Excellent
	24. Formatting text	60-120 s	79%	81%	97 s	85 s	0	+	Excellent	Excellent
	25. Creating a link	60-120 s	91%	69%	77 s	99 s	0	+	Unmatched	Very Good
	26. Insert an image	60-120 s	92%	80%	61 s	79 s	0	+	Unmatched	Excellent
	27. Resize the editor	40-80 s	72%	35%	59 s	89 s	0	-	Very good	Poor
	28. Rating follow-up	60-90 s	92%	89%	34 s	73 s	0	+	Unmatched	Excellent

The block of tasks performed by between 100% and 90% are those related to the start of the platform. It should be highlighted that the student users of v.2.x mostly rated the completion of the tasks neutrally, while the users of v.3.x gave the positive rating to a greater extent to describe the emotion. The tasks of accessing the form with the platform's technical support and forming groups show significant differences between the users of the evaluated versions. We observed that the v.2.x users performed them more easily than the v.3.x users.

Questionnaires Q2 and Q3

With respect to the results of the Q2 questionnaires, addressed to teachers and student users of the platform, it was noted that both were in complete agreement that learning to use the platform and its new functions is simple. They also felt that they can explore the functionalities of the platform by trial and error. The sections of the platform were easily identified, expressing that they strongly (71% and 53%) and partially agree (41%), respectively. Similarly, 46% of the respondents (55 people) and 37% (72 students) stated that the Moodle platform is similar to other common interfaces for teachers. Both types of users expressed that the platform is easy to use, even after not having used it, and they strongly agree (62% and 55%). A total of 77 teachers, representing 65%, totally agreed that the functioning of Moodle is satisfactory, as did 117 students, corresponding to 60%. Likewise, 93 teachers (78%) and 129 students (66%) stated that they would recommend the Moodle platform to people who might require an LMS system. It was observed that both teachers and students thought that the Moodle platform has an attractive interface (60% and 46%), its organization is clear (70% and 52%) and logical (65% and 51%) and that the environment is user-friendly (73% and 60%). The above shows a positive assessment of Moodle's usability.

The Q3 questionnaire aimed at usability experts was answered by engineers linked to the University of Atlantico and the University of Granada, but who are not responsible for the administration of Moodle platforms. The results showed that, according to the experts, both v.2.x and v.3.x had an adequate contrast between background and text, as well as a typography that facilitates reading. However, differences were observed between these platforms in terms of alternative text. The group of experts who evaluated the v.2.x. instance reported that they were indifferent to the use of the alternative text, while two experts from the v.3.x. evaluation group, representing 67%, expressed a positive evaluation, and finally one expert (representing the remaining 33%) expressed a negative evaluation. Regarding the hierarchical organization of the information, the v.2.x group stated that their opinion was indifferent, whereas for the v.3.x group, three experts (75%) totally agreed that there is easy access to the information and partially agreed (50%) that actions can be easily canceled.

The opinion of the expert group for v.3.x was partially in agreement on the question of whether the platform complies with navigability features. Opinions were more disparate with respect to the action cancellation feature. Sixty-seven percent (two experts) partially agreed that the help section is easy to locate, while each of the respondents expressed varying opinions about the help manual and contacting technical support. With respect to v.2.x, fifty percent (two experts) expressed that finding help is easy, seventy-five percent (three experts) expressed indifference to the manuals, and this same percentage expressed partial agreement that they have means of contacting the technical support team. Regarding the headers, it was observed that both v.2.x and v.3.x are clear and descriptive according to the experts, who were in full and partial agreement, respectively. A pop-up window is an element that appears on the screen, in this case, when accessing a section of the platform, and on this aspect, the v.2.x and v.3.x experts were in full agreement that the use of these is discreet.

Regarding the use of the highlighted sections, the majority of respondents in v.2.x were indifferent about this element of usability. For the v.3.x case, they strongly agreed. The evaluators stated that both v.2.x and v.3.x are pleasant and satisfactory to use, with data in the strongly agreed column, as shown in Table 5, and partially agree on the attractiveness of the v.3.x platform by 67% (two experts). The Q3 questionnaire directed at experts was applied to evaluate the usability of both Moodle platforms. The results obtained in both indicated good usability, considering the linguistic evaluation given.

Qualitative Data Analyzed with NVivo

In order to analyze the records obtained in the focus groups and the UT, as well as the presence of important elements, three categories of analysis identified through the use of NVivo software were chosen. The categories chosen by the researcher are the positive aspects, negative aspects and suggestions for improvement in the blocks of tasks faced by the users, as well as general comments on the Moodle platform. The most highly valued tasks (with a total of 12 references) are those related to the use of Activity resources. Users did not express comments or make positive references regarding the tasks of accessing technical support and user account management in either of the two sources analyzed. Likewise, no positive aspects were referenced in the UT regarding user account management, access to information and resources/content and general comments on the platform.

Analysis based on Computing with Words Methodology

The linguistic variable usability allows us to represent the global view of the usability property, and we applied it to both platforms. It refers to an interpretation of the global results of the instruments that arises from the point of view of the research team. Table 6 shows the usability of both platforms in comparison.

The conclusion reached is that the usability of the v.3.x platform was good, as was that of the v.2.x platform. However, these platforms require adjustments in their configuration to be made more accessible, and an intervention by the technical team that administers them, since the rating of poor was obtained by both. Likewise, a thorough review by the technical team is required to comply with accessibility standards. It should be made clear that questionnaires Q2 and Q4 were applied in the MOOC course developed only on the v.3.x platform; therefore, there is no data for v.2.x.

Table 6. Linguistic usability evaluation of Moodle v.2.x and v.3.x.

Instrument	Moodle v.2.x	Moodle v.3.x
Wave accessibility evaluation	Poor	Poor
Usability Testing	Good	Good
Emotions in Usability Testing	Positive	Positive
Q2 Moodle user teachers and students	-	Very good
Q3: Usability experts	Good	Good
Q4: MOOC participants with and without experience in teaching	-	Very good

MOOC Course Evaluation

The educational program proposed in this research is the MOOC Inclusive Educational Contexts: Design for All (MOOC-IEC). This course was designed based on the parameters of the UDL. The following are the results obtained at the end of the course, which reflect the opinion of the participants. First, the opinion of the participants with teaching experience in LMS platforms is shown, followed by the opinion of the participants on the design and experience after completing the course. Table 7 presents the results of the Q4 questionnaire in its two versions, one addressed to MOOC participants and the other addressed to participants with teaching experience in virtual educational environments. The first two columns of the table present the principles and guidelines of the UDL, followed by the Likert scale of the questionnaire.

The results of the Q4 questionnaire show that participants with and without teaching experience expressed full agreement that the three UDL principles were accounted for, especially the options of effort and persistence and self-regulation, with values above 80%. Regarding the fuzzy linguistic assessment of usability, the data showed a very good usability. In general, all rating results were concentrated on the Strongly Agree and Partially Agree scale values, both for participants with and without teaching experience.

Table 7. Questionnaire results according to UDL principles. Scale: Strongly disagree, partially disagree, Indifferent, partially agree, strongly agree. Other acronyms: participant (P), participant with teaching experience (PTE)

UDL principle	Guideline	SA		PA		I		PD		SD	
		PTE	P	PTE	P	PTE	P	PTE	P	PTE	P
I	Perception	65%	67%	24%	19%	6%	10%	2%	1%	3%	3%
	Language and symbols	79%	60%	11%	17%	5%	20%	3%	2%	2%	1%
	Comprehension	79%	87%	18%	12%	1%	1%	2%	0%	0%	0%
II	Physical performance	73%	80%	20%	18%	3%	2%	4%	0%	0%	0%
	Execution	79%	74%	18%	23%	1%	2%	1%	1%	1%	0%
	Pursuit of interests	75%	70%	21%	27%	1%	1%	3%	2%	0%	0%
III	Effort and persistence	87%	84%	9%	15%	2%	1%	1%	0%	2%	0%
	Self-regulation	84%	79%	14%	15%	1%	6%	1%	0%	0%	0%

DISCUSSIONS AND CONCLUSION

The VLE organizes didactic resources that focus on students by analyzing their characteristics and learning styles. The VLE favors autonomy and self-regulation, through the use of and access to the different resources available. VLEs are a necessity in all educational institutions and their accessibility is of the utmost importance for students, including those with disabilities (Alahmadi and Drew, 2017; Kent et al., 2018; Crisol, et al., 2019; Edwards, 2019; Vilaverde, 2020).

One of the objectives of the study was to identify online Assistive Technologies (ATs) that can be integrated into Moodle in order to improve its usability. In this regard, we found that there are options that initially enhance accessibility. ATs facilitate both accessibility and the completion of tasks faced by users of virtual platforms, because they allow the use and manipulation of different formats that guarantee access to information and knowledge (Alahmadi and Drew, 2017). There were different AT options according to their function, ranging from screen magnifiers, optical character recognition, text-to-audio converter and screen readers for people with visual functional diversity, task organizers for people with autism spectrum disorder, audio-to-text converter for people with motor functional diversity, and voice recorders for those with reading and writing difficulties. One of the great contributions of the online ATs selected in this study is their open and free use, since no investment is required by users to access them, and they thus become empowered with their use. Promoting accessibility in VLEs is necessary to ensure that all social groups have access to virtual education and is supported by a legal framework that is becoming increasingly important worldwide every day (Alahmadi and Drew, 2017; Edwards and Boyd, 2018; Edwards, 2019).

The members of the virtual education departments, both academic and technical managers, indicated that students with special educational needs participate in virtual classrooms. They also recognize a potential in TA tools for promoting inclusive education. However, they lacked mastery of them and were reserved when suggesting their integration in Moodle.

Our study recognizes accessibility as an important component of usability. No web page can be usable if it is not first accessible to users. Therefore, web accessibility and usability metrics were selected to be applied in the Moodle platform, using user-centered design techniques, and a theoretical review on usability and accessibility, and their application to the VLE, was undertaken. For accessibility, an automatic evaluation was completed using the free Wave Tool. This tool reviews and identifies accessibility difficulties that may occur on a web page.

Both the v.2.x platform of the UGR and v.3.x of the UA mostly obtained results of single A labels, so the platform requires improvements to meet the diversity of its users and improve accessibility conditions according to the standards proposed by the W3C. Both platforms were linguistically evaluated with the adjective poor, given the conditions they present and accessibility barriers for users with functional diversity.

As a complement to the selected usability metrics, in this research we applied a Usability Testing (UT) approach as a key method of inquiry into the Moodle platforms in the study. Subjecting users to tasks that are carried out in Moodle, verifying whether they complete them, how long they do it and the emotions they feel when facing them, gave the opportunity to analyze the degree of usability of these systems. The evaluation was not limited to the verification of accessibility standards, because although these are both important and a legal requirement, it is essential to determine the factor of human interaction with the Moodle platform. Hence the relevance of the usability results, which in this case and according to the selected metrics, found that in the UT users took more time than estimated to complete the tasks of accessing the technical support form, updating the profile image and adding an entry to the glossary. Likewise, the tasks they had more difficulties completing were those of forming groups, expanding the editor's area and accessing the technical support form, leaving them with negative emotions.

With respect to the opinions of users of the Moodle platforms in the study, it is evident that although the experts state that the platforms meet the attributes of good usability, as expressed in the Q3 questionnaire, and that teachers and students who responded to Q2 reaffirm this by indicating that it is easy to learn to use, efficient, easy to remember, error tolerant, produces satisfaction and is attractive, there are suggestions for improvement made by users in the focus groups.

The positive aspects are directly related to the activities that users can do on the course, while the negative aspects mainly concern the tasks associated with the start of the platform and access to content. Likewise, they also suggest improvements in the access to resources and contents. Overall, this allowed the researcher to give a linguistic valuation based on the adjectives proposed by the System Usability Scale, resulting in usability = poor for v.2.x, and usability = good for v.3.x.

Finally, a MOOC type educational program was designed, which presented an introductory module and the content organized into 3 modules, 42 educational resources in different complementary formats (audio, text, video) and 12 evaluation activities (6 mandatory and 6 optional). This was used as a context for data collection to discover the opinions of the participants with and without teaching experience, on the application of the UDL in the VLE. The products, which have been designed under the principles of equality, flexibility, simplicity and intuition, seek an environment in which everyone can participate, recognizing equal opportunities, respect for the rights of all and the participation of all students (CAST, 2018).

Participants rated the pilot experience positively, indicating, according to the answers obtained in the Q4 questionnaire addressed to participants, that the guide- lines proposed by the UDL paradigm were satisfactorily met. Through the course design, platform configuration and content creation, multiple means of representation, forms of action and expression and forms of involvement with learning were provided.

The design of this online training action brings benefits in quality inclusive virtual education, it improves accessibility, without the need for technical adjustments in the platform, and involves the participants in their learning. VLEs designed using the principles set forth in the UDL do not imply that the teacher develops a unique path for each student and their needs, but that the variability of this system is taken into account through the prediction of the possible ways in which students can learn in a flexible way (Dickinson Gronseth, 2020; Frumos, 2020; Griful-Freixenet, et al., 2020).

This educational initiative is a successful complement to the academic experience provided by students, graduates, officials, teachers and external guests and contributes to the democratization of education. It was a space for continuous learning, where participants shared and discussed different opinions and experiences of what Design for All entails in inclusive educational contexts. The statistics of the course show that a total of

520 people accessed the platform at least once and completed the activities that allowed 215 participants to be certified, corresponding to 27% of the population. Offering learning paths adapted to the characteristics of the participants and maintaining adequate feedback in MOOC courses can reduce dropout rates (Borrella, Caballero-Caballero and Ponce-Cueto, 2022)

The fulfillment of the specific objectives made it possible to carry out the general objective of the study, which consisted of designing a methodology to evaluate the usability of the Moodle platform based on the principles of UDL. This methodology is transferable to other contexts and institutions that wish to consider virtual education for all. UDL applied to a VLE promotes learning opportunities, improving pedagogical practices for a great diversity of students, including those with and without functional diversity. This enhances student retention in online courses, thus tackling one of its great challenges, the high dropout rate.

Virtual Learning Environments have evolved over the years, and today web designers, content creators, and teachers are concerned about usability as a present feature, since, if they focus on the student as the protagonist in education, they must recognize the wide variety of learning styles and preferences for receiving information that they may have.

It is important to offer virtual education for all, recognizing the diversity of students, according to their physical, psychological and social characteristics, as well as their previous experiences and interests. This is a challenge because it involves the consideration of technological and pedagogical aspects that guarantee quality and educational equity in learning environments mediated by technologies that are constantly evolving and are widely used by a diversity of users.

The proposal that VLEs should consider the accessibility of platforms and digital educational resources favors inclusion processes. The Universal Design for Learning (UDL) can be applied to virtual educational contexts, more specifically to training actions on the Moodle platform, since it makes content more flexible so that everyone can access information and learning more easily.

The use of Assistive Technologies (AT) is a good option to improve accessibility to the information society and therefore to knowledge. These technologies allow access to the curriculum, activities, resources and communication for students with functional diversity. The design of VLEs for all should not be limited to the use of AT, but should incorporate pedagogical and instructional practices for students with and without disabilities, based on the principles of the UDL. ATs can be used by students with and without disabilities and support UDL.

It is important to mention that the staff in charge of supporting virtual teaching, both academics and technicians, indicate that students with special needs participate in virtual classrooms and recognize that these tools have the potential to enhance inclusive education. However, the diversity and disparity of technological solutions does not encourage a deep mastery of them, which is why they show reservations when suggesting their integration into Moodle. Therefore, it is essential that the technical/managerial and pedagogical teams of support centers constantly monitor and update new ATs for virtual education in universities, provided that they wish to provide an inclusive service.

Limitations and Future Research Directions

This study has been limited to the community of Universidad del Atlantico in Colombia and Universidad de Granada in Spain. This restricts the scope of the results, also considering the versions of Moodle that both institutions had during the period of time in which the research was developed, however, the results of these contributed to the current versions. The development of the technical capabilities of the platforms and therefore the user experience through them was improved. It is expected to be able to carry out comparative studies of the applicability between different versions of Moodle also leading to an update with respect to the new version of the UDL presented by CAST in 2024. Similarly, it would be interesting to develop longitudinal studies based on current versions of the Moodle LMS platform.

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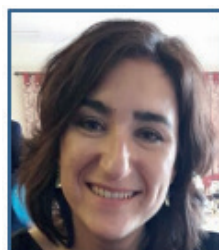
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DIFFERENCES BETWEEN ARABIC AND ENGLISH MEDIUM SCHOOL LEARNERS IN TERMS OF E-LEARNING TECHNOLOGY ACCEPTANCE AND USE FROM THE ASPECT OF THE CONSTRUCTIVIST LEARNING APPROACH

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ABSTRACT

Schools in Iraq use Arabic, and English, as the language of instruction. This study aims to examine the impact of language of instruction on students' attitudes towards technology, teaching practices, and learning outcomes in secondary and upper primary schools in Iraq. This research study employed a quantitative approach to explore the differences in influencing factors such as, constructivist learning approach, student investigation, respect for difference, attitude towards technology use, perceived usefulness, perceived ease to use, learning facility that affect the acceptance of e-learning technology and perceived e-learning outcomes by incorporating a constructivist learning approach between schools that use either Arabic or English as the language of instruction. The data were obtained from 936 secondary and upper primary school students based in Erbil through a self-report questionnaire. A structural equation modeling approach was implemented to analyze the data and test the hypotheses in this study. This study revealed that students studying in English medium schools showed stronger positive effects from the Constructivist learning approach on their perceived e-learning outcomes. Conversely, students studying in Arabic medium schools demonstrated a more potent positive effect from perceived usefulness on their attitudes towards technology. Moreover, the positive impact of an attitude towards technology use on perceived e-learning outcomes was more pronounced among the Arabic medium school students compared to English medium school students. Additionally, the influence of the learning facility on the perceived ease of use, as well as the perceived usefulness of technology, differed between the two groups. The English medium school students experienced a more substantial positive impact. However, there was no significant positive difference observed in the effect of perceived ease of use on attitudes towards technology use between the English medium and Arabic medium school students. Furthermore, no significant positive difference was observed in the effect of perceived usefulness on the Constructivist learning approach for either Arabic medium school students or English medium school students.

Keywords: English-medium instruction, Arabic-medium instruction, constructivist learning approach, e-learning technology acceptance model, perceived e-learning outcomes, Multi-group Analysis, partial least squares structural equation modeling (PLS-SEM).

INTRODUCTION

In the digital age, there has been a surge in the prevalence and visibility of Information and Communication Technologies (ICTs), which have necessitated a reconceptualization of teaching and learning. The utilization of ICTs in the educational sector has become a significant and widely discussed issue in recent years. Despite the growing popularity of educational technologies such as tablets and smartphones, mobile learning has emerged as the preferred choice among education users. Its ability to provide proactive teaching, foster active learning, facilitate quicker knowledge acquisition, and create spaces for sharing information and interaction all contribute to its growing popularity (Huang et al., 2020; Livingstone, 2012). Schools in Iraq use Arabic and English as languages of instruction. This study examines the impact of the language of instruction on students' attitudes towards technology, teaching practices, and learning outcomes in Arabic and English medium school students in Iraq.

Many international organizations, such as UNESCO, as well as Arab governments and policymakers in the field of education, have expressed considerable worry about the impact of language, especially English, on internet use and access (Hasan & Ditsa, 1999; United Nations Development Program & Regional Bureau for Arab States, 2011). Despite there being almost 6,000 other languages in the world, 58.8% of websites in a poll done in (2023) by World Wide Web Technology Surveys (W3Techs) used English as their primary language. As it turns out, only ten languages make for 86.4% of all online material as it is shown in the figure (1). About 1.5 billion people can communicate well in English, yet only 1.2 billion of them utilize the internet, making up only 25.9% of all internet users. Therefore, without the aid of translation software, over 60% of websites may be inaccessible to the world's non-English speaking internet users. These numbers highlight the seriousness of language hurdles in the worldwide web, which may prevent non-English speakers from fully partaking in global conversations and restricting their access to information (Richter, 2022). Therefore, it is essential in countries where English is not first language to develop e-learning resources that make use of local languages.

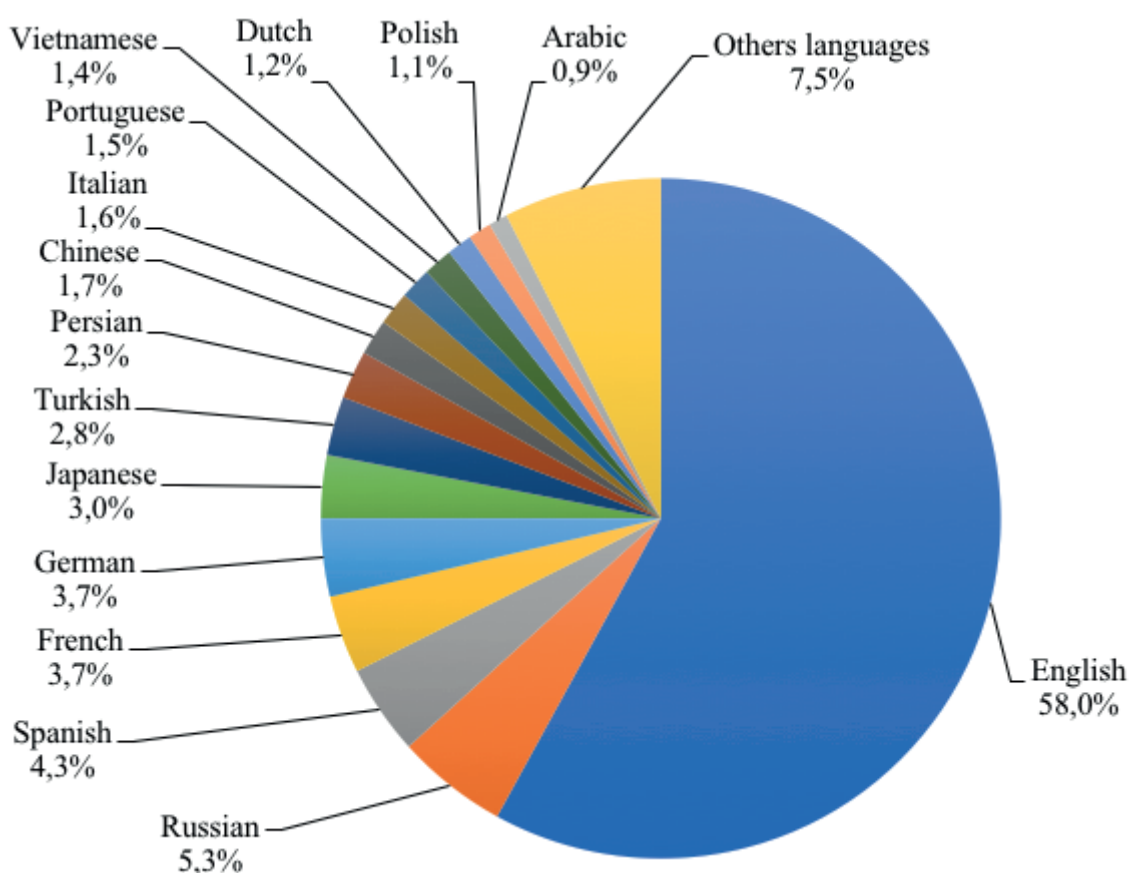


Figure 1. As of January 2023, the languages most commonly utilized for web content

The Arab educational system also confronts similar difficulties. Many students with low English proficiency tend to avoid e-learning due to their struggle with understanding English materials, as observed by Shraim and Khalif (2010) in Palestine. This issue extends to instructors, with some faculty members at Libyan universities reported as being computer illiterate and having struggles with English, compounded by a lack of Arabic-supported e-learning applications (Kenan et al., 2013). Studies in the Arab world, including those by Al Masri and Rimawi (2022) and Alkharang and Ghinea (2013), have highlighted this issue, suggesting the need for local language resources to boost the efficacy of internet utilization and e-learning. The underrepresentation of Arabic online coupled with the absence of comprehensive translation tools heightens the language barrier for Arab people, impeding their full participation in global digital spaces.

The social and cultural aspects play a significant role in the e-learning process. The cultural elements and factors affecting the implementation of e-learning cannot be overlooked, despite their complexity. The cultural factors are considered the most challenging to identify, conceptualize, and quantify (Hasan & Ditsa, 1999). To craft effective e-learning policies, policymakers need to possess a comprehensive understanding of the social and cultural standards and contextual expertise of a specific region. These cultural standards and customized instructional materials govern the modification of course content to accommodate local language, culture, and religious beliefs. For example, symbols and images used in the course material should be culturally appropriate to avoid offending or confusing the learners.

E-learning providers in Middle Eastern countries with educationally limited development tend to overlook these crucial elements (Khan et al., 2015). The available content is often disorganized and lacking instructional value. In Saudi Arabia, a major challenge in e-learning is the lack of customization, as evidenced by a research investigation conducted at King Khalid University has found that there is interference between educational and non-educational materials on social media platforms (Al-shehri, 2012). To ensure the maximum effectiveness of e-learning, it is crucial to make sure that educational materials are available in the native language of the targeted learners. This is especially important for enabling individuals living in remote areas to take advantage of online learning.

This study is a comparative study between schools that use English-medium instruction and schools that use Arabic-medium instruction, focusing on technology acceptance and use in the constructivist learning approach and its impact on e-learning outcomes. Previous research has highlighted the lack of e-learning resources and software applications in Arabic, particularly in many Arab countries such as Palestine, Libya, Jordan, and Kuwait, which can hinder the adoption and acceptance of new technologies like e-learning platforms by both teachers and students (Al Masri & Rimawi, 2022; Alkharang & Ghinea, 2013; Kenan et al., 2013; Shraim & Khlaif, 2010).

In addition to language barriers, most e-learning resources are primarily available in English and are not adapted to the cultural context of local communities. For instance, symbols and images used in course materials may be culturally inappropriate, leading to confusion or offense, especially in subjects like social studies. This creates significant concerns for educators and impedes the adoption of e-learning among Arab students in many Arab countries. For example, in Palestine, a large percentage of students and teachers reported difficulties in understanding English ICT terminology and expressed a preference for Arabic (Shraim & Khlaif, 2010). Similarly, the lack of software in native languages, as observed in the Vietnamese context, also affects students' ability to use educational applications effectively (Vu et al., 2011).

Based on these findings, the goal of this study is to evaluate the acceptance of e-learning and technology in English and Arabic medium schools. The study aims to identify the factors influencing e-learning adoption in both types of schools and determine how these factors vary in different educational environments.

ARABIC MEDIUM INSTRUCTION

Stretching from the Atlantic Ocean to the Arabian Gulf, the Middle East and North Africa encompass a vast geographical area. Numerous shared historical and cultural elements can be found across the nations in this region. The predominant religion, Islam, coupled with the widespread use of the Arabic language, significantly contributes to the formation of the region's identity (Akkari, 2004). Arabic is official language

in Iraq. English is taught alongside Arabic. Therefore, the students in Arabic medium instruction schools are from Arabic ethnic group but beside mastering their mother tongue language, they take Kurdish and English courses. The Mathematic, natural Science and social science are taught in Arabic language.

ENGLISH MEDIUM INSTRUCTION

English Medium Instruction (EMI) refers to the practice of using English as the language of instruction to teach academic subjects in non-English speaking countries or regions. Instruction in English is widespread in countries throughout the Middle East, Asia, and Europe, primarily because of a growing need for global integration and the dominant role English plays as a global lingua franca (Macaro et al., 2018). Importantly, the focus of EMI is not on teaching English itself, but on teaching academic content with English serving as the medium (Pecorari & Malmstrom, 2018). English language proficiency is thus a byproduct of this approach, rather than its main goal (Muttaqin & Chuang, 2022). The cultural and linguistic landscape of Iraq is diverse and rich. Serving as the official languages, Arabic is understood and spoken by the majority of the citizens. Besides these, the region also accommodates languages such as Assyrian Neo-Aramaic, Chaldean Neo-Aramaic, and Turkmen, each spoken widely within their respective communities. Among this linguistic multitude, English emerges as a second or third language for most students studying in English medium schools within the region.

ENGLISH LANGUAGE PROFICIENCY AND E-LEARNING OUTCOMES

English language proficiency refers to an individual's capability to effectively use the English language, encompassing writing, listening, reading, and speaking skills (Jimoh & Kenneth, 2016). This competency is critical for academic success, particularly for students in English Medium Instruction (EMI) programs, and is often measured through tests like TOEFL, IELTS, or TOEIC (Dev & Qiqieh, 2016; Rose et al., 2019).

Several studies have underscored the relationship between English language proficiency and learning achievement. These studies were conducted across multiple countries, including Iran (Maleki & Zangani, 2007; Sadeghi et al., 2013; Sahragard & Baharloo, 2009), Oman (Roche & Harrington, 2013; Sivaraman et al., 2014), Australia (Feast, 2002; L. C. Wilkinson & Silliman, 2008), Nigeria (Ajibade, 1993; Fakeye & Ogunsiji, 2009; Jimoh & Kenneth, 2016), and the United Arab Emirates (Suleiman, 1983). The studies discovered that students with a higher command of English often achieved higher academic success. This significant relationship was observed using various metrics, such as Grade Point Average (GPA) and performance in specific courses like cataloguing and classification (Jimoh & Kenneth, 2016; Muttaqin & Chuang, 2022).

Meanwhile, inadequate mastery of language skills has been found to stifle academic progress. For instance, in the Arab world, Suleiman (1983) found that deficient language skills impeded the advancement of Arab students at the university. Likewise, an investigation by Sivaramana and colleagues in (2014) also discovered that poor English Language proficiency in the English language hindered the success of engineering students in Oman. Further supporting these findings, research conducted at two higher education institutions in Oman showed a significant and positive correlation between performance in English and overall academic success (Jimoh & Kenneth, 2016; Roche & Harrington, 2013).

Language proficiency also influences how efficiently, and quickly non-native speakers assimilate and comprehend information. For example, in a global e-learning program, non-native English speakers read at a slower speed than native speakers and thus preferred instructors to summarize the content before reading assignments (Edmundson, 2007). The use of English as a medium of instruction presents language challenges to students, affecting their capacity to accurately express their ideas, logic, and understanding of scientific concepts (Pun et al., 2022). This issue is especially pronounced for students with limited English proficiency. Moreover, poor vocabulary knowledge in English has been associated with reduced communication skills, lack of comprehension and potential negative impacts on student achievement (Pun et al., 2022; Soruc et al., 2018; Wang et al., 2018).

ENGLISH LANGUAGE PROFICIENCY AND E-LEARNING TECHNOLOGY ACCEPTANCE

Language plays a crucial role in cultural identification and mediates cognition, embodying unique ways of thinking and speaking (Gudykunst & Mody, 2002; Mason, 2003; Pincas, 2001). It's an essential component of cross-cultural communication that's often overlooked in theoretical frameworks, despite its profound influence on thought and communication patterns (Gunawardena et al., 2001). Underlying this is the Sapir-Whorf hypothesis, suggesting that language not only reflects but also shapes our thoughts, beliefs, and attitudes. In this context, language's grammatical structure isn't just a conduit for expressing ideas, but it actively influences and shapes those ideas (Mason, 2003).

From an educational perspective, a student's ability to effectively use a language can influence their willingness to embrace technology. For example, a more recent study conducted by Al Masri & Rimawi (2022) titled "Challenges of applying e-learning facing faculty members in public universities during COVID-19" echoes these sentiments. In their study involving 226 randomly chosen faculty members from four Jordanian public universities, they found that second only to the challenge of scientific research on the Internet was the issue of English language proficiency. Their findings align with another study conducted in Palestine by Shraim & Khlaif (2010), where a significant percentage of both students and teachers reported being perplexed by English ICT terminology, expressing a preference for Arabic.

The role of social and cultural issues affecting e-learning effectiveness has been the focus of multiple studies, particularly those conducted in non-English speaking countries such as Arab nations. Research has shown that factors such as computer illiteracy, language barriers, and a lack of e-learning resources can significantly influence instructors' utilization of e-learning (Aldowah et al., 2019; Alkharang & Ghinea, 2013; Kenan et al., 2013). For instance, despite being provided with personal computers, a significant number of faculty members at Libyan universities were found to be computer illiterate, with additional struggles with English. This language issue was compounded by the lack of Arabic-supported E-learning applications, making teaching e-learning courses nearly impossible (Kenan et al., 2013).

Alkharang and Ghinea (2013) suggest that language barriers, specifically when e-learning content is primarily available in English, can inhibit the adoption and acceptance of new technology, such as e-learning platforms, particularly in non-English speaking regions or where English is a second language. In these contexts, learners who are not proficient in English may find it challenging to understand and interact with the technology, leading to reluctance to use it (Alkharang & Ghinea, 2013). In an examination of this issue in the Arab world, Alkharang and Ghinea (2013) also found out that these language barriers are a priority concern in Kuwait, unlike in developed countries where they are considered less significant. This indicates that the correlation between the language of instruction and technology acceptance may vary from region to region, and it is not a universal phenomenon.

METHODOLOGY

The Constructivist Learning Survey

The Constructivist Learning Survey is a tool grounded in social and cognitive constructivist theories. It measures the value students place on creating engaging learning environments that foster critical thinking, inquiry, investigation, negotiation of ideas and collaboration (Huang et al., 2020; Sultan et al., 2011). There are five scales within the pioneering CLA survey which are adopted from Constructivist Learning Environment Survey (CLES) (P. C. Taylor et al., 1994, 1997), and each scale includes between four and six sub-scales. Standard elements of the constructivist learning approach (CLA) survey, widely used within the CLES, include Shared Control, Student Negotiation, Uncertainty, Personal Relevance, and Critical Voice. The combination of these constructs has created a high-order construct known as a constructivist learning approach and administered in the Arabic and English school students at Iraq. The range of potential responses a student can provide in the survey includes Almost Never, Seldom, Sometimes, Often, and Almost Always. These options constitute what is referred to as the five-point Likert scale. Johnson and McClure (2004) in their research, defined elements of constructivist learning approach, regarded as the primary constructs in the current research investigation:

1. *Personal Relevancy* of students refers to the growth of their knowledge derived from their daily activities and the interconnectedness of experiences both inside and outside the school environment. (Johnson & McClure, 2004).
2. *Critical Voice* is the practice of questioning teaching methods and structures through the identification of hindrances to learning, along with the extent to which an environment fosters such questions and innovations positively, to find room for alternative ways of developing knowledge (Johnson & McClure, 2004).
3. *Student Uncertainty* refers to the degree to which students view scientific knowledge as being derived from theoretical investigations. This concept also includes the exposure of students to human values and experiences that are consistently evolving and are established within social and cultural contexts (Johnson & McClure, 2004).
4. *Student Negotiation* is the method where students assess the significance of their concepts or opposite ideas by carefully listening, appraising other students' viewpoints, and elaborating on their developing ideas (Johnson & McClure, 2004).
5. *Shared Control* refers to the practice of students actively participating in defining evaluation criteria, setting learning goals, designing instructional methods, and shaping the classroom environment by offering their input and ideas (Johnson & McClure, 2004).

The influence of psychological aspects in the formal and informal learning environment on student learning outcomes has been confirmed by recent studies, building upon early academic research in the field. This validation is seen in works from various countries, such as Singapore (Chionh & Fraser, 2009), Malaysia (Sultan et al., 2011), Indonesia (Margianti et al., 2004), and Canada (Parker & Becker, 2003). T. Wangpipatwong and Papasratorn (2007) found out that students using constructivist e-learning technologies within a traditional classroom achieved superior test scores and learning outcomes compared to their counterparts. Tynjala (1999) carried out an experiment as part of an educational psychology course. The experiment indicated that students who learned in a constructivist setting displayed better learning results and a more extensive range of knowledge than those who learned through conventional teaching approaches. Thus, the current research has proposed the following hypothesis regarding constructivist learning approach:

Hypothesis 1: There is a significant positive difference for effect of a constructivist learning approach on perceived e-learning outcomes between Arabic and English medium school students.

E-Learning Technology Acceptance Model

The E-Learning Technology Acceptance Model (ETAM), renowned for its simplicity, adaptability, and predictive prowess, is a dominant model in the realm of technology acceptance. ETAM probes both individual and social-psychological factors affecting attitudes and utilisation of e-learning technology. As such, it proves to be a dependable research instrument for predicting technology adoption (Casey et al., 2021). Davis (1993) posits that the usage of technology is positively influenced by its perceived usefulness and perceived ease to use technology interface, both of which are mediated through attitudes towards technology utilization. The E-Learning Technology Acceptance Model (ETAM) was operationalized via a structured survey, consisting of multiple constructs such as perceived usefulness, attitudes towards technology usage, perceived ease of use, perceived e-learning outcomes, learning facility condition, and demographic information. Each construct was evaluated using a 5-point Likert scale, where a rating of 5 indicated strong agreement, while a rating of 1 indicated strong disagreement. The specific items employed in the survey were borrowed from the study conducted by Li and colleagues in (2019). The subsequent scales constitute the aspects related to attitudes toward the use of technology:

Attitude toward Technology Use (ATU)

In the realm of technology application, Venkatesh et al. (2003) define the attitude towards technology usage as the emotional response of students, signifying their level of positivity towards the employment of a specific technology. The students' attitude on the utilization of technology significantly influences their educational

outcomes and academic success. A positive attitude towards technology enhances individuals' willingness and likelihood to use technology effectively and leading to positive educational outcomes, while a negative attitude can result in under-utilization and potential adverse effects on perceived learning outcomes (Dick & Yagmur Akbulut, 2020; Teo et al., 2009; Wongwatkit et al., 2020).

Additionally, the attitude towards educational technology strongly correlates with the extent of satisfaction, amusement, fulfilment, and delight experienced during its use (El Bachari et al., 2011; S. Y. Park, 2009). According to Liang and Tsai (2008), advanced proficiency in internet usage can improve students' attitudes, search methodologies, and overall learning outcomes when engaging with online instruction. Hence, the present study proposes the subsequent hypothesis related to attitude:

Hypothesis 2: There is a significant positive difference for effect of Attitude toward technology use on perceived e-learning outcomes between Arabic and English medium school students.

Perceived Usefulness (PUF)

Arshad and Akram (2018), Davis (1989), and Li et al. (2019) have expounded on the concept of technology's perceived usefulness within e-learning. According to these researchers, this refers to the degree to which individuals' belief that their task or job performance will be enhanced by employing a specific system or technology. Additionally, they suggest that this adoption also contributes to alleviating cognitive stress. Research by Cheung and Vogel (2013), along with Nagy (2018), has demonstrated a notable positive correlation between the perceived usefulness and perceived ease of technological tools use and the attitudes towards these tools. These attitudes were found to have a considerable influence on students' behavioral intent to utilize the tools, as also supported by Gurer and Akkaya (2022), and Ibili et al. (2019). Despite this, students' attitude to use online forums as collaborative educational tools was influenced more by their perceived usefulness of the forums than by their ease of use (Camarero et al., 2012).

Concerning the correlations between the perceived usefulness and the constructivist learning approach, F. Huang et al. (2020) and Ertmer and Ottenbreit-Leftwich (2010) have suggested that learners who adhere to constructivist philosophies tend to use technology more proficiently in learning environments, as their beliefs about learning encourage active participation and readiness to integrate technology into education, compared to those with conventional learning beliefs. The key difference in the effectiveness of technology utilization appears to stem from the perception of traditional learners viewing technology merely as an alternative to standard knowledge dissemination channels such as instructors and textbooks. In contrast, Learners adopting constructivist beliefs tend to be more active in learning environments that encourage hands-on participation, interaction, and reflection. They effectively employ e-learning tools for information discovery and collaboration with peers and educators, fostering a richer, experiential learning process that facilitates knowledge investigation and sharing (Ertmer, 2005; Howard et al., 2000).

According to prior analysis, scholars posit that constructivist learning contexts might influence how students perceive the usefulness and ease to use of technology, shaping their attitudes towards it. Evidence from studies by Liu et al. (2017) and Limone et al. (2019) corroborates a positive relationship among constructivist beliefs held by individuals and their perception of technology's usefulness and ease of use:

Hypothesis 3 There is a significant positive difference for effect of Perceived Usefulness on Constructivist Learning Approach between Arabic and English medium school students.

Hypothesis 4: There is a significant positive difference for effect of Perceived Usefulness on Attitude towards Technology use between Arabic and English medium school students.

Perceived Ease to Use (PEU)

The term "Perceived ease of use" is an individual's assumption regarding the minimal physical or cognitive effort required to operate a specific system or technology, leading to lessened cognitive strain and simpler task execution (Davis, 1989; Sarwar et al., 2019). Most scholars agree that users' attitudes towards technology are significantly shaped by their perceived usefulness and ease of use, a sentiment echoed in the works of Davis (1989) and Gurer and Akkayas (2022).

The role of perceived ease of use in determining users' attitude towards mobile technology has been extensively studied by Teo et al. (2012) and E. Park et al. (2014). Their research highlights the importance of this factor in shaping individuals' attitudes towards mobile technology. Furthermore, studies such as Al-Rahmi and colleagues (2019) have shown that the perceived level of simplicity in using e-learning technology has noteworthy consequences for its acceptance and uptake. Building upon these findings, the present study proposes the following hypotheses to examine the role of perceived ease of technology use in the context of our research:

Hypothesis 5: There is a significant positive difference for effect of Perceived Ease to Use on Attitude towards Technology Use between Arabic and English medium school students.

Learning Facility (LFC)

Learning Facility is the concept of how an individual perceives environmental support in terms of encouraging and enabling technology adoption (S. Taylor & Todd, 1995). Li et al. (2019) along with Teo (2011) and Teo et al. (2018) posited that facilitating conditions conceptually involves not only the accessibility to technological resources but also the provision of technical and administrative support. It could be essential to offer skill training, facilitate the availability of pertinent information or resources, and extend administrative assistance to educators and students, with the aim of incorporating educational technologies into their pedagogical methodologies (Groves & Zemel, 2000).

Multiple scholarly works underscore the indispensable role of technical support in promoting technology adoption in educational settings (Y. Li et al., 2019; Williams, 2002) and enhancing user satisfaction (Mirani & King, 1994; Vanitha & Alathur, 2020). Furthermore, there is a considerable body of literature that highlights the direct influence of good facility conditions on elements like perceived ease of use (Abbad, 2012; Teo, Ursavas, & Bahcekapili, 2012), perceived usefulness (Y. Li et al., 2019; Sanchez-Prieto et al., 2016), as well as attitudes pertaining to computer utilization (Ngai et al., 2007; Teo, 2008; Teo, Ursavas, & Bahcekapili, 2012). Thus, the current research has proposed the following hypotheses related to the learning facility condition:

Hypothesis 6: There is a significant positive difference for effect of Learning Facility on Perceived usefulness between Arabic and English medium school students.

Hypothesis 7: There is a significant positive difference for effect of Learning Facility on Perceived Ease to Use between Arabic and English medium school students.

Perceived E-Learning Outcome (PLO)

Perceived E-learning outcomes encapsulate their discernments about the efficacy of the technology in fostering critical thinking and enhancing comprehension. Succinctly, it represents the potential benefits learners may derive from utilizing e-learning resources and tools to bolster their academic performance (Sultan et al., 2011; Wighting, 2011).

Data Collection (Sampling)

The study was quantitative in nature, employing specific methodologies to address distinct research inquiries through numerical descriptions of various phenomena. Data collection involved the use of a questionnaire. The accumulated data was then processed using Partial Least Squares Structural Equation Modelling (PLS-SEM) on the SmartPLS software. Meanwhile, the SPSS software was utilized for initial data screening and coding. The research was conducted within the Erbil Province, located in the Northern region of Iraq. The study involved the recruitment of participants using a technique known as stratified random sampling. Specifically, it aimed to include students in grades 8 through 12. A total of 936 students from both upper primary and secondary school levels were invited to participate in the research survey. This research sample included 780 students from English Medium schools and 156 students from Arabic Medium schools. A method of random selection was employed to choose the schools, and the data was gathered through a questionnaire that individuals completed on their own using paper forms. There was a fairly even gender

split across the sample, with 48.3% girls and 51.7% boys. A majority, about 78.53%, of students utilized a computer or laptop at home for internet access. Additionally, 16.02% can access to only internet by using their phone or tablet.

Table 1. Sociodemographic characteristics of participants

Characteristic	Total Sample	
	Number	Percentage
Gender		
Girls	452	48.3%
Boys	484	51.7%
Student Grade		
Grade Eight	212	22.64%
Grade Nine	234	25%
Grade Ten	274	29.27%
Grade Eleven	165	17.62%
Grade Twelve	51	5.49%

Adaptation of the Instrument

In this research, the elements were extracted from the E-Learning Technology Acceptance Model (ETAM) and the CLE, having secured the requisite permission from Dr. Peter Taylor. These elements were subsequently rendered in Arabic. To maintain the integrity of the meaning in the English, and Arabic renditions, a method of double back translation was utilized. The process incorporated three multilingual educators: the initial educator converted the English rendition to Arabic, the next educator, not familiar with the initial English text, translated it back to English from Arabic, while the final educator compared this English translation with the original to ensure consistency.

Procedure

Erbil-General Directorate of Education sanctioned data collection for the involved schools and universities prior to its commencement. Ethical approval was given to this research project by the Institutional Review Board of University of Szeged, post evaluation of the research questionnaires, authorizing the researchers to conduct data collection. Students at their corresponding schools received the surveys, and they were inquired to give insights on in person lessons and virtual learning, encompassing both academic and interpersonal exchanges with instructors and peers. Prior to obtaining parental approval, participants were briefed on the data collection procedures, questionnaire completion methods, and guaranteed anonymity. It was emphasized that they had the option to submit incomplete or blank responses without facing any coercion. At last, they received confirmation that their course-related personal data would not be utilized.

Data Analysis

In this study, data analysis was conducted using SmartPLS Version 3, following a two-step analytic approach. This manuscript is organized to initially validate the lower-order measurement framework, subsequently scrutinize the high-order measurement structure, and ultimately, to analysis research hypotheses, examining the differences in variable relationships in a conceptual model between Arabic and English medium school students. The approach of Partial Least Squares-Structural Equation Modeling (PLS-SEM) was employed to evaluate both the measurement and structural models. Additionally, to draw the comparison between these two groups, the researchers utilized Partial Least Squares Multigroup Analysis (PLS-MGA). The consistency of the variables was evaluated through the implementation of a Measurement Invariance of Composite

Models (MICOM) test, a method proposed by Henseler et al. (2016). The choice of PLS-SEM was based on the inclusion of a combination of reflective and reflective constructs in the model. The application of PLS-SEM is supported by various researchers who advocate for its use when dealing with models that encompass both reflective and reflective constructs (Sarstedt et al., 2019). Furthermore, PLS provides a more advantageous method than regression, as it evaluates the model in its entirety, incorporating its moderating impacts as a unified whole instead of breaking it down into separate pieces (Goodhue et al., 2012). This characteristic renders it aptly suited for the scrutiny of complex models (Hair et al., 2011).

Validating the First-Order Measurement Model

The reliability of the item in both Arabic and English school samples was assessed, along with analyses of convergent and discriminant validity, in order to closely examine the validity of the preliminary lower-order measurement model in the initial stage. Each first order construct exhibited a reflective characteristic. Ali et al. (2018) propose that convergent validity and reliability are ascertainable when loading, AVE, and CR values exceed 0.7 and 0.5 respectively. Contrastingly, Hair Jr et al. (2021) argue that surpassing the stated values for AVE and CR allows for a loading range of 0.5 to 0.7, which is considered acceptable. Each first-order construct in this study exhibited reflective characteristics, consistent with theoretical and empirical precedents in construct measurement. As highlighted by Ali et al. (2018), these indicators provide reliable benchmarks for assessing convergent validity and reliability. Specifically, Factor loadings greater than 0.7 indicate a strong relationship between the observed variables and their associated constructs, demonstrating that the indicators reliably reflect the underlying constructs (Bolt et al., 2016).

An AVE value exceeding 0.5 suggests that the construct accounts for more variance from its indicators than is attributed to measurement error, meeting an essential criterion for convergent validity (G. W. Cheung et al., 2024). Furthermore, a CR value surpassing 0.7 reflects strong internal consistency among the indicators, reinforcing the construct's reliability. By adhering to these established thresholds, the methodology employed in this study conforms to best practices in structural equation modeling, ensuring the credibility and rigor of the findings. These benchmarks not only enable meaningful comparisons with prior research but also solidify the theoretical and empirical foundations of the constructs, thereby enhancing the overall validity of the study (G. W. Cheung et al., 2024).

As depicted in the table (2), all item loadings exceeded the 0.5 threshold. Due to the reliability issues caused by inadequate loadings, the researchers omitted specific items from both the Arabic and English datasets. Additionally, Fornell and Larcker (1981) emphasized that every Cronbach alpha exceeded the 0.7 benchmark for factor reliability. Table (4) displays the internal reliability of the study, established through Cronbach's Alpha. All constructs within the Arabic and English samples achieved alpha values above the accepted 0.7 threshold, barring three exceptions. For the Arabic sample, "uncertainty" (0.554), "negotiation" (0.679), and "critical voice" (0.699) fell below this value. Similarly, in the English sample, "uncertainty" (0.530), "critical voice" (0.602), and "learning facility" (0.689) also did not meet the threshold. Nonetheless, based on Taber's standards (Taber, 2018), these figures may be deemed satisfactory. The tolerable span for Cronbach's Alpha value lies between 0.45-0.96. It is also noteworthy that in certain cross-cultural investigations, such as those conducted by Aldridge et al. (2000) and Anagun and Anilan (2010), the reliability and validity of the constructivist learning environment surveys for students were confirmed. However, several of the original thirty items were discarded due to their minimal factor values, attributed to differences in cultural and teaching practices as revealed in the data analysis. Attaining semantic equivalence across all survey questions may not always be possible, considering the utilization of translated surveys in vastly different cultural settings (Uk, 2001).

In an academic context, the studies carried out by Johnson et al. (2004), Aldridge, Fraser, and Sebela, (2004) and Kim, Fisher, and Fraser (1999) yielded relatively analogous findings, with Uncertainty's Cronbach's Alpha recording values of 0.61, 0.64, and 0.64 respectively. The recurring low alpha values can be attributed to the use of individuals instead of classroom as the analysis unit. This highlights a capability for the scale of classroom environment survey to effectively distinguish difference in learner perceptions within varied classroom settings. Essentially, a similar perception should be observed among learners within the same classroom, while it should be apparent that the average perceptions vary significantly among different classes.

The instrument's reliability used in both study groups is confirmed by the outcomes that presented in Table (4). However, The results presented in Table 3 indicate that the items deleted from the research model for both Arabic and English samples had factor loadings that exceeded the 0.5 threshold. However, there were some notable exceptions. For the Arabic sample, the Uncertainty construct (UCT3) had a factor loading of 0.423, which was below the threshold. Similarly, for the English sample, UCT3 had a factor loading of 0.492, also below 0.5. For the Attitude toward Technology construct, the English sample exhibited factor loadings below the threshold for ATU3 (0.420) and ATU6 (0.421). Additionally, ATU5 fell below the threshold for both samples, with a loading of 0.486 for Arabic and 0.467 for English. Furthermore, the Learning Facility construct (LFC3) had a factor loading of 0.677 for the English sample, which, while higher than 0.5, was still relatively low compared to its counterpart in the Arabic sample (0.883). These low factor loadings contributed to low Average Variance Extracted (AVE) values for the associated constructs, ultimately raising concerns about convergent validity in the research model for both Arabic and English medium schools. Should it be possible to improve the composite reliability and (AVE) Average Variance Extracted by eliminating outer loadings within the range of 0.4 to 0.7, such action should be taken to ensure these outer loadings exceed 0.7 (Hair Jr. et al., 2021).

The instrument's reliability, as reflected in the outcomes presented in Table 2, was confirmed for both study groups. However, low AVE values for certain constructs pointed to issues of convergent validity. For the Arabic classrooms sample, the AVE values for Attitude toward Technology (0.427), and Uncertainty (0.410) were below the acceptable threshold of 0.5. Similarly, for the English classrooms sample, the AVE values for Attitude toward Technology (0.390), Uncertainty (0.439), Critical Voice (0.475), and Learning Facility (0.483) were also insufficient to establish convergent validity.

Table 2. Results: Assessment of Reflective Measurement model After Deletion of Items

Constructs	Items	Loadings		Constructs	Items	Loadings	
		Arabic	English			Arabic	English
Relevancy	RLV1	0.663	0.807	Perceived Usefulness	PUF1	0.796	0.784
	RLV2	0.713	0.702		PUF2	0.640	0.670
	RLV3	0.812	0.702		PUF3	0.789	0.752
	RLV4	0.745	0.715		PUF4	0.780	0.747
Uncertainty	UCT1	0.743	0.833		PUF5	0.632	0.745
	UCT2	0.812	0.767	Perceived Ease to Use	PEU1	0.858	0.809
	UCT4	0.611	0.540		PEU2	0.765	0.750
Critical Voice	CTV2	0.766	0.736		PEU3	0.858	0.633
	CTV3	0.822	0.784	Learning Facility	PEU4	0.798	0.787
	CTV4	0.778	0.717		PEU5	0.768	0.775
	SCT1	0.756	0.803		LFC1	0.954	0.667
Shared Control	SCT2	0.797	0.847		LFC2	0.923	0.743
	SCT3	0.890	0.806		LFC4	0.834	0.621
	SCT4	0.849	0.600		LFC5	0.750	0.815
Negotiation	NGO1	0.709	0.749	Perceived E-Learning Outcomes	PLO1	0.774	0.842
	NGO2	0.823	0.788		PLO2	0.817	0.880
	NGO3	0.723	0.78W5		PLO3	0.738	0.728
	NGO4	0.591	0.660		PLO4	0.839	0.829
Attitude toward Technology	ATU1	0.767	0.801				
	ATU2	0.847	0.843				
	ATU4	0.808	0.764				

Table 3. Items Deleted for Both Samples (Arabic Medium Schools and English Medium Schools)

Constructs	Items	Factor Loading	
		Arabic	English
Uncertainty	UCT3	0.423	0.492
Critical Voice	CTV1	0.746	0.551
Attitude toward Technology	ATU3	0.484	0.420
	ATU5	0.486	0.467
	ATU6	0.573	0.421
Learning Facility	LFC3	0.883	0.677

Table 4. Result of Cronbach's Alpha for Arabic and English Classroom Samples Before and After Deletion of Items

Constructs	Cronbach's Alpha Before Items Deletion		Cronbach's Alpha After Items Deletion	
	Arabic Classroom Sample	English Classroom Sample	Arabic Classroom Sample	English Classroom Sample
Attitude towards Technology Use	0.726	0.680	0.733	0.724
Critical Voice	0.724	0.637	0.699	0.602
Learning Facility	0.891	0.742	0.925	0.689
Negotiation	0.679	0.735	0.679	0.735
Perceived e-learning outcomes	0.802	0.836	0.802	0.836
Relevancy	0.717	0.713	0.717	0.713
Shared Control	0.851	0.766	0.851	0.766
Uncertainty	0.489	0.571	0.554	0.530
Perceived Usefulness	0.822	0.829	0.822	0.829
Perceived Ease to Use	0.869	0.809	0.869	0.809

Table 5. Results of AVE Before and After Deletion of Items in the Research Model for Both Samples (Arabic and English Medium Schools)

Constructs	AVE Results Before Items Deletion		AVE Results After Items Deletion	
	Arabic Sample	English Sample	Arabic Sample	English Sample
Attitude towards Technology Use	0.427	0.390	0.653	0.645
Critical Voice	0.544	0.475	0.623	0.557
Learning Facility	0.566	0.483	0.755	0.504
Negotiation	0.513	0.559	0.513	0.559
Perceived e-learning outcomes	0.629	0.673	0.629	0.673
Relevancy	0.540	0.537	0.540	0.537
Shared Control	0.680	0.593	0.680	0.593
Uncertainty	0.410	0.439	0.528	0.525
Perceived Usefulness	0.531	0.539	0.531	0.539
Perceived Ease to Use	0.657	0.568	0.657	0.568

Table 6. Results of Composite Reliability (CR) Before and After Deletion of Items in the Research Model for Both Samples (Arabic and English Medium Schools)

Constructs	CR Results Before Items Deletion		CR Results After Items Deletion	
	Arabic Sample	English Sample	Arabic Sample	English Sample
Attitude towards Technology Use	0.811	0.781	0.849	0.845
Critical Voice	0.827	0.781	0.832	0.790
Learning Facility	0.866	0.823	0.924	0.801
Negotiation	0.806	0.834	0.806	0.834
Perceived e-learning outcomes	0.871	0.891	0.871	0.891
Relevancy	0.824	0.822	0.824	0.822
Shared Control	0.894	0.852	0.894	0.852
Uncertainty	0.724	0.750	0.768	0.763
Perceived Usefulness	0.871	0.875	0.871	0.875
Perceived Ease to Use	0.905	0.867	0.905	0.867

The removal of specific items with low factor loadings significantly improved the AVE values for these constructs, as detailed in Table 5. For the Attitude toward Technology construct, removing items ATU3, ATU5, and ATU6 increased the AVE to 0.653 for Arabic classrooms and 0.645 for English classrooms. Similarly, eliminating CTV1 from the Critical Voice construct raised the AVE to 0.623 for Arabic classrooms and 0.557 for English classrooms. For the Learning Facility construct, the removal of LFC3 resulted in AVE values of 0.755 for Arabic classrooms and 0.513 for English classrooms. Lastly, deleting UCT3 from the Uncertainty construct improved the AVE to 0.528 for Arabic classrooms and 0.525 for English classrooms.

This improvement aligns with recommendations in the literature (Hair Jr. et al., 2021) to remove items with factor loadings between 0.4 and 0.7 to enhance composite reliability and AVE. By selectively removing items with low outer loadings, the constructs were able to achieve acceptable AVE values, thereby addressing the issue of convergent validity. These results highlight the importance of refining measurement scales by eliminating problematic items to ensure the reliability and validity of the research model.

Ultimately, the deletion of the six problematic items identified in Table 3 led to substantial improvements in AVE values across constructs in both Arabic and English classroom contexts, as shown in Table 5. These adjustments successfully resolved the issues of convergent validity in the research model, providing a robust foundation for further analysis and interpretation.

Table 7. Result of Discriminant validity assessment for first order constructs (Arabic classrooms)

Constructs	ATU	CTV	LFC	NGO	PEU	PLO	PUF	RLV	SCT	UCT
Attitude toward Technology	0.808									
Critical Voice	0.053	0.789								
Learning Facility Conditions	0.156	0.203	0.869							
Negotiation	0.320	0.432	0.103	0.716						
Perceived Ease of Use	0.507	0.049	0.074	0.106	0.811					
Perceived e-learning Outcomes	0.567	0.250	0.091	0.340	0.342	0.793				
Perceived Usefulness	0.786	-0.033	0.052	0.225	0.536	0.500	0.729			
Personal Relevancy	0.252	0.464	0.022	0.555	0.171	0.354	0.232	0.735		
Shared Control	0.133	0.611	0.109	0.426	0.024	0.247	0.094	0.455	0.825	
Uncertainty	0.249	0.390	-0.032	0.448	0.117	0.290	0.185	0.478	0.426	0.727

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

Table 8. Result of Discriminant validity assessment for first order constructs (English classrooms)

Constructs	ATU	CTV	LFC	NGO	PEU	PLO	PUF	RLV	SCT	UCT
Attitude toward Technology	0.803									
Critical Voice	0.182	0.746								
Learning Facility Conditions	0.191	0.303	0.710							
Negotiation	0.161	0.411	0.240	0.747						
Perceived Ease of Use	0.558	0.179	0.218	0.210	0.754					
Perceived e-learning Outcomes	0.378	0.325	0.343	0.348	0.283	0.820				
Perceived Usefulness	0.701	0.140	0.243	0.182	0.554	0.420	0.734			
Personal Relevancy	0.229	0.469	0.313	0.342	0.308	0.351	0.289	0.733		
Shared Control	0.097	0.355	0.308	0.396	0.111	0.332	0.101	0.316	0.770	
Uncertainty	0.225	0.418	0.299	0.323	0.220	0.327	0.224	0.479	0.283	0.724

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

During the examination of the measurement model, convergent validity was assessed, focusing on the relationships among constructs. This analysis was undertaken using methods such as composite reliability, factor loadings, and average variance extracted, as emphasized by Hair Jr et al. (2021). Notably, every variable in the samples from both the Arabic and English classrooms exceeded the baseline average variance extracted (AVE) value of 0.5. Additionally, composite reliability of the model score surpassed the recommended 0.7 benchmark, registering values from 0.768 to 0.946 for the Arabic cohort and 0.763 to 0.891 for the English cohort. This clearly demonstrates the attainment of convergent validity, as detailed in Tables 7 and 8. To facilitate the discriminant analysis, the heterotrait-monotrait (HTMT) correlation ratio was employed. The originally proposed structural orientations were validated through the HTMT analysis outcomes. According to Henseler et al. (2015), discriminant validity is achieved when the HTMT value between two constructs is less than 0.9. Consequently, all primary factors in both Arabic and English classroom samples verified discriminant validity, as all recorded values were below 0.9, as shown in the tables 7 and 8.

Validating the Higher-Order Measurement Model

Before evaluating the structural framework, the analytical model of a Constructivist Learning Approach was analysed as a higher-order reflective construct, utilizing a two-stage approach that incorporated the use of the extended repeated indicators technique. During the analysis of the measurement model of a reflective higher-order construct, it is essential to confirm three central criteria: 1) Discriminant validity; 2) Item reliability; and 3) Convergent validity (Hair Jr. et al., 2021).

The assessment of the reliability and validity of the high-order Constructivist Learning Approach construct is based on its connection to its sub-components. Thus, the interrelationship between the Constructivist Learning Approach and its sub-components involves five constructs: Uncertainty, Personal Relevance, Shared Control, Critical Voice, and Student Negotiation. In the path model, what are viewed as loadings are actually path coefficients. The analysis reveals that loadings for the Arabic classroom sample are as follows: Critical Voice (0.709), Negotiation (0.811), Relevancy (0.818), Shared Control (0.719), and Uncertainty (0.746). In contrast, the English classroom sample exhibits loadings of Critical Voice (0.739), Negotiation (0.694), Relevancy (0.762), Shared Control (0.632), and Uncertainty (0.718). These findings affirm the reliability of the indicators for both sample sets. Additionally, the internal consistency for the CLA construct was determined through Cronbach's Alpha, yielding results of (0.825) for the Arabic sample and (0.754) for the English sample. These values surpass the recommended 0.700 cut-off for factor reliability (Fornell & Larcker, 1981).

Table 9. Result of Cronbach's Alpha After Establishing Second Order Construct

Constructs	Cronbach's Alpha	
	Arabic Classroom Sample	English Classroom Sample
Attitude towards Technology Use	0.733	0.724
Learning Facility	0.925	0.689
Perceived e-learning outcomes	0.802	0.836
Constructivist learning Approach	0.825	0.754
Perceived Usefulness	0.822	0.829
Perceived Ease to Use	0.869	0.809

Table 10. Result of Factor Loading for Second Order Construct

Constructivist Learning Approach	Factor Loading	
	Arabic Classroom Sample	English Classroom Sample
Critical Voice	0.709	0.739
Negotiation	0.811	0.694
Relevancy	0.818	0.762
Shared Control	0.719	0.632
Uncertainty	0.746	0.718

Table 11. Result: Discriminant validity assessment for Second order constructs (Arabic classrooms)

Constructs	CR	AVE	ATU	LFC	PLO	CLA	PUF	PEU
ATU	0.849	0.653	0.808					
LFC	0.924	0.755	0.156	0.869				
PLO	0.871	0.629	0.567	0.091	0.793			
CLA	0.873	0.580	0.277	0.109	0.384	0.762		
PUF	0.870	0.531	0.787	0.053	0.501	0.196	0.728	
PEU	0.905	0.657	0.507	0.074	0.342	0.120	0.536	0.811

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

Table 12. Result of Discriminant validity assessment for Second order constructs (English classrooms)

Constructs	CR	AVE	ATU	LFC	PLO	CLA	PUF	PEU
ATU	0.845	0.645	0.803					
LFC	0.801	0.504	0.191	0.710				
PLO	0.891	0.672	0.379	0.343	0.820			
CLA	0.835	0.505	0.257	0.411	0.473	0.710		
PUF	0.875	0.539	0.701	0.244	0.422	0.276	0.734	
PEU	0.867	0.568	0.558	0.218	0.283	0.298	0.556	0.754

Note: Square roots of average variance extracted (AVE) shown on the diagonal in bold.

Tables (11) and (12) underscore the consistency of the six constructs within Arabic and English samples, as determined by assessing composite reliability and average variance extracted. All six constructs exhibited sufficient credibility, with composite reliability ranging between 0.870 to 0.924 and 0.801 to 0.891 for Arabic

and English samples respectively. Specifically, the composite reliability of the CLA construct exceeded the 0.700 threshold, posting 0.873 for Arabic and 0.835 for English samples. Furthermore, the average variance extracted from the CLA construct stood at 0.580 and 0.505 for Arabic and English samples respectively, surpassing the recommended 5.0 mark as reported by Hair Jr, Hult, Ringle, and Sarstedt (2021). Thus, the measurement items' internal consistency is deemed satisfactory for both Arabic and English samples.

Tables (11) and (12) confirm discriminant validity in both the Arabic and English samples, as demonstrated by the Average Variance Extracted (AVE) values of the reflective second-order constructs, which are significantly higher than the highest squared correlation with any other latent variable. This suggests that the constructs are distinct, reinforcing discriminant validity. Thus, we can assertively affirm discriminant validity for both Arabic and English measurement models.

TESTING THE STRUCTURAL MODEL

Multi-Group Analysis

Ultimately, the study's research hypotheses were thoroughly examined through a Partial Least Squares Multigroup Analysis (PLS-MGA). These hypotheses investigated potential differences between Arabic and English school students regarding the proposed relationships. Henseler, Ringle, and Sarstedt (2016), along with Hair et al. (2016), underscore the importance of validating measurement invariance before conducting a multi-group analysis (MGA) involving two or more groups in structural equation modeling (SEM). Nevertheless, when utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM), a composite-based analysis approach, the use of the measurement invariance of composites (MICOM) becomes more pertinent. Given this study's intent to compare a model across two groups using PLS-SEM, the implementation of MICOM has been chosen. Accordingly, prior to conducting the PLS-MGA, the authors undertook a preliminary stage to verify the measurement invariance of the variables. This was done using a Measurement Invariance of Composite Models (MICOM) test (Henseler et al., 2016), which ensured the validity of the measurement scales across both language groups. This important step laid the foundation for the subsequent analysis and interpretation of the findings.

The coefficient of determination (R^2) value was investigated in accordance with Cohen (2013), and the R^2 of endogenous can be evaluated as weak =0.02, moderate =0.13, and substantial =0.26. The results of the variance analysis (Table 13) indicated that the research model was able to explain approximately 37.7% of the variance in Perceived E-learning Outcomes for the Arabic sample, and 29.5% for the English sample which the values for both samples are substantial. Moreover, Perceived Usefulness and Ease of Use accounted for 64.1% of the variance in Attitude Towards Technology Use in the Arabic sample, and 53.3% in the English sample which the values for both samples are also substantial. However, Perceived Usefulness had a minor impact on the constructivist learning Approach, explaining only 3.8% of its variance for the Arabic sample and 7.6% for the English sample. Similarly, the learning facility had a minimal effect on Perceived Usefulness and Ease of Use, accounting for only 0.3% of the variance in Perceived Usefulness and 0.5% of the variance in Perceived Ease to Use for the Arabic sample. In the English sample, the learning facility's impact on Perceived Usefulness and Ease of Use was also marginal, explaining only 5.9% of the variance in Perceived Usefulness and 4.8% of the variance in Ease of Use.

Table 13. Result of Variance explained.

Constructs	R2	
	Arabic Classroom Sample	English Classroom Sample
Attitude towards Technology Use	0.641	0.533
Perceived e-learning outcomes	0.377	0.295
Constructivist learning Approach	0.038	0.076
Perceived Usefulness	0.003	0.059
Perceived Ease to Use	0.005	0.048

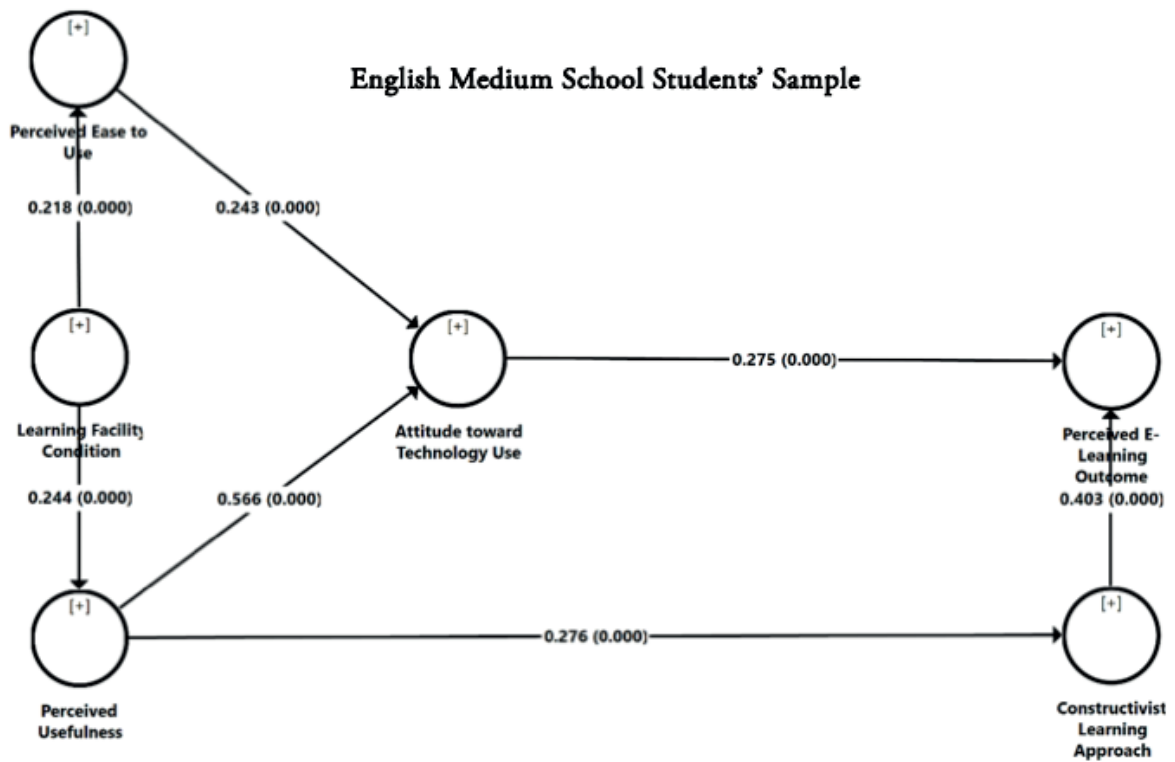
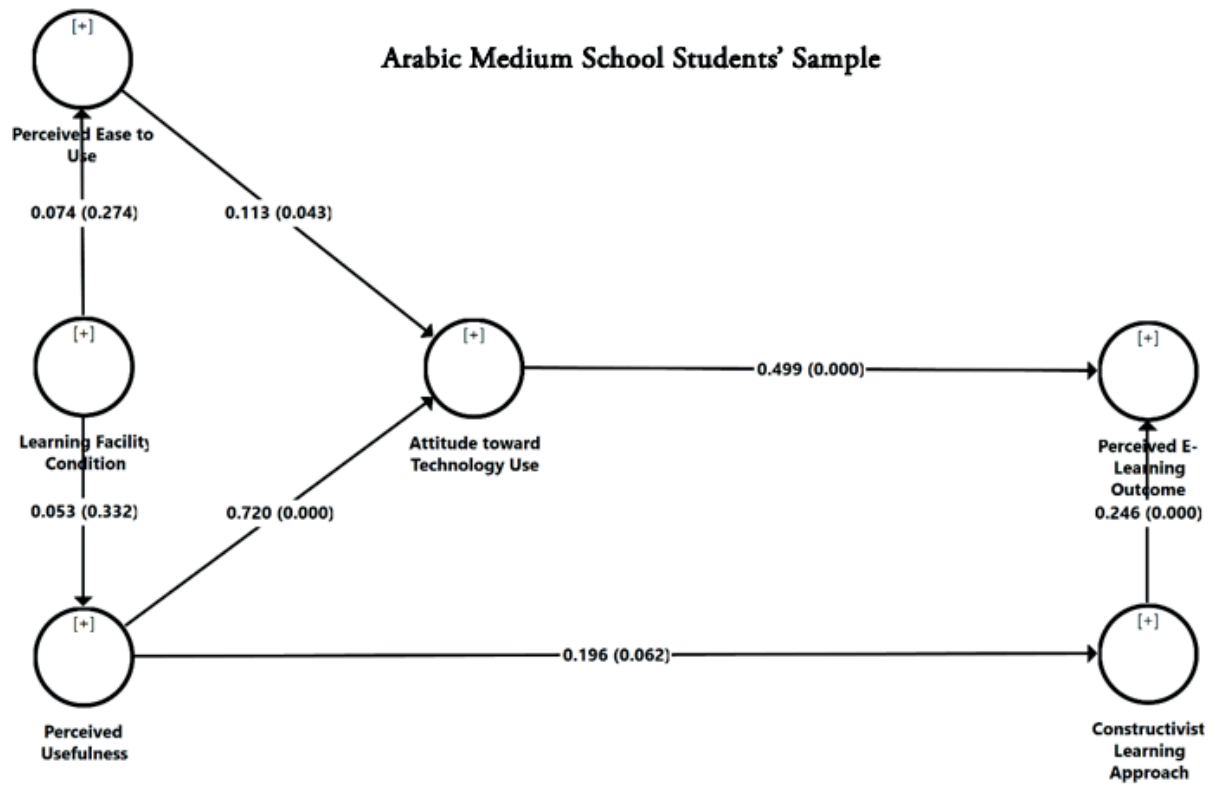


Figure 2: Results of Analysis for Arabic and English School Students

Table 14. Results of invariance measurement testing using permutation (MICOM).

Constructs	Configural invariance	Compositional invariance (Correlation = 1)		Partial measurement invariance established	Equal mean assessment			Equal variance assessment		Full measurement invariance established
		C=1	Confidence Interval (CIs)		Differences (Arabic – English)	Confidence Interval (CIs)	Differences (Arabic – English)	Confidence Interval (CIs)		
ATU	Yes	0.999	[0.997, 1]	Yes	0.068	[-0.141, 0.139]	Yes	-0.032	[-0.285, 0.231]	Yes
LFC	Yes	0.869	[0.787, 1]	Yes	-0.728	[-0.147, 0.126]	No	0.878	[-0.173, 0.147]	No
PLO	Yes	0.999	[0.996, 1]	Yes	0.259	[-0.137, 0.140]	No	-0.029	[-0.205, 0.165]	No
CLA	Yes	0.996	[0.987, 1]	Yes	0.183	[-0.141, 0.133]	No	0.333	[-0.254, 0.248]	No
PUF	Yes	0.999	[0.997, 1]	Yes	-0.095	[-0.141, 0.135]	Yes	0.004	[-0.280, 0.234]	Yes
PEU	Yes	0.998	[0.995, 1]	Yes	-0.023	[-0.152, 0.132]	Yes	0.229	[-0.285, 0.254]	Yes

Table 15. Results of hypothesis testing.

Hypothesis	Relationships	Path Coefficient		Confidence Interval (95%) Bias Corrected		Path Coefficient Difference	P-value Difference		Supported
		Arabic	English	Arabic	English		Henseler's MGA	Permutation test	
H1	CLA → PLO	0.246	0.403	[0.140, 0.372]	[0.346, 0.461]	-0.157	0.026*	0.026*	Yes / Yes
H2	ATU → PLO	0.499	0.275	[0.376, 0.615]	[0.221, 0.328]	0.224	0.002**	0.006**	Yes / Yes
H3	PUF → CLA	0.196	0.276	[-0.034, 0.382]	[0.198, 0.352]	-0.080	0.286	0.242	No / No
H4	PUF → ATU	0.720	0.566	[0.585, 0.813]	[0.513, 0.619]	0.154	0.030*	0.016*	Yes / Yes
H5	PEU → ATU	0.113	0.243	[0.026, 0.245]	[0.186, 0.303]	-0.130	0.053	0.059	No / No
H6	LFC → PUF	0.053	0.244	[-0.201, 0.195]	[0.182, 0.313]	-0.191	0.040*	0.014*	Yes / Yes
H7	LFC → PEU	0.074	0.218	[-0.204, 0.209]	[0.158, 0.287]	-0.144	0.101	0.048*	No / Yes

Note: In Henseler's MGA approach, a p value lower than 0.05 or greater than 0.95 shows 5% level significant differences across two groups

RESULT AND DISCUSSION

This study aimed to explore how differences in the language of instruction—Arabic or English—may influence students' acceptance of technology and e-learning outcomes in Iraq. Participants were selected from two distinct educational systems (Arabic and English) to examine potential differences in their responses to e-learning technology. Using Partial Least Squares-Multi Group Analysis (PLS-MGA), statistically significant differences were identified between the two groups (as indicated in Table 15). The analysis revealed significant differences in five out of seven pathways associated with the e-learning technology acceptance model. Two exceptions were the correlation between perceived usefulness and the constructivist learning approach ($PUF \rightarrow CLA$) and the relationship between perceived ease of use and attitude towards technology use ($PEU \rightarrow ATU$). Path coefficient scores were generally higher in the English group compared to the Arabic group, except for the influence of attitude towards technology use on perceived e-learning outcomes ($ATU \rightarrow PLO$) and perceived usefulness on attitude towards technology use ($PUF \rightarrow ATU$), where the Arabic classroom sample scored higher.

The Figure 2 and Table 15 illustrate that the proposed paths for both samples, such as the relationship between Constructivist Learning Approach and perceived e-learning outcomes ($CLA \rightarrow PLO$), attitude towards technology use and perceived e-learning outcomes ($ATU \rightarrow PLO$), perceived usefulness and attitude towards technology use ($PUF \rightarrow ATU$), and perceived ease of use and attitude towards technology use ($PEU \rightarrow ATU$), were statistically significant in both the Arabic and English samples. However, the relationship between perceived usefulness and Constructivist Learning Approach ($PUF \rightarrow CLA$), learning facility and perceived usefulness ($LFC \rightarrow PUF$), and learning facility and perceived ease of use ($LFC \rightarrow PEU$), were only statistically significant in the English sample. Subsequent sections will reveal the results of hypothesis-related comparisons between Arabic and English school students, based on standardized measures, will be discussed:

Constructivist Learning Approach and Perceived E-Learning Outcomes

To address research hypothesis (1), the results of the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed differences in the CLA and PLO relationship between Arabic and English students. Specifically, the coefficient of the CLA and PLO relationship for the English group ($\beta = 0.402$, $t = 11.670$, $p = 0.00$) is significantly higher than that for the Arabic group ($\beta = 0.246$, $t = 3.446$, $p = 0.00$). The explanation for this difference may be that students within the context of English Medium Instruction are tasked with acquiring content knowledge while simultaneously honing their English language skills. This process requires effective comprehension of the subject matter and concurrent development of English proficiency (Han, 2023). Consequently, this imposes a greater cognitive and study load on students in the English group. Research in European higher education suggests that the design of English Medium Instruction courses can be improved through student-centred learning. This learning approach encourages student autonomy in determining both the content and methods of their learning. It also offers students the opportunity to practice the English language freely with their peers during group work, fostering enjoyment in their studies and promoting independent knowledge acquisition (R. Wilkinson, 2013). Doan (2021), along with Jiang and Zhang (2017), have revealed that the inverse relationship holds true. Their research suggests that a focus on English Medium Instruction can promote students' self-directed learning, as seen in methods like team-teaching and process-oriented writing exercises. When students take on more responsibility for managing their language learning through content delivery, it proves beneficial for both the understanding of content and language skills. Therefore, the application of English Medium Instruction can enhance constructivist learning at the university level.

In a practical example that illustrates the relationship between English medium instruction and the constructivist learning approach, Mirizon et al. (2019) found through interviews with science teachers in an English medium instruction setting that she employs a unique teaching approach for Biology, specifically for the topic of Animal Structure. She uses Information and Communication Technology (ICT) as a support tool for her instruction in Biology education. She divides her students into teams for group discussions that culminate in presentations. The students use ICT to search for educational resources, acquire animations from the internet, create slide presentations, and take turns in delivering these presentations. The use of ICT becomes particularly valuable when the lessons are taught in English, given the considerably larger availability of online resources in English than in Bahasa (Mirizon et al., 2019).

Attitude towards Technology Use and Perceived E-Learning Outcomes

To address research hypothesis (2), the results from the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed differences in the relationship between ATU and PLO among Arabic and English students. Specifically, the coefficient of the ATU and PLO relationship for the Arabic group ($\beta = 0.499$, $t = 6.940$, $p = 0.00$) is significantly higher than that for the English group ($\beta = 0.275$, $t = 8.605$, $p = 0.00$). The difference in academic performance between upper primary and secondary school students studying in English medium instruction and their counterparts using Arabic medium instruction can be attributed to the level of language proficiency. Students studying natural sciences and social studies in English are still in the process of developing a certain level of proficiency, particularly those who study in English medium schools and for whom English is not their native language (Han, 2023).

Moreover, students receiving English medium instruction face a high cognitive load due to the complexity of topics that require abstract thinking, which heavily depends on their knowledge of the target language (Lee, 2023; Mirizon et al., 2019; Zhang, 2018). Non-native language learners, especially those with limited language skills, experience cognitive overload when processing new content and a foreign language simultaneously (Min et al., 2019). Consequently, a low proficiency level in English among non-native students can result in disadvantages to their academic performance across various educational levels, from school through to college and university (Abdeljaoued, 2023; Ghenghesh, 2015).

Researchers have explored the effects of English language proficiency on students' academic performance, particularly in Arab contexts. Inadequate mastery of listening, speaking, reading, and writing skills has been identified as a hindrance to the progress of Arab students at the university level (Suleiman, 1983). Similar findings in Oman indicate that the lack of English proficiency impacts the performance of engineering students (Sivaraman et al., 2014). Moreover, a positive relationship between English language performance and GPA has been observed in two tertiary education institutions in Oman (Roche & Harrington, 2013). Denman et al. (2019) highlight significant challenges faced by students studying their subject content in English, including limited understanding of course content and communication difficulties with family members regarding help with their studies. These challenges can be mitigated through instruction in the students' mother tongue, leading to increased linguistic comfort and improved perceived learning outcomes.

Perceived Usefulness and Constructivist Learning Approach

To address research hypothesis (3), the results of the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed no significant differences in the PUF and CLA relationship between Arabic and English students. Despite the coefficient of the PUF and CLA relationship for the English group ($\beta = 0.276$, $t = 5.932$, $p = 0.00$) is slightly higher than that of the Arabic group ($\beta = 0.196$, $t = 1.539$, $p = 0.062$). The slight differences between the English and Arabic groups could be attributed to the fact that the perceived usefulness of technology largely depends on the language barriers and capabilities, and the quality of information (Alassafi, 2022; Alsabawy et al., 2016; Ngo et al., 2016).

The role of language as an instrument of culture in global online education is underscored by the research of Al-Huwail et al. (2007). Confirming this position, the investigation by Ngo et al. (2016) revealed an interaction between students' language capability and their views on the perceived usefulness and ease of use of e-learning technology, particularly in a Vietnamese context. Citing a language barrier example, Vu et al. (2011) expressed concerns that the inadequacy of Vietnamese-language software hampers the exploitation of the Internet for educational purposes. Edmundson (2007) further noted that individuals who do not speak English might feel excluded from the benefits of technology if they cannot understand the content. Even among those who speak or understand English, its use is often confined to certain contexts, such as email and entertainment. All these findings and hypotheses support the notion that English medium school students who are studying in English are more able to leverage the usefulness of technology compared to their counterparts studying in Arabic.

Further, research conducted by Roca et al. (2006) demonstrated that the quality of information was a significant determinant of user satisfaction. This, in turn, directly influenced users' ongoing intention to continue utilizing e-learning platforms. Knowledge, information quality, and technology fit are the primary

elements influencing students' perceived ease of use and usefulness of technology (Allassafi, 2022; Younas et al., 2021). The lack of educational values in Arabic e-learning resources can be seen in the study conducted in Saudi Arabia by Al-shehri (2012), who discovered that a significant obstacle within the domain of e-learning pertains to the insufficiency of cultural adaptation for content and a lack of educational values. This has been substantiated by an empirical study carried out at King Khalid University, which revealed an interference between educational and non-educational learning materials on social media platforms.

Perceived Usefulness and Attitude towards Technology Use

To address research hypothesis (4), the results of the Permutation and Henseler's MGA tests, as illustrated in Table 15, showed significant differences in the PUF and ATU relationship between Arabic and English students. The coefficient of the PUF and ATU relationship for the Arabic group ($\beta = 0.720$, $t = 10.455$, $p = 0.00$) is higher than that of the English group ($\beta = 0.566$, $t = 17.358$, $p = 0.00$). The differences between Arabic and English groups may be attributed to the fact that quality English-medium education is predominantly monopolized by elite families from high socioeconomic backgrounds in society (Manan et al., 2015). Li and Qiu (2018) found that the educational background of parents and per capita income of the family are both positively correlated with the quality of children's school attendance and their participation in tutorial classes. The researchers also noted that urban children have a higher probability of attending superior quality schools, enrolling in extracurricular tutorial classes, and accessing technology and internet connectivity. However, disadvantaged children typically do not gain as much benefit from using computers, including those in their own homes (Du et al., 2004; Pohlmann, 1956). Accordingly, the impact of perceived usefulness on attitudes towards technology use may have been stronger for Arabic-speaking groups than for students studying in English. This could be because English learners often come from a more socio-economically advantaged background and have a stronger presence of modern technology in their family culture. For students who are studying in English, it may be more challenging to make lessons with Information and Communication Technology (ICT) tools appealing, given their already significant exposure to technology in both the home and school environment (Z. Li & Qiu, 2018). Despite students from higher socioeconomic backgrounds demonstrated superior ICT literacy skills (Scherer & Siddiq, 2019).

Perceived Ease to Use and Attitude towards Technology Use

In addressing research hypothesis (5), the results from the Permutation and Henseler's MGA tests, as illustrated in Table 15, revealed no significant differences in the PEU and ATU relationship between Arabic and English students. Despite this, the coefficient of the PEU and ATU relationship for the English group ($\beta = 0.243$, $t = 6.898$, $p = 0.00$) was slightly higher than for the Arabic group ($\beta = 0.113$, $t = 1.719$, $p = 0.043$). Despite the fact that language capability has a substantial direct impact on Perceived Ease of Use, and an indirect influence on Attitude towards Technology Use through the mediation of Perceived Ease of Use (Ngo et al., 2016), the impact of perceived ease of use on attitudes towards technology use is more pronounced among English-speaking groups than the Arabic group. This could be attributed to the prevalent use of English-language terminology in technology, coupled with the availability of a broader range of resources and educational materials in English (Alkharang & Ghinea, 2013; Statista, 2023). Hence, the availability of resources in English can positively impact their perceived ease of use by offering more comprehensive and diverse information on technology. However, the lack of software in the mother tongue language affects the use of the internet in educational applications for students who are studying in their native language, as exemplified in the Vietnamese context (Vu et al., 2011) as well as in Palestine where a significant percentage of both students and teachers reported being perplexed by English ICT terminology, expressing a preference for Arabic (Shraim & Khlaif, 2010).

Learning Facility Condition

Perceived Usefulness and Perceived Ease to Use Technology. In addressing research hypotheses (6) and (7), the results from the Permutation and Henseler's MGA tests, as illustrated in Table 15, revealed significant differences in the LFC and PUF relationship between Arabic and English students. The coefficient of the LFC and PUF relationship for the English group ($\beta = 0.244$, $t = 6.067$, $p = 0.00$) was higher than that for the Arabic group ($\beta = 0.053$, $t = 0.435$, $p = 0.332$). However, unexpectedly, the results of the Permutation and Henseler's MGA tests (hypothesis 7), as illustrated in Table 15, showed different outcomes regarding the differences in the coefficients of the learning facility condition and the feeling of ease of use. The Permutation test revealed a (p-value of 0.048), indicating significant differences in the coefficient of the LFC and PEU relationship between these two groups. Conversely, the Henseler's MGA test yielded a (p-value of 0.101), suggesting no significant differences in the coefficient of the LFC and PEU relationship across these two groups. The coefficient of the LFC and PEU relationship for the English group ($\beta = 0.218$, $t = 5.514$, $p = 0.00$) was higher than that of the Arabic group ($\beta = 0.074$, $t = 0.602$, $p = 0.274$), with a path coefficient difference of approximately -0.144. These differences in the path coefficient results between these two groups are due to two reasons: (1) progress in Arabic content development, such as incorporating cultural and traditional aspects, has been slow, and the e-learning tools still heavily rely on English content (United Nations Development Programme & Regional Bureau for Arab States, 2011). Despite the many efforts by Arab governments and universities to provide faculty members with personal computers, they still couldn't effectively take advantage of technology and adopt it because they are still struggling with English (Kenan et al., 2013; Shraim & Khlaif, 2010). (2) Commonly, students studying in English medium instruction schools are from a better socio-economic status (Manan et al., 2015). This suggests that parents with higher socio-economic status tend to provide their children with more resources, including technological facilities, extracurricular activities, and educational outings (Merritt & Buboltz, 2015). As a result, the English student group tends to have greater exposure to educational technology and demonstrate superior ICT literacy skills (Scherer & Siddiq, 2019), as the availability of facilities has a direct effect on computer self-efficacy (Lai, 2013).

CONCLUSION AND IMPLICATIONS

Learning process has already been changed within Iraqi Secondary and Upper primary schools specially after 2007 educational reform and adopting western curriculums (Artosh, 2016), however, policymakers of Iraqi Ministry of education should investigate and consider students' usage and acceptance of e-learning technology prior to development and implementation process. Based on statistical findings of this study, previous studies, and literature related to technology acceptance and pedagogical practices in English medium instruction context in the Arab world, this study underscore the importance of Arabic language education for Arab students, particularly in primary and secondary school levels, to enhance students' learning outcomes and performance. However, in the context of e-learning, the majority of educational applications and materials available on the internet are in English (Alkharang & Ghinea, 2013; Statista, 2023; W3Techs, 2023). The lack of learning material in Arabic and inadequacy of English language proficiency can causes a significant barrier for students studying in Arabic, for whom English is a second or third language, when trying to adopt technology for educational purposes and fully leverage its benefits (Al Masri & Rimawi, 2022; Alkharang & Ghinea, 2013; Kenan et al., 2013; Shraim & Khlaif, 2010).

Moreover, this research study suggests modifications to e-learning material to align with the Arabic language, culture, and religious beliefs of Iraq's society. The findings of this study highlight the necessity to develop Arabic content that integrates cultural and traditional aspects (Al-shehri, 2012; Ameen et al., 2017), and to make this content readily available online for Arabic learners in the e-learning context in Iraq. However,

despite the broad availability of educational material for students who use English as a medium of instruction, most of these learning resources lack cultural and social adaptations. The absence of cultural adaptation for learning material can lead to confusion, especially when these educational materials were developed in a cultural context different from the student's own. This issue is particularly critical in primary and secondary school education as e-learning materials and applications are predominantly developed in the Western world (Ameen et al., 2017; Andersson & Gronlund, 2009). In addition, teachers working within an English medium instruction context should consider incorporating constructivist learning practices to facilitate both the student's comprehension of the content and language acquisition simultaneously, and to reduce cognitive load for students with low English proficiency (Min et al., 2019; R. Wilkinson, 2013).

Limitations and Future Research

Like all research endeavors, this study is not exempt from certain limitations, which have resulted in more questions than resolutions. These limitations are classified under three broad categories. Firstly, our methodology, which heavily relied on self-reported questionnaires, inherently invited a level of response bias as the students' responses were based on their subjective evaluations. This limitation opens up room for future studies to gain a more comprehensive understanding of the reasons students accept or reject new technologies in a Constructivist learning environment. A potential solution could be the adoption of a mixed-methods approach, incorporating both questionnaires and focus group interviews for a more holistic understanding of the subject matter.

Secondly, an area of improvement for future research is the expansion of the E-Learning Technology Acceptance Model (ETAM). This could include additional constructs such as social influence, learning motivation, proficiency in international languages, language capability, information quality, knowledge quality, technology fit, self-directed learning, computer self-efficacy, study load, cognitive load, students' socio-economic status, parental educational level, and students' academic outcomes (GPA). By integrating these additional scales, future studies could provide more empirical answers to the questions that arose from our study. More importantly, it would enhance our understanding of the interplay between classroom environments in Iraq and the corresponding learner outcomes. Lastly, the geographic scope of our study was a constraint, as the research was conducted exclusively within urban regions. We suggest that future studies widen the research parameters to include rural and semi-urban areas. Such an expansion would not only allow for a broader data set but also offer richer, more varied insights into the implementation and acceptance of new technologies in different educational settings.

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MODELLING HYBRID TEACHING IN THE NEXT NORMAL FOR PHILIPPINE PRIVATE HIGHER EDUCATION

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ABSTRACT

The COVID-19 pandemic disrupted higher education globally, catalyzing a rapid shift to remote learning modalities like online and hybrid instruction. As the post-pandemic era emerges, higher education institutions face the challenge of effectively implementing hybrid teaching models that blend in-person and online components. This study investigates the factors influencing faculty members' behavioral intention to adopt hybrid teaching approaches in selected Philippine private higher education institutions. Grounded in the unified theory of acceptance and use of technology (UTAUT) model, the study examines the roles of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit. Additionally, it introduces the novel construct of technology fit use to assess the alignment between course technologies and faculty teaching needs. Partial least squares structural equation modeling analyzed survey responses from 300 faculty members across multiple institutions. The findings indicate that performance expectancy, social influence, hedonic motivation, price value, and habit significantly influence

behavioral intention, while effort expectancy and facilitating conditions have a limited impact. Moreover, behavioral intention predicts technology fit use and actual technology use. Age moderates the effect of effort expectancy on behavioral intention, while experience moderates the habit-intention relationship. The study provides insights for educational policymakers and technology developers to foster successful hybrid teaching adoption through strategies tailored to user experiences, institutional support, and technology-pedagogy integration.

Keywords: UTAUT, hybrid teaching, PLS-SEM, Philippine private universities.

INTRODUCTION

The global health pandemic has affected many facets of organizational practices, most significantly those in higher education institutions. When the international communities locked down due to the worldwide transmission of COVID-19 in March 2020, various operations shut down, and higher education was hard hit. According to Pokhrel and Chetri (2021), the pandemic has resulted in the most significant event in higher education ever seen in human history. Due to the virus outbreak, more than 1.6 billion students across over 200 countries were devastated. Many schools were closed, and those that remained open had to discover novel methods of instruction and learning that aligned with present requirements (Singh et al., 2021). The learning format was abruptly shifted from traditional in-person sessions to online in response to an emergency. This change was made without considering the levels of expertise that both students and faculty members had with online technology tools (mainly related to designing and organising for better learning experiences and creating distinctive learning environments, with the help of digital technologies. With this article, we provide some expert insights into this online-learning-related PCK, with the goal of helping non-expert university teachers (i.e. those who have little experience with online learning Lorenza & Carter, 2021; Rapanta et al., 2020). Thus, higher education managers were faced with the challenges of, among others, deciding on the most appropriate online platforms and technologies that would best cater to the needs and realities of both learners and faculty and the gravity of the transition from conventional classroom-based learning to remote, online learning, most especially in the spectrum of students' performance assessment (Singh et al., 2021). While the pandemic brought tremendous changes in how education is practiced globally, it also gave way for education researchers to reflect on challenges and lessons learned for various universities and colleges to adapt in the post-vaccine world. In their 2021 study, Singh and colleagues pinpointed four essential areas for adapting higher education following the pandemic. These areas include incorporating technology, providing structural support, encouraging faculty participation, and fostering a sense of shared responsibility in learning.

In the Philippines, the CMO No. 04 Series was enacted by the Commission on Higher Education (2020) and established a new policy for flexible learning starting in the 2021 school year and continuing thereafter. This directive requires private higher education institutions to embrace flexible learning approaches, utilizing digital and non-digital technologies. However, as private higher education institutions embark on this transition, the demands of flexible learning present significant difficulties for faculty members in effectively navigating pedagogical practices and learning strategies and meeting the conditions to implement hybrid teaching successfully.

Students' needs for more flexibility, as shaped by the learning process, can be addressed by flexible learning (Muller et al., 2023). Flexible learning is an umbrella term that refers to autonomy, which provides increased choice, convenience, and personalization to suit the learners (Joan, 2013). For conceptual clarity, blended learning integrates online tools to aid traditional in-person instruction, which often focuses on flexibility

through asynchronous (self-paced) activities, while hybrid learning specifically mixes in-person education with access to learning tools with substantial emphasis on real-time (synchronous) and asynchronous aspects (Nuankaew et al., 2023). The present study adopts blended learning as the framework due to its applicability to encompass hybrid learning strategies used by teachers. The emphasis on hybrid learning within the blended learning framework aligns with the current teaching practices of educators in Philippine private higher education, particularly during the “next normal.” This context requires teachers to adapt to different modalities to meet the needs of students, blending traditional and innovative teaching methods effectively.

Hybrid learning, where professors blend online and in-person teaching – is like a new recipe in the higher education sector. Numerous research studies have looked into whether it works and how to make it a success, like trying the recipe in different kitchens. Early on, we saw how Christian colleges could find unique ways to blend faith-based teachings with this style (Bruner, 2007). Studies showed that well-designed hybrid courses increase student participation (Ernst, 2008). However, achieving the correct balance between online and in-person interactions is crucial (Trentin & Bocconi, 2014; Coates & Mahat, 2014).

Hybrid learning has positive results for students, making them more engaged and boosting satisfaction levels (Meydanlioglu & Arikan, 2014; Nava, 2015; Potter, 2015). It can even be as effective as traditional classes (Alpert et al., 2016), but we need supportive teachers on board with trying the technology (Young et al., 2016). Newer ideas like “adaptive hybrid MOOCs” offer personalized experiences to improve these courses (Garcia-Penalvo et al., 2018). Smart tech also shows promise by tailoring online tools to specific student needs (Kadhim & Hassan, 2020). Importantly, designing a great hybrid model means understanding the culture of a school, how teachers like to teach, and the tech available (Coates et al., 2021).

Furthermore, recent insights give us clues about what makes professors embrace hybrid learning. A study in Romania by Potra and colleagues (2021) and in the Philippines by Barrot and his team (2021) highlighted the difficulties students faced during the pandemic, which teachers must be aware of. The academic world is also starting to see how hybrid design impacts teacher and student outcomes (Munday, 2022). Interestingly, hybrid work setups in which professors work from home sometimes have benefits, but there is a need to ensure professors have technology or tech support to feel successful (Choudhury et al., 2024). Hybrid events, mixing online and in-person, also seem like a cost-saving and accessible way to learn (Nechita et al., 2023).

Moreover, a significant portion of the literature on people’s adoption of new technologies is guided by the Unified Theory of Acceptance and Use of Technology, known as UTAUT. By examining this theory, researchers may obtain insights into the motivations behind students’ decisions to participate in or steer clear of online educational platforms. Do they think it will help them? Is it easy to use? Do their friends use it? (Alblooshi & Hamid, 2021). It is not just about the tech but a whole mix of factors (Qiao et al., 2021). Even the flipped classroom model, where students do some work before class, follows these acceptance patterns (Alyoussef, 2022). Moreover, especially during COVID, factors like good tech setup, social pressure, and whether professors truly believed online learning worked all determined who would adopt these platforms (Mujalli et al., 2022; Li et al., 2022).

Specifically in the Philippines, where “flexible learning” has become prominent in recent years, students are facing unique challenges. Researchers and other literature and studies know that having the right tech tools makes a difference in how well students adapt (Ulanday et al., 2021). However, not all rural areas have excellent internet access (Gocotano et al., 2021). It is not just students like. Colleges themselves have to be ready to support teachers for this kind of change (Barrera et al., 2020). Factors like internet access, student device ownership, knowledge of how to use tech, and even individual life situations all impact if flexible learning works for a given person (Cajurao et al., 2023).

CONCEPTUAL FRAMEWORK

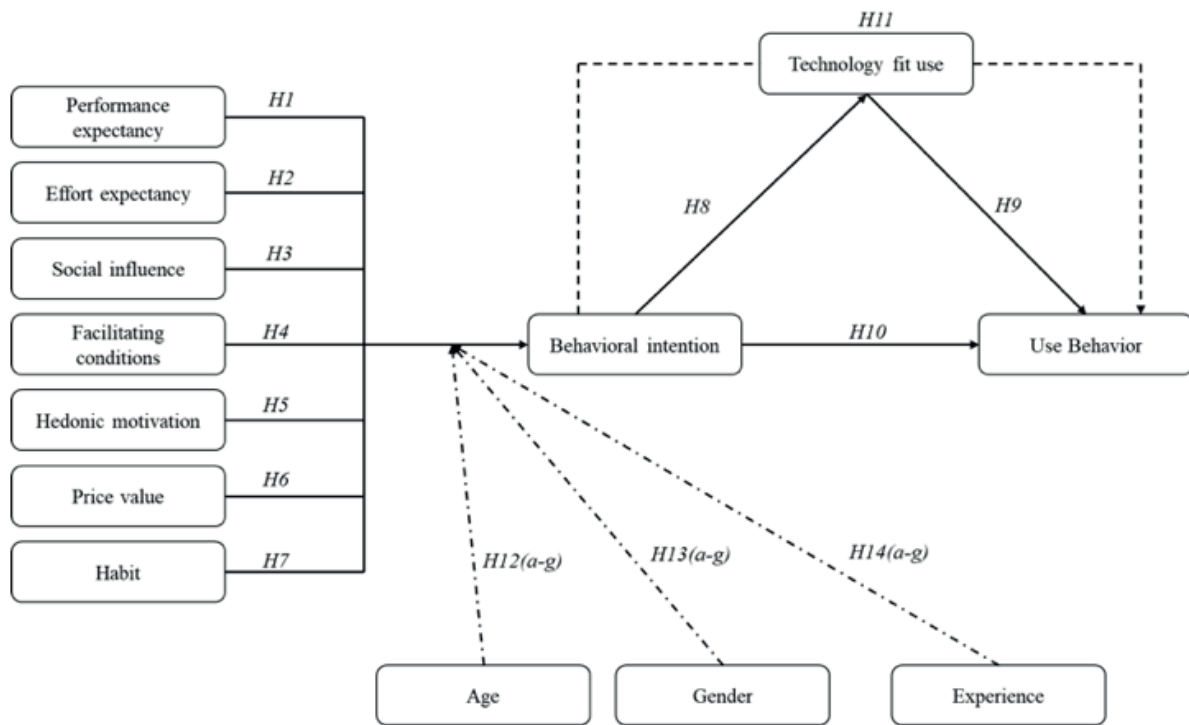


Figure 1. Proposed Hybrid Teaching Model

Figure 1 describes the association between performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC), hedonic motivation (HM), price value (PV), habit (HA), behavioral intention (BI), technology fit use (TF), and use behavior (US). The present study explores the effect modification pathways of age, gender, and experience between PE, EE, SI, FC, HM, PV, HA, and BI. The above scaffolding also determines how TF may explain the association between BI and US.

PURPOSE OF THE STUDY

With the successful rollout of Covid-19 vaccines, global economies have opened and are recovering. The COVID-19 cases in most countries have decreased, resulting in increased mobility and fewer restrictions on day-to-day activities. Thus, organizations are gradually going back to their normal. Higher education is no exception. While online teaching offers many advantages, it also has drawbacks (Rashid & Yadav, 2020). In the context of post-COVID-19 vaccines, where establishments would want to imagine a future with workers' performance not hindered by COVID-19, the need for higher education institutions to reform education and research strategies post-pandemic, aiming to attain the desired learning outcomes for students and uphold the standards of quality education, has intensified. One of these strategies is to blend the physical and virtual modality or the hybrid work. There is a rich literature on hybrid work and its impact on business organizations, most commonly in the business process outsourcing industries. Many colleges and universities have adopted hybrid work models during the pandemic. However, the teaching process, the learning experience, and the essential conditions for their successful implementation still lack thorough exploration regarding the impact of these models. Therefore, this study explored this area in the research questions below:

1. How do PE, EE, SI, FC, HM, PV, and HA influence BI in the context of hybrid teaching?
2. How does BI influence TF and US in the context of hybrid teaching?
3. How does TF influence US in the context of hybrid teaching?
4. How does TF mediate the relationship between BI and US in the context of hybrid teaching?

5. How do age, gender, and length of experience act as an effect modifier on the links between:
- PE and BI in the context of hybrid teaching?
 - EE and BI in the context of hybrid teaching?
 - SI and BI in the context of hybrid teaching?
 - FC and BI in the context of hybrid teaching?
 - HM and BI in the context of hybrid teaching?
 - PV and BI in the context of hybrid teaching?
 - HA and BI in the context of hybrid teaching?

Hypotheses Development

Utilizing the UTAUT model as a foundational scaffolding and integrating insights from existing literature and the characteristics of the sample under study, this research introduces a new variable, TF (standing for technology fit use). Figure 1 illustrates a suggested hypothetical model for investigating the acceptance of hybrid teaching. Each hypothesis presented below is supported by relevant literature that underpins the theoretical contribution of the variables of interest in the present study.

Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Hedonic Motivation (HM), Price Value (PV), Habit (HA), and Behavioral Intention (BI) within the UTAUT in the context of Hybrid Teaching

Our examination of the factors of behavioral intentions toward hybrid education involving college students at three state universities in Chongqing, China, builds on the foundational research by Xie and colleagues (2022). This study investigated several key factors, such as perceived ease of use, perceived usefulness, perceived satisfaction, SI, PE, FC, and BI. The findings from their study documented that among all underlying factors, such as convenience of use perception, had the most significant effect on BI, notably influencing perceived usefulness. Furthermore, Alhramelah et al.'s (2020) examination of PE, EE, and SI within a blended learning context reinforces the applicability of the UTAUT model for understanding technology acceptance and usage in educational settings. Their study demonstrated that EE and PE significantly predict students' engagement with hybrid learning. The determinants influencing intention and usage, including PE, EE, SI, and FC, were explored by Abbad (2021). The findings demonstrate that BI to use Moodle is significantly influenced by EE, underscoring the utility of the UTAUT model in analyzing the acceptance of e-learning systems among students. Jalil et al. (2022) researched Malaysian primary school teachers' behavioral intentions regarding adopting Industry 4.0 (IR4.0) technologies. Their findings indicated that social influence significantly affects teachers' willingness to incorporate IR4.0 technologies into their practices, aligning with UTAUT's emphasis on SI as a crucial factor in technology acceptance. As explored by Mahande and Malago (2019), FC emerged as a critical contributor to e-learning acceptance, significantly influenced by students' knowledge and internet speed, which duly supports the UTAUT model, highlighting the importance of FC in technology adoption. Moreover, Zacharis and Nikolopoulou (2022) documented that HM significantly influenced the student's propensity to use eLearning platforms. They expanded the UTAUT2 model to incorporate constructs such as empowerment in learning and learning value to study this effect. In understanding price value, Twum and colleagues (2022) and Moorthy's team of researchers (2019) explored the factors influencing the propensity to engage with E-learning and mobile learning. They identified IT-related personal innovativeness, financial cost perception, PE, HM, and SI as significant determinants. These findings demonstrate the multifaceted nature of factors influencing technology adoption. Finally, Azizi et al. (2020) explored factors influencing students' inclination towards adopting blended learning, with HA significantly influencing students' propensity to make use of blended learning. These studies collectively support our first research question on how PE, EE, SI, FC, HM, PV, and HA influence BI in terms of hybrid teaching, providing a robust foundation for our investigation into faculty members' intentions toward adopting hybrid teaching methods. Given these findings, we propose that:

- H1. PE has a significant association with BI in the context of hybrid teaching.
- H2. EE has a significant association with BI in the context of hybrid teaching.
- H3. SI has a significant association with BI in the context of hybrid teaching.
- H4. FC has a significant association with BI in the context of hybrid teaching.
- H5. HM has a significant association with BI in the context of hybrid teaching.
- H6. PV has a significant association with BI in the context of hybrid teaching.
- H7. HA has a significant association with BI in the context of hybrid teaching.

Behavioral Intention and Technology Fit Use

For this study, where BI is referred to as the willingness of faculty members to embrace hybrid teaching methods, a new variable, Technology Fit Use (TF), is introduced. TF assesses how well the course technology aligns with faculty members' specific needs and tasks within their teaching roles. TF includes evaluating whether the technology effectively supports their teaching objectives, aids in understanding course materials, facilitates active participation in teaching activities, allows for the demonstration of teaching competencies, provides essential technical support, ensures accessibility, and presents user-friendly features. Drawing from the operationalized constructs of the UTAUT, this study considers the participants' age, education, and gender. Tahir's (2023) study highlighted the impact of these variables on the intention to utilize online education, subsequently impacting its actual use, which is supported by numerous studies. For instance, in higher education, a study by Xue et al. (2024) explored mobile learning tools, such as m-learning, devices, and technologies, emphasizing the patterns of student acceptance and usage patterns in Asia and North America. However, given that TF is a novel variable, there is a gap in evidence in this area. Therefore, we duly propose that:

- H8. BI is significantly associated with TF in the context of hybrid teaching.

Technology Fit Use and Use Behavior

In 2019, Cheng and colleagues conducted research to assess how students' continued engagement with e-learning platforms (cloud-based) and their perceived learning outcomes within educational environments are influenced by the Task-Technology Fit, also known as TTF. It affirmed that the compatibility between task requirements and technological features directly affects students' perception of TTF, reflecting technology's effectiveness in supporting specific tasks within a system. As a result, this connection directly affects their contentment, perceived utility, and validation of the cloud-centric e-learning platform. Whether directly or indirectly, these perceptions influence the tendency of the students to persist in utilizing the system and ultimately affect their perceived learning outcomes. As mentioned, Technology Fit Use (TF) is a novel variable in our study. It assesses how well course technology aligns with faculty members' specific needs and tasks within their teaching roles. Like TTF, TF evaluates whether the technology effectively supports teaching objectives, aids in understanding course materials, facilitates active participation in teaching activities, allows for the demonstration of teaching competencies, provides essential technical support, ensures accessibility, and offers user-friendly features. Since TTF is aligned with TF, we can infer that TF may also influence use behavior, given its focus on the fit between technology and faculty needs. Therefore, building on the established association between BI and use behavior (US) in previous studies, we propose the following hypothesis:

- H9. TF is significantly associated with US in the context of hybrid teaching.

Behavioral Intention and Use Behavior

The association between BI and US is well-documented, as evidenced by several studies. For example, Xue (2024) and their research team carried out a review to assess how well the UTAUT model predicts the adoption

of technology within the context of higher education. This review predominantly involved students from North America and Asia, emphasizing mobile learning tools as the most frequently investigated technologies. The main approach for data collection was surveys, with structural equation modeling serving as the favored method of analysis which found that performance expectancy substantially influenced behavioral intention, providing valuable insights for integrating new educational technologies. The authors recommended that subsequent uses of UTAUT should include comprehensive research involving diverse populations, employ a variety of methodological approaches, and embrace different theoretical viewpoints. This approach aims to thoroughly explore the patterns of adopting technology in higher education and to create tailored strategies to integrate. Additionally, Al-Marroof et al. (2022) explored individuals' intention to adopt blended learning (b-learning), where e-learning emerged as the most effective tool for managing blended learning classrooms. Most analyzed studies focused on investigating students' adoption and acceptance of b-learning and its underlying technologies. Similarly, Granic (2022) confirmed UTAUT as a valuable framework for predicting and explaining user behavior toward accepting and adopting various technologies supporting learning and teaching processes. Given the established association between BI and US in these studies, we propose the following hypothesis:

H10. BI is significantly associated with US in the context of hybrid teaching.

Technology Fit Use as a Mediating Variable

As previously discussed, in 2019, Cheng investigated the impact of Task-Technology Fit (TTF) on students' engagement with e-learning platforms (cloud-based) and their perceptions of learning achievements in educational environments. Technology Fit Use (TF) is a novel variable in our study, designed to assess how well course technology aligns with faculty members' specific needs and tasks within their teaching roles. Like TTF, TF evaluates whether the technology effectively supports teaching objectives, aids in understanding course materials, facilitates active participation in teaching activities, allows for the demonstration of teaching competencies, provides essential technical support, ensures accessibility, and offers user-friendly features. Given that TTF is aligned with TF, we can infer that TF may mediate the association between BI and US. This suggests that the magnitude to which faculty members investigate the technology as fitting their needs and TF may influence how their behavioral intention translates into actual US. Therefore, building on the established association between BI and US in previous studies, as mentioned, we propose the following hypothesis:

H11. TF acts as an effect-modifying factor influencing the association between BI and US in the context of hybrid teaching.

Age, Gender, and Experience as Effect Modifiers

Age

The research conducted by Li and colleagues in 2021 combines the UTAUT with the concept of Connected Classroom Climate (CCC) to determine the factors influencing students' intentions to persist with Massive Open Online Courses (MOOCs). UTAUT, drawing from eight theories, examines factors such as PE, EE, SI, and FC, considering a moderation variable, age. Through moderation analysis in SPSS, the study explores how CCC acts as an effect-modifying factor influencing the association between the variables as mentioned above and the intention to use MOOCs. Results reveal significant interactions between CCC and the core variables of UTAUT, indicating that as CCC increases, the impact of these variables on continued MOOC usage also increases, affirming the effect-modifying role of CCC in shaping learners' intentions in this context. In a similar vein, Lin (2019) developed a customized research framework and hypotheses based on the UTAUT model and relevant literature, focusing on users' intentions towards utilizing e-books. The empirical investigation unveiled that effort expectancy, facilitating conditions, and individual innovation notably influenced users' intentions to adopt e-books. Moreover, the study emphasized the significant role of effort expectancy and identified the moderating factor of age influencing these associations. Additionally,

Nassar et al. (2019) reported that age negatively served as an effect-modifying factor influencing the association between SI and BI concerning ICT adoption among Palestinian administrative staff at the Ministry of Higher Education (MOHE). Hu et al. (2020) explored mobile technology readiness, acceptance, and uptake among teachers in Chinese institutions of higher education. The study highlighted that key influencers of academics' intention to use and actual usage behaviors centered around PE, FC, HM, and HA. It also noted that behavioral intentions significantly shaped how faculty members utilized mobile technologies. Furthermore, age emerged as a moderating factor. Dionika et al. (2020) tested age as a moderator in the impact of HM on the intention to use digital public services, including various applications and sites facilitating access to information and administrative services. In a different context, Na et al. (2021) documented that age difference moderates the relationship between PV and BI in using fast food self-order kiosks among customers in Korea. Furthermore, Dionika et al. (2020) observed that age significantly acted as an effect-modifying factor on the association between HA and BI toward implementing smart cities through diverse digital public services. Hence, based on these findings, it is proposed that:

- H12a. Age acts as an effect-modifying factor influencing the association between PE and BI in the context of hybrid teaching.
- H12b. Age acts as an effect-modifying factor influencing the association between EE and BI in the context of hybrid teaching.
- H12c. Age acts as an effect-modifying factor influencing the association between SI and BI in the context of hybrid teaching.
- H12d. Age acts as an effect-modifying factor influencing the association between FC and BI in the context of hybrid teaching.
- H12e. Age acts as an effect-modifying factor influencing the association between HM and BI in the context of hybrid teaching.
- H12f. Age acts as an effect-modifying factor influencing the association between PV and BI in the context of hybrid teaching.
- H12g. Age acts as an effect-modifying factor influencing the association between HA and BI in the context of hybrid teaching.

Gender

Alghamdi et al.'s (2022) research primary objective is to identify factors influencing students' willingness to embrace e-training for teaching field training courses at Imam Abdulrahman Bin Faisal University (IAU). Findings revealed that EE, FC, PE, and SI are key predictors of the intention of students to use e-training, collectively accounting for 32.1% of the variance in their BIs. Additionally, significant gender differences were observed in students' perceptions of PE, FC, and SI, providing valuable insights for IAU policymakers to prioritize factors crucial for enhancing the acceptance of students' e-training. The 2020 study by Jaradat et al. delves into the aspects that shape the willingness of students in Jordan's higher education to integrate cloud computing. It specifically points out the pivotal role of EE in influencing students' intentions toward cloud computing adoption. These results suggest that students lean more toward embracing cloud technology when they know its services are valuable and applicable across various educational aspects. Moreover, the study underscores the effect-modifying influence of gender on the association between PE and BI to adopt cloud computing. Analysis indicates that the influence of EE on BI is particularly pronounced in older respondents, implying that males, recognizing the utility of cloud computing for improving performance in the workplace, lean toward adopting this technology. In the study introducing the Unified Technology Acceptance and System Success (UTASS) model by Zhang et al. (2022), which considers gender a significant effect modifier found through the analysis of structural equation modeling that system quality, SI, and FC positively influence BI.

Additionally, no significant association was observed between FC, BI, and US, with only gender as an effect modifier being evident. These findings indicate that system quality and SI have a greater impact on male college students. Moreover, Mojarro Aliano et al. (2019) aimed to pinpoint the key factors impacting the acceptance and willingness to utilize smartphones and tablets for educational purposes in higher education environments. Furthermore, the moderation of these factors by socio-demographic variables, such as gender, was explored. Gender differences were evident in perceived FC, with women showing a stronger association than men. In addition, significant variations were observed in usage intentions, with men exhibiting a greater inclination towards usage than women. According to Dakduk and Santalla-Banderalli (2018), blended learning in executive education is more likely to be accepted by men than women. The study found that 40% of the variance in BI is accounted for by the combined effect of HM and gender, with the association between HM and BI being more substantial in men than women, as indicated by the negative and significant effect modifier of gender. In the same vein, Wong et al. (2020) documented that gender moderated the relationships between price value and mobile internet adoption among mobile network service subscribers in suburban areas in Malaysia. Additionally, Dionika et al. (2020) found that gender significantly acted as an effect-modifying factor on the association between HA and BI to implement smart cities through various digital public services, including apps and websites for accessing administrative services and information. Hence, according to the findings above, we propose that:

- H13a. Gender serves as an effect-modifying factor influencing the association between PE and BI in the context of hybrid teaching.
- H13b. Gender serves as an effect-modifying factor influencing the association between EE and BI in the context of hybrid teaching.
- H13c. Gender serves as an effect-modifying factor influencing the association between SI and BI in the context of hybrid teaching.
- H13d. Gender serves as an effect-modifying factor influencing the association between FC and BI in the context of hybrid teaching.
- H13e. Gender serves as an effect-modifying factor influencing the association between HM and BI in the context of hybrid teaching.
- H13f. Gender serves as an effect-modifying factor influencing the association between PV and BI in the context of hybrid teaching.
- H13g. Gender serves as an effect-modifying factor influencing the association between HA and BI in the context of hybrid teaching.

Experience

The study by Chang et al. (2019) revealed that experience plays a significant role in moderating how SI and PV affect customers' intentions to book hotels online. This result was observed among clients from 17 international hotels in different cities throughout Taiwan. In 2019, Aliyu and collaborators identified the vital moderating role of experience on how PE and SI relate to BI toward adopting new digitally-aided learning technologies in virtual and blended learning environments among business students in Malaysia. Izkair and Lakulu's study (2021) confirmed that the moderator variable of experience influences EE, SI, and PE regarding the inclination toward adopting mobile learning among students and academic personnel across three state universities in central Iraq. Wang and Yang's research (2005) revealed that experience with the internet, alongside neuroticism, acted as effect modifiers on the association between FC and the intention to adopt online stock trading in Taiwan. Dionika et al. (2020) investigated how experience acted as an effect modifier between HM and the intention to use digital public services, including various applications and websites enabling access to information and administrative services. Umami and Irawan (2021) documented that experience served as an effect-modifying factor on the association between HA and the intention to use the Regional Property Management Information System (SIMBMD) within a regional government in Indonesia. Therefore, grounded on the documented findings, we propose that:

- H14a. Experience acts as an effect-modifying factor influencing the association between PE and BI in the context of hybrid teaching.
- H14b. Experience acts as an effect-modifying factor influencing the association between EE and BI in the context of hybrid teaching.
- H14c. Experience acts as an effect-modifying factor influencing the association between SI and BI in the context of hybrid teaching.
- H14d. Experience acts as an effect-modifying factor influencing the association between FC and BI in the context of hybrid teaching.
- H14e. Experience acts as an effect-modifying factor influencing the association between HM and BI in the context of hybrid teaching.
- H14f. Experience acts as an effect-modifying factor influencing the association between PV and BI in the context of hybrid teaching.
- H14g. Experience acts as an effect-modifying factor influencing the association between HA and BI in the context of hybrid teaching.

METHODS

Research Design, Sampling, and Respondents

The study utilized a quantitative predictive-causal research design with a cross-sectional sample. Purposive sampling was used to select faculty members from selected private institutions of higher education in the Philippines. A priori power analysis performed with the G*Power software established the minimum required sample size. As a result, the minimum sample size required was determined to be 253. This analysis considered a medium effect size of 0.15, an alpha level of 0.05, a statistical power of 0.95, and the inclusion of 28 predictors. The researchers collected 300 valid responses, exceeding the minimum recommended sample size, thereby ensuring the reliability of the hypothesis testing outcomes.

Instrument

The study used a revised and expanded model of the Unified Theory of Acceptance and Use of Technology (UTAUT2), as gleaned from Venkatesh and colleagues in 2012, alongside insights from Sun's 2016 study titled "Multi-dimensional alignment between online instruction and course technology: A learner-centered perspective."

Ensuring the reliability and validity of the underlying constructs is crucial during evaluating the measurement model and instrument. The authors used Cronbach's alpha (α) and composite reliability (CR) for reliability assessment for these constructs. Furthermore, convergent and discriminant validity are examined in the validity assessment process.

In the assessment of the reliability of latent constructs, it is required that the values of Cronbach's Alpha (α) and Composite Reliability (CR) should be no less than 0.70, as stated by Kock (2014). As gleaned on the results in Table 1, all latent variables – PE (α = 0.916, CR = 0.941), EE (α = 0.913, CR = 0.939), SI (α = 0.909, CR = 0.943), FC (α = 0.876, CR = 0.915), HM (α = 0.948, CR = 0.966), PV (α = 0.884, CR = 0.966), HA (α = 0.892, CR = 0.933), BI (α = 0.927, CR = 0.954), use (α = 0.906, CR = 0.935), and TF (α = 0.936, CR = 0.949) passed the internal consistent tests.

According to Kock and Lynn (2012) and Kock (2014), in order to be established as having convergent validity, it is required for the average variance extracted (AVE), as well as the factor loadings of latent constructs to be 0.50 or higher. Moreover, for significance to be attributed, a p-value of 0.05 or lower must be had by each factor loading. According to the values reflected in Table 1 – PE (AVE = 0.799), EE (AVE = 0.793), SI (AVE = 0.846), FC (AVE = 0.730), HM (AVE = 0.906), PV (AVE = 0.812), HA (AVE = 0.823), BI (AVE = 0.873), use (AVE = 0.783), and TF (AVE = 0.726) exhibit convergent validity. (see Table 1 for the complete list of reliability, convergent validity, and factor loadings).

Data Collection Procedures

The necessary approvals were obtained from various private higher education institutions before the pilot study. After the pilot study, the clarity of the items was evaluated to determine whether the participants could understand them easily. The data collection process occurred from June to July of 2023. The research instrument was distributed using Google Forms, and participants' email addresses were collected for tracking purposes. The form's URL included an electronic consent form and the research instrument. All the data gathered from the forms were compiled into a single Google Spreadsheet, which was used for statistical analyses using WarpPLS.

Ethical Considerations

Informed consent was duly obtained from the participants via Google Forms, facilitating consent collection online. The participants were duly informed about the research objectives, duration of participation, as well as the procedures involved. Participants were assured of their rights to maintain anonymity and confidentiality. To ensure confidentiality, the researchers assigned numerical codes to identify participants. Information about the potential risks and benefits of the study was provided to the participants, who were also made aware of their right to withdraw from the study at any time they wished. We shared our contact information with the participants for any concerns or inquiries about the study. Data were securely stored and processed. Through a Google Spreadsheet, accessible exclusively to us. The collected data was used solely for the study. Additionally, we obtained permission from the appropriate institutional authorities from the selected private institutions of higher education before conducting the study, with funding provided by the Philippine Association of Private Schools, Colleges, and Universities (PAPSCU) and the Private Education Assistance Committee (PEAC) under Grant No. Proj-3-2022-23.

Data Analysis

In the present study, particularly in hybrid teaching, Performance Expectancy (PE) can be defined as the teachers' perception of the advantages and positive outcomes of using this approach, as they anticipated. Effort Expectancy (EE) pertains to the preference for an easy-to-understand application that maximizes the advantages of hybrid teaching. Social Influence (SI) is the perception that using hybrid teaching is approved and influenced by peers, thereby influencing a faculty member's intention to participate. As to Facilitating Conditions (FC), it is the impact of having the necessary knowledge and resources for hybrid teaching. Hedonic Motivation (HM) reflects the pleasure of using hybrid teaching, while Price Value or PV considers the worth attributed to its implementation. Habit (HA) signifies the automatic execution of behaviors related to hybrid teaching, and Behavior Intention (BI) denotes faculty members' willingness and subjective expectations regarding its use in their teaching practices. These factors, PE, EE, SI, FC, HM, PV, and HA, shape faculty members' decisions and actions regarding adopting and utilizing hybrid teaching methods as expressed in BI.

The Partial-Least Square or PLS-SEM was used to assess how PE, EE, SI, FC, HM, price value, and HA influence BI in the context of hybrid teaching and determine if BI influences TF and US in the context of hybrid teaching and assess how TF influence US in the context of hybrid teaching. Mediation analysis was used to assess how TF acts as an effect modifier on the association between BI and US in the context of hybrid teaching.

Simple Moderation and Multigroup Analysis were used to determine and confirm if age, gender, and length of experience act as an effect modifier on the links between:

- a. PE and BI in the context of hybrid teaching,
- b. EE and BI in the context of hybrid teaching,
- c. SI and BI in the context of hybrid teaching,
- d. FC and BI in the context of hybrid teaching,

- e. HM and BI in the context of hybrid teaching,
- f. PV and BI in the context of hybrid teaching,
- g. HA and BI in the context of hybrid teaching.

The association among the variables of interest was examined using WarpPLS 8.0 software, aligning with the research problems and objectives.

RESULTS AND DISCUSSION

We utilized Partial Least Squares-Structural Equation Modeling (PLS-SEM) to examine the suggested correlations thoroughly. The process involved two primary phases: firstly, we rigorously assessed the measurement model to ensure its validity and reliability, and secondly, we thoroughly evaluated the structural model to understand the relationships between the constructs (Lacap, 2019; Lacap, 2020; Lacap & Sicat, 2022).

Measurement Model Assessment

Validity is evaluated by conducting tests for convergent as well as discriminant validity. Additionally, reliability is measured using Cronbach's alpha and composite reliability (CR) for latent constructs. The reliability and validity of the latent constructs are to be evaluated when the measurement model is being assessed.

In measuring the reliability of the latent constructs, the values of Cronbach's Alpha (α) and CR must be at least 0.70 (Kock, 2014). As gleaned from the results in Table 1, all latent variables – PE ($\alpha = 0.916$, CR = 0.941), EE ($\alpha = 0.913$, CR = 0.939), SI ($\alpha = 0.909$, CR = 0.943), FC ($\alpha = 0.876$, CR = 0.915), HM ($\alpha = 0.948$, CR = 0.966), PV ($\alpha = 0.884$, CR = 0.966), HA ($\alpha = 0.892$, CR = 0.933), BI ($\alpha = 0.927$, CR = 0.954), US ($\alpha = 0.906$, CR = 0.935), and TF ($\alpha = 0.936$, CR = 0.949) passed the internal consistent tests.

For convergent validity, latent constructs with factor loadings of at least 0.50 and average variance extracted (AVE). Additionally, for each factor loading to be considered significant, the p-value must be equal to or less than 0.05 (Kock & Lynn, 2012; Kock, 2014). Again, gleaning from the findings in Table 1, the AVE values for PE, EE, SI, FC, HM, PV, HA, BI, US, and TF were 0.799, 0.793, 0.846, 0.730, 0.906, 0.812, 0.823, 0.873, 0.783, and 0.726, respectively, exhibit convergent validity.

Table 1. Reliability and convergent validity

Latent constructs and Items	Factor loading	Average variance extracted	α (CA)	C.R.
Performance expectancy		0.799	0.916	0.941
I find hybrid teaching useful in my daily teaching.	0.875			
Using hybrid teaching increases my chances of achieving things that are important to me.	0.901			
Using hybrid teaching helps me accomplish things more quickly.	0.897			
Using hybrid teaching increases my productivity.	0.902			
Effort expectancy		0.793	0.913	0.939
Teaching how to use hybrid teaching modality is easy for me.	0.894			
My interaction with hybrid teaching is clear and understandable.	0.898			
I find hybrid teaching easy to use.	0.902			
It is easy for me to become skillful at using hybrid teaching.	0.869			

Social influence		0.846	0.909	0.943
People in the academe think that I should use hybrid teaching.	0.903			
People who influence my behavior think that I should use Hybrid teaching.	0.932			
People whose opinions that I value prefer that I use hybrid teaching.	0.923			
Facilitating conditions		0.730	0.876	0.915
I have the resources necessary to use hybrid teaching.	0.874			
I have the knowledge necessary to use hybrid teaching.	0.905			
Hybrid teaching is compatible with other technologies I use.	0.854			
I can get help from others when I have difficulties using hybrid teaching	0.780			
Hedonic motivation		0.906	0.948	0.966
Using hybrid teaching is fun.	0.951			
Using hybrid teaching is enjoyable.	0.961			
Using hybrid teaching is very entertaining.	0.943			
Price value		0.812	0.884	0.928
The cost of hybrid teaching is reasonable.	0.867			
Hybrid teaching is worth the institution's investment.	0.922			
In the next normal hybrid teaching is a good value for teachers and students.	0.914			
Habit		0.823	0.892	0.933
Hybrid teaching has become a normal part of my teaching practice.	0.899			
I must use hybrid teaching.	0.909			
Hybrid teaching has become natural to me.	0.914			
Behavioral intention		0.873	0.927	0.954
I intend to continue using hybrid teaching in the future.	0.919			
I will always try to use hybrid teaching in my daily academic life.	0.939			
I plan to continue to use hybrid teaching frequently.	0.944			
Use		0.783	0.906	0.935
I use the hybrid teaching when teaching in class.	0.910			
I consider myself a regular user of hybrid teaching.	0.946			
I prefer to use LMS when necessary.	0.784			
I do most teaching tasks using hybrid teaching.	0.891			
Technology fit use		0.726	0.936	0.949
Course technology helps me reach prescribed learning objectives	0.873			
Course technology facilitates my understanding of instructional materials	0.907			
Course technology allows me to participate in learning activities	0.897			
Course technology lets me demonstrate acquired competencies	0.840			
Technical support is available when needed.	0.739			
Course tools are readily accessible.	0.847			
Course tools are user-friendly in general.	0.850			

Note: All item loadings are significant ($p < 0.001$). α -Cronbach's alpha, C.R.- Composite Reliability

To assess the discriminant validity of the latent components, the study used the heterotrait-monotrait ratio of correlations (HTMT). In order to assert that the model has discriminant validity, the HTMT ratio requirement of 0.90 must be reached, according to Gold et al. (2001). All latent constructs have HTMT ratios of less than 0.90, indicating that discriminant validity was attained, according to the data in Table 2.

Table 2. HTMT ratios for discriminant validity

	PE	EE	SI	FC	HM	PV	HA	BI	US	TF
PE										
EE	0.756									
SI	0.779	0.749								
FC	0.669	0.843	0.592							
HM	0.731	0.689	0.690	0.581						
PV	0.818	0.760	0.770	0.719	0.750					
HA	0.812	0.723	0.798	0.641	0.743	0.893				
BI	0.834	0.706	0.787	0.644	0.775	0.827	0.847			
US	0.750	0.706	0.835	0.568	0.767	0.849	0.818	0.870		
TF	0.734	0.697	0.659	0.700	0.671	0.842	0.857	0.699	0.736	

Note: PE-performance expectancy; EE-effort expectancy; SI-social influence; FC-facilitating conditions; HM-hedonic motivation; PV-price value; HA-habit; BI-behavioral intention; US-use; TF-technology fit use.

Structural Model Assessment

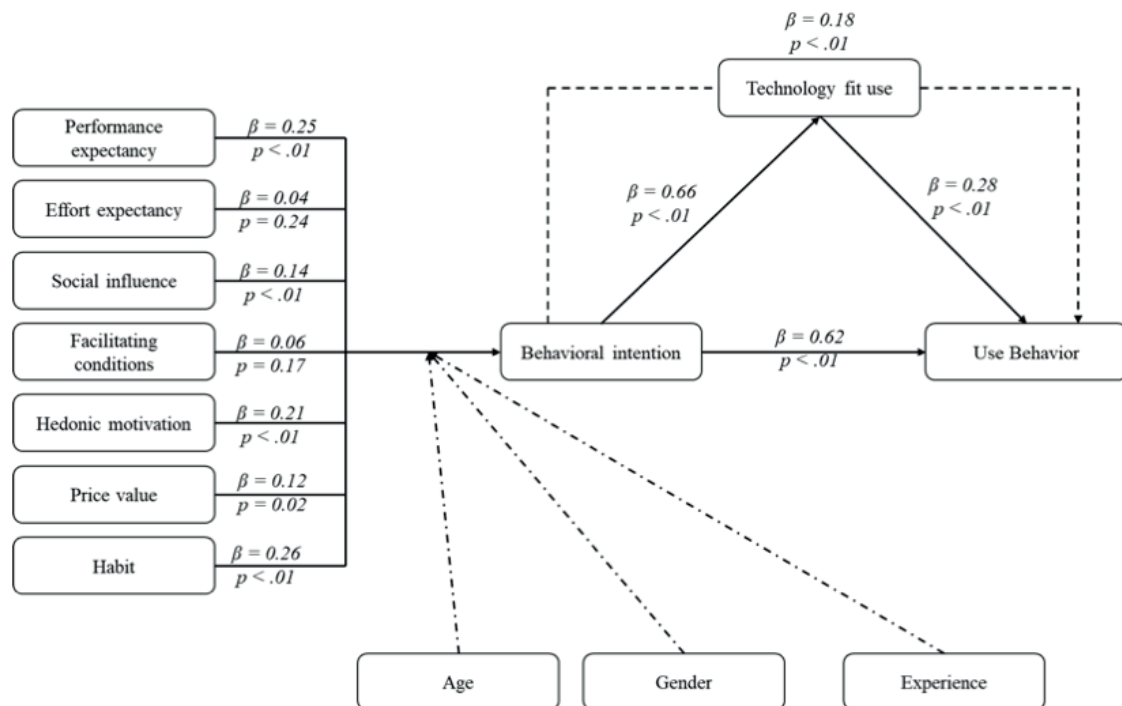


Figure 2. Structural Model of Hybrid Teaching

*As for the results of Moderating effects, refer to Table 3 and Table 5.

The structural model's evaluation includes assessing the path coefficients, p-values, standard error, and effect sizes (Lacap & Sicat, 2022). The results from the structural model evaluation are showcased in Figure 2 and Table 3.

The findings revealed that PE with a beta coefficient of 0.246 ($p < 0.001$, $f^2 = 0.190$), SI with a beta coefficient of 0.144 ($p = 0.006$, $f^2 = 0.104$), HM with a beta coefficient of 0.212 ($p < 0.001$, $f^2 = 0.155$), PV with a beta coefficient of 0.118 ($p = 0.019$, $f^2 = 0.088$), and HA with a beta coefficient of 0.257 ($p < 0.001$, $f^2 = 0.200$) showed significant effect on BI, with effect sizes ranging from small to medium. Therefore, H1, H3, H5, H6, and H7 are supported.

The research identifies five significant predictors: PE, SI, HM, PV, and HA. Each of these elements demonstrated a measurable impact on behavioral intentions, with effect sizes ranging from small to medium. Specifically, PE, which relates to the anticipated performance benefits of hybrid teaching, showed a strong correlation with BI ($\beta = 0.246$), highlighting its critical role in faculty decisions. In the Philippines, adopting the hybrid teaching model can be effectively analyzed through various psychological and behavioral factors. The results from the recent study highlight significant predictors that influence educators' and students' BI toward this blended approach. PE, for example, the magnitude to which an individual believes their job performance will be improved by using the system, showed a strong positive relationship ($\beta = 0.246$, $p < 0.001$, $f^2 = 0.190$). This infers that the more useful the hybrid model is perceived to be in enhancing learning and teaching effectiveness, the greater the likelihood of its acceptance and sustained use. SI and HM are also crucial factors. SI, which reflects how an individual understands that important others (like peers or authorities) believe they should use the new system, had a notable impact ($\beta = 0.144$, $p = 0.006$, $f^2 = 0.104$). This suggests that in the educational context, encouragement or approval from colleagues and the educational community can significantly sway an individual's decision to engage with hybrid teaching methods. Similarly, HM, which refers the fun or pleasure of using the technology, also plays a significant role ($\beta = 0.212$, $p < 0.001$, $f^2 = 0.155$). This underscores that enjoyment and satisfaction from interactive and versatile learning environments can enhance commitment to hybrid models.

Moreover, factors like PV and HA further reinforce BI. PV ($\beta = 0.118$, $p = 0.019$, $f^2 = 0.088$) indicates the financial cost-effectiveness of adopting hybrid models compared to traditional or fully online systems. HA ($\beta = 0.257$, $p < 0.001$, $f^2 = 0.200$), or the magnitude to which people tend to perform behaviors automatically because of learning, shows the strongest influence. The results are congruent with the study of Xie et al. (2022), where many variables correlate with behavioral intentions, which is the influence of the UTAUT model. Consequently, Alhramelah et al. (2020) revealed that there are intrinsic and extrinsic variables that are similar to PV and HA that also reinforce the UTAUT model by Venkatesh et al. (2007) for understanding technology acceptance and usage in educational settings, more specifically in e-learning and mobile learning modalities as revealed by both studies of Twum et al. (2022) and Moorthy et al. (2019).

On the contrary, EE with a beta coefficient of 0.041 ($p = 0.240$) and FC with a beta coefficient of 0.055 ($p = 0.168$) showed no significant influence on BI. Thus, H2 and H4 are not supported. The study reveals that EE, or the ease users expect to interact with the hybrid system, does not significantly impact their BI ($\beta = 0.041$, $p = 0.240$). This infers that the perceived simplicity or complexity of using hybrid teaching technologies might not be a primary concern for educators and students. It is possible that faculty members are either sufficiently confident in their ability to manage the technology or that other factors, such as the quality of outcomes and the support from their peers or colleagues, or even the students' ability to adapt, overshadow concerns about ease of use. Similarly, FC, referred to as the extent to which it is believed by an individual that an organizational and technical infrastructure is in place to support the use of the system, also showed no significant impact on BI ($\beta = 0.055$, $p = 0.168$). This could indicate that the users might not see the availability of resources and support as a limiting factor, possibly because the existing conditions are already adequate, or because personal motivation and institutional culture play more decisive roles in the acceptance and effectiveness of hybrid teaching.

These findings are insightful as they suggest a shift in focus from what is traditionally considered critical barriers to technology adoption, the ease of use and support structures, to more integral aspects such as intrinsic motivation, the perceived value of the technology, and cultural factors within educational institutions. This shift could guide future strategies in implementing hybrid teaching models, emphasizing

enhancing educational quality and user engagement over merely addressing technical and support concerns. This could imply that other factors, such as HA and HM, are more pivotal in shaping BI in this educational context. This contrasts with the study of Mahande and Malago (2019), that facilitating conditions, emerged as a key contributor to e-learning acceptance, significantly influenced by students' knowledge and internet speed. Additionally, Abbad (2021) and Alhramelah et al. (2020) conducted contrasting results studies. Their findings demonstrate a significant predictive relationship between students' willingness to participate in blended learning and the BI to use Moodle, with EE being a significant influencing factor. This underscores the importance of the UTAUT model in elucidating the adoption of e-learning platforms among faculty and students.

Furthermore, BI was found to have a significant impact on technology with US ($\beta = 0.656$, $p < 0.001$, $f^2 = 0.430$) and on use ($\beta = 0.620$, $p < 0.001$, $f^2 = 0.430$), with large effect sizes. Thus, H8 and H10 are supported. These findings underscore the critical role that educators' and students' willingness or intent to engage with hybrid teaching technologies play in perceiving them as appropriate for their needs and their practical application and integration into daily educational practices. This relationship indicates a dynamic where positive BI toward hybrid teaching tools significantly enhances the perceived alignment of these technologies with educational goals and their actual utilization in educational settings. As such, these insights should guide educational policymakers and administrators in emphasizing strategies that foster positive attitudes towards hybrid teaching to maximize the effective deployment and utilization of such technologies. Thus, the results can be supported by the study of Tahir (2023), which highlighted the influence of these factors on the propensity to adopt online education, subsequently impacting its actual use. It is also congruent with the research done by Xue et al. (2024), which shed light on the patterns of adopting mobile learning tools, including m-learning devices and technologies within higher education, are being examined, with a particular emphasis on how students in Asia and North America accept and utilize these tools.

A significant and positive relationship between TF and US was further revealed by the analysis of the data ($\beta = 0.276$, $p < 0.001$, $f^2 = 0.189$), characterized by a medium effect size. Hence, H9 is supported. This outcome highlights the practical implications that when educators perceive technology as suitable and fitting well with their teaching modalities, it naturally leads to higher usage rates. This relationship underscores the importance of aligning technological tools with educational goals and teaching practices to enhance their adoption and effective integration into the educational process. Therefore, for educational technology developers and institutional policymakers, ensuring that technology solutions are available and appropriately tailored to meet the specific needs of hybrid teaching environments is crucial for their successful implementation and utilization. The results affirmed the study conducted by Cheng (2019) that the compatibility between task requirements and technological features directly affects students' perception of TTF, reflecting technology's effectiveness in supporting specific tasks within a system.

It was indicated by the mediation analysis that the use of technology served as a mediator in the association between BI and actual US ($\beta = 0.181$, $p < 0.001$, $f^2 = 0.145$), with a small effect size being shown. Therefore, H11 is supported. This mediating effect suggests that merely having a strong intention to use hybrid teaching technologies is not enough for actual usage; the technology must also be perceived as appropriate and effective for the specific teaching context. This result emphasizes the necessity for educational institutions and technology developers to not only foster positive BI towards hybrid teaching technologies but also ensure that these technologies are perceived as fitting the teaching and learning needs. This dual focus can potentially increase the actual usage of technology in educational settings, thereby enhancing the effectiveness of hybrid teaching strategies. Consequently, it appears that Cheng (2019) revealed how Task-Technology Fit (TTF) influences students' use of e-learning platforms using cloud-based technology and their perceived outcomes related to learning in educational settings. Lastly, as previously mentioned, TF is a novel variable in our study, designed to assess how well course technology aligns with faculty members' specific needs and tasks within their teaching roles.

To measure the interaction effects of age and length of experience of the respondents on the hypothesized relationships, this study performed a simple moderation analysis. The findings revealed that age is shown to have an effect-modifying role in the link between EE and BI ($\beta = 0.125$, $p = 0.014$, $f^2 = 0.028$) with a small effect size. This signifies that, as the age of the respondents increases, the positive association between EE and BI strengthens. Thus, H12b is supported. This moderation effect underscores the variability in

technology adoption across different age groups. Older users may require a more precise understanding and demonstration of ease of use before they form a strong intention to engage with new teaching technologies. This insight is crucial for implementing hybrid teaching strategies, suggesting that training and support systems should be tailored to general user needs and consider age-specific preferences and requirements. Enhancing EE through targeted support could effectively strengthen BI among older educators, thereby fostering more inclusive and effective adoption of hybrid teaching modalities. This is also similar to the study of Lin (2019), which found that there is a significant role of EE and identified moderating factors such as age, gender, and educational background influencing these associations. Additionally, and in support of the results, Nassar et al. (2019) documented that age negatively acts as an effect modifier on the relationship between SI and BI. In another context, Dionika et al. (2020) tested age as a moderator in the impact of HM on the intention to use digital public services, including various applications and sites facilitating access to information and administrative services. In another different context, Na et al. (2021) found that age difference moderates the relationship between PV and BI in using self-order kiosks in fast-food restaurants. Similarly, length of experience was also found to have an effect-modifying role on the link between HA and BI ($\beta = 0.153$, $p = 0.004$, $f^2 = 0.053$) with a small effect size. This indicates that, as the length of experience of the respondents rises, the positive link between habit and behavioral intention becomes stronger. Hence, H14g is supported. These findings suggest that experienced faculty members are more inclined to adopt hybrid teaching methodologies when the technologies align with their established pedagogical practices. For seasoned instructors, the integration of new tools must complement, rather than disrupt, their existing workflows. This underscores the importance of tailoring implementation strategies to consider faculty experience levels for successful technology adoption within the hybrid teaching model. The results align with the study of Aliyu et al. (2019) where experience significantly affects the PE or social pressures in a hybrid or blended and virtual learning. Izkair and Lakulu (2021) as well as Dionika et al. (2020) similarly found that university instructors' experience levels influenced their assessment of new mobile learning technologies, particularly the ease of use, SI, and anticipated outcomes.

Table 3. Direct, mediating, and moderating effects

Hypothesis	Path coefficient	p-value	Standard error	Effect size	Decision
<i>Direct effects</i>					
H1. PE → BI	0.246	<0.001	0.056	0.190	S
H2. EE → BI	0.041	0.240	0.057	0.026	U
H3. SI → BI	0.144	0.006	0.056	0.104	S
H4. FC → BI	0.055	0.168	0.057	0.032	U
H5. HM → BI	0.212	<0.001	0.056	0.155	S
H6. PV → BI	0.118	0.019	0.057	0.088	S
H7. HA → BI	0.257	<0.001	0.055	0.200	S
H8. BI → TF	0.656	<0.001	0.052	0.430	S
H9. TF → US	0.276	<0.001	0.055	0.189	S
H10. BI → US	0.620	<0.001	0.052	0.430	S
<i>Mediating effect</i>					
H11. BI → TF → US	0.181	<0.001	0.040	0.145	S
<i>Moderating effects</i>					
H12a. Age*PE → BI	-0.049	0.196	0.057	0.017	U
H12b. Age*EE → BI	0.125	0.014	0.057	0.028	S
H12c. Age*SI → BI	0.015	0.396	0.058	0.005	U
H12d. Age*FC → BI	0.054	0.172	0.057	0.014	U
H12e. Age*HM → BI	0.089	0.059	0.057	0.021	U
H12f. Age*PV → BI	-0.064	0.131	0.057	0.010	U

H12g. Age*HA → BI	-0.000	0.500	0.058	0.000	U
H14a. EXP*PE → BI	0.036	0.266	0.057	0.010	U
H14b. EXP*EE → BI	-0.007	0.449	0.058	0.002	U
H14c. EXP*SI → BI	0.082	0.075	0.057	0.024	U
H14d. EXP*FC → BI	0.024	0.340	0.058	0.004	U
H14e. EXP*HM → BI	0.056	0.162	0.057	0.015	U
H14f. EXP*PV → BI	0.049	0.196	0.057	0.011	U
H14g. EXP*HA → BI	0.153	0.004	0.056	0.053	S

Note: S-supported; U-unsupported. Effect sizes evaluation (Cohen, 1988): 0.02 – small; 0.15 – medium; 0.35 – large.

Multigroup Analysis

To analyze the moderating effects of respondent's sex (male vs. female), multigroup analysis (MGA) was performed.

Before performing MGA, a robustness test using measurement invariance was conducted. Measurement invariance testing is utilized to make sure that the scrutiny of the measurement model under various circumstances result to same representations of the same latent variables (Hair et al., 2010). In MGA, a measurement invariance test is required (Memon et al., 2019). In the present study, constrained latent growth with loadings using WarpPLS 8.0 was the analysis method used to gauge measurement invariance (Kock, 2014). As seen in Table 4, all items used in the present study showed no significant difference in loadings' absolute latent growth coefficients. Hence, measurement invariance was not detected in the model (Kock, 2022).

Table 4. Measurement invariance test

Item	ALGC for loadings	p-value	T-ratio
PE1	0.009	0.871	0.163
PE2	0.008	0.889	0.140
PE3	0.013	0.816	0.233
PE4	0.014	0.803	0.249
EE1	0.019	0.748	0.322
EE2	0.023	0.689	0.400
EE3	0.011	0.843	0.198
EE4	0.007	0.901	0.124
SI1	0.007	0.903	0.121
SI2	0.010	0.857	0.180
SI3	0.004	0.950	0.062
FC1	0.007	0.907	0.117
FC2	0.005	0.934	0.083
FC3	0.028	0.627	0.486
FC4	0.029	0.619	0.498
HM1	0.001	0.992	0.010
HM2	0.007	0.907	0.117
HM3	0.006	0.913	0.109
PV1	0.028	0.630	0.481
PV2	0.009	0.870	0.164
PV3	0.017	0.771	0.290
HA1	0.002	0.969	0.039

HA2	0.006	0.921	0.099
HA3	0.003	0.952	0.060
BI1	0.015	0.799	0.254
BI2	0.006	0.921	0.099
BI3	0.009	0.881	0.149
US1	0.010	0.862	0.174
US2	0.031	0.588	0.542
US3	0.017	0.774	0.288
US4	0.029	0.617	0.500
TF1	0.037	0.516	0.650
TF2	0.007	0.900	0.126
TF3	0.024	0.673	0.421
TF4	0.039	0.498	0.678
TF5	0.001	0.991	0.012
TF6	0.027	0.636	0.474
TF7	0.010	0.862	0.173

Note. ALGC – absolute latent growth coefficients; p – p -value, two-tailed.

Since the absence of measurement invariance was already established, MGA using constrained latent growth method using WarpPLS 8.0 was executed. Through MGA, differences in the hypothesized relationships (H13a-H13f) between respondent's sex (male vs. female) may be measured. Table 5 highlights the outcomes of the moderation analysis using MGA, and the results showed no moderating effects in all hypothesized relationships. Hence, H13a to H13g are not supported. This outcome suggests that the influence of PE, EE, SI, FC, HM, PV, and HA on the BI to use hybrid teaching technologies is consistent across different sexes. These findings are significant as they indicate that sex-based differences do not need to be a primary concern in designing and implementing hybrid teaching strategies. Policymakers and administrators can thus focus on factors that universally affect all users rather than tailoring interventions specifically by sex. This could streamline efforts in technology adoption and training processes, ensuring that resources are allocated efficiently across the diverse body of educators and students in the private higher education sector in the Philippines. The results are similar to the past study of Zhang et al. (2022), which considers moderator variables such as gender and significance; it was found through structural equation modeling analysis that system quality (SQ), SI, and FC positively influence BI, whereas information quality (IQ) does not. Also, both Dakduk and Santalla-Banderalli (2018), Wong et al. (2020), and Dionika et al. (2020) documented that gender acted as an effect modifier on the association between habit and behavioral intention significantly across different contexts and industries.

Table 5. Multigroup analysis (MGA)

Hypothesis	Male β	Female β	ALGC	T-ratio	p	Decision
H13a. SEX*PE $\rightarrow$ BI	0.275	0.227	0.013	0.228	0.410	Unsupported
H13b. SEX*EE $\rightarrow$ BI	0.086	0.000	0.020	0.348	0.364	Unsupported
H13c. SEX*SI $\rightarrow$ BI	0.124	0.057	0.042	0.728	0.233	Unsupported
H13d. SEX*FC $\rightarrow$ BI	0.039	0.058	0.008	0.147	0.442	Unsupported
H13e. SEX*HM $\rightarrow$ BI	0.230	0.257	0.003	0.059	0.476	Unsupported
H13f. SEX*PV $\rightarrow$ BI	0.196	0.191	0.005	0.095	0.462	Unsupported
H13g. SEX*HA $\rightarrow$ BI	0.165	0.121	0.027	0.476	0.317	Unsupported

Note: p - p -value (one-tailed); β -path coefficient; ALGC-absolute latent growth coefficient.

CONCLUSION

This study examined the factors that influence the willingness of faculty members to adopt a hybrid learning approach in private higher education institutions. hypothesized framework in the study was anchored in the combined construct of the Unified Theory of Acceptance and Use of Technology and Technology Fit Use. Findings revealed that PE, SI, HM, PV, and HA are significant predictors of the BI of faculty members to adopt the hybrid learning approach. In contrast, the dimensions of EE and FC reported limited impact on the perceived willingness of faculty members in technology adoption in hybrid learning approach. These findings revealed that ease of use in adopting technology and technological requirements may potentially vary in terms of the specific circumstances of the users and the enabling environment present in their institutions. Thus, the willingness to adopt the hybrid learning model may be particularly influenced by the technological environment and training programs provided by the institutions in private higher education.

Additionally, the study presented the significant impact of positive perceived experiences on the key determinants of actual technology use in fostering behavioral intention among faculty members. This necessitates the importance of understanding user experiences and intention to ensure the effective integration of new technologies in a hybrid setting.

Furthermore, the study highlighted the moderating factor of Technology Fit Use in the association between users' behavioral intentions and their actual use of technology. Therefore, the need to customize the technological solution is advised to facilitate the effective implementation of the hybrid learning approach. This finding highlights that aligning technology with user requirements encourages adoption and ensures its integration into daily operations and contextualized approaches.

Lastly, the moderating role of demographic factors such as age and professional experience posits further understanding and alignment of strategies in adopting the technology for a hybrid learning approach. Ease of use in adopting technological innovation is more evident for older faculty members than younger counterparts. Similar findings were noted with more professional experience tend to adhere strongly to adopting technology, emphasizing an increased level of significant habitual use in technology engagement. These insights can guide developing effective technology adoption strategies in fostering the effective adoption of hybrid learning modalities within private higher education institutions.

Implications

This study is not just about how things worked in one specific Philippine university; it has implications for how the faculty members understand and implement hybrid learning everywhere. The researchers built a model that shows what makes faculty members agree to this way of teaching. This model highlights the specific things that affect how professors experience hybrid learning, offering schools a roadmap on how to make this style a success. In addition, findings show that what matters most is how well it supports teachers' goals and aligns with what they consider important.

This research supports the findings of prior research, indicating that favorable experiences with technology tend to enhance willingness and engagement. The proposed theoretical model can be useful in building insights and understanding of the gaps in future research exploring how the convergence of technological capabilities and pedagogical needs influences adoption and usage behaviors. The hypothesis posits that enhanced congruence with technological tools boosts both the motivation to utilize them and their actual use, thereby fostering more effective implementation of hybrid teaching models.

This study has significant implications for administrators and policymakers in Philippine private higher education. Factors presented in the study can aid the administrators in formulating strategies for customizing the technology integration and addressing the needs of faculty members for an effective hybrid learning approach. Understanding the importance of Technology Fit Use provides educational institutions with a construct to evaluate and design professional development programs and resource allocation to support effective hybrid teaching practices.

Limitation

This study identifies particular limitations that need to be addressed in subsequent studies. The investigation is limited to a single geographical focusing on the faculty members from private higher education institutions in the Philippines, which potentially limits the generalizability of the findings to other academic settings such as public universities and colleges. Thus, future research should aim to include a diverse number of participants across various academic institutions. Moreover, other factors, such as economic conditions, sociocultural norms, and institutional policies were not explored in the study.

To address these limitations, future research must employ a combination of quantitative and qualitative methods by augmenting the current instrument with in-depth interviews or focus group discussions, allowing deeper insights into contextual factors that shape the faculty experiences and perceptions in the hybrid learning model. Moreover, the framework proposed in this can be expanded by including socio-economic and cultural considerations to improve the reliability and relevant application across various settings.

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E-LEARNING PRACTISED INNOVATION TOWARDS KNOWLEDGE MANAGEMENT AND MASSIVE OPEN ONLINE COURSES (MOOCS) IN OPEN UNIVERSITY, INDONESIA

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ABSTRACT

Developing students' competences for postgraduate has been attractive to explore in the field of social sciences. However, there is little study to analyze the effect of an e-learning practiced innovation on knowledge management and massive open online courses (MOOCs) for postgraduate student academic performance in Open University. We applied a quantative analysis through structural equation modelling with data sampled from 155 postgraduate students spread across the whole of Open University in Indonesia. Data gained through questionnaires was entered and the 6 point Likert scale was applied for strongly agreeing to strongly not agreeing. The results show that e-learning practice models have a positive and significant effect on knowledge management and Massive Open Online Courses (MOOCs). Meanwhile, knowledge management also has a positive and significant effect on Massive Open Online Courses (MOOCs) of postgraduate student achievement in Open University. Based on the research findings, we argue that developing of postgraduate student academic performance in knowledge management and MOOCs programs availability, then, it must be creating a better e-learning practiced innovation at Open University in Indonesia for creating a greater policy programs of independent Learning-Independent Campus era.

Keywords: E-Learning practiced model, knowledge management, massive open online courses (MOOCs), postgraduate student, open university, Indonesia.

INTRODUCTION

Accordingly, the e-learning model has been viewed as a successful model in education. For example, research has investigated the success model of e-learning in undergraduate students' academic performance and asserted that an e-learning initiative's overall success is contingent on achieving success at each of the three stages of e-learning system development: system design, system delivery, and system outcome (Holsapple & Lee-Post, 2006). Moreover, the e-learning strategy has greater effectiveness for study compared with face-to-face teaching and learning programs in universities (Soffer & Nachmias, 2018). Other studies have proved that there were some elements of e-learning success factors. The critical elements involved course design quality, instructor, motivation, student-student dialog, student-instructor dialog, self-regulated learning, and

perceived learning results were all elements in e-learning systems being viewed as success factors in Higher Education (Eom & Ashill, 2018) the proliferation of measures of dependent and independent variables has been overelaborated. We argue that a significant reduction in dependent and independent variables and their measures is necessary for building an e-learning success model, and such a model should incorporate the interdependent (not independent).

E-learning may improve students' knowledge management and learning management system innovation. The relationship between e-learning and knowledge management (Dahou et al., 2019; Eom & Ashill, 2018; Holsapple & Lee-Post, 2006; Soffer & Nachmias, 2018) the proliferation of measures of dependent and independent variables has been overelaborated. We argue that a significant reduction in dependent and independent variables and their measures is necessary for building an e-learning success model, and such a model should incorporate the interdependent (not independent has been considered to be explored in order to develop the learning management system. Besides, the knowledge management theory perceived as the main factor and/or as crucial dimensions in the learning governance development and businesses of all types and sectors (Calcado et al., 2022; Dahou et al., 2019; Fernandez-Gimenez et al., 2019; D. Maier et al., 2015; Ronald, 2007) yet few longitudinal studies examine how learning occurs in CAM or apply the science of learning to interpret this process. We present an analysis of decision-making processes within the collaborative adaptive rangeland management (CARM. Open University in Indonesia is the one kind of university delivering a distance learning postgraduate programs. There are many programs innovations have been conducted, such as e-learning programs, the Massive Open Online Courses (MOOCs), and the Learning Management System in the Open University in Indonesia. However, Open University has faced challenges to how to improve the academic learning outcomes for postgraduate students and make the students more attractive to learn, satisfaction, and ease to improve their chance for success. This research proposes a model of e-learning practiced in the postgraduate students' academic achievement at Open University in Indonesia.

This research focus on to measure the effect of e-learning perspective on the postgraduate students' academic performance and learning management system in Open University in Indonesia. Based on the previous description, this study purposes to analyze the impact of e-learning perspective on knowledge management and learning management system effectiveness for improving the postgraduate students' academic performance in Open University in Indonesia. The need for such innovations is highlighted by prior studies, which emphasize the importance of aligning e-learning strategies with knowledge management practices to support student learning and improve organizational effectiveness (Rulinawaty et al., 2024). Furthermore, this research seeks to measure the impact of e-learning on knowledge management and its role in improving postgraduate academic outcomes.

E-Learning Practiced

E-learning systems have undergone considerable evolution, particularly due to the global shift towards online education in recent years. These systems comprise multiple dimensions, such as instructional design, learner engagement, technological readiness, and the adoption of innovative teaching methodologies. Instructional design, as noted by Bilgic & Tüzün, (2020), plays a foundational role in ensuring the success of e-learning, particularly in environments that differ from traditional face-to-face education. Effective instructional design, aligned with established learning theories, enhances both the course structure and the educational experience (Afifi & Alamri, 2014). Additionally, (Ucar & Ugurhan, 2023) suggests that learners' readiness for e-learning significantly affects their self-regulation, an essential skill for thriving in digital education.

Moreover, learner engagement is critical for fostering deeper interaction with course content. Mirmoghtadaie & Ahmady (2019) assert that active learner participation is key to developing higher-order thinking skills, while Demir et al., (2023) catalysis, drug storage and delivery. The number of MOFs and their potential applications are growing so quickly that, when novel MOFs are synthesized, testing them for all possible applications is not practical. High-throughput computational screening approaches based on molecular simulations of materials have been widely used to investigate MOFs and identify the optimal MOFs for a specific application. Despite the growing computational resources, given the enormous MOF material space, computational identification of promising MOFs requires more efficient approaches in terms of time and effort. Leveraging data-driven science techniques can offer key benefits such as accelerated MOF design and

discovery pathways via the establishment of machine learning (ML emphasize the role of learner autonomy in improving satisfaction and performance. Social connectedness, fostered through interactive elements like discussion forums, further contributes to this engagement (Slagter van Tryon & Bishop, 2012).

Technological readiness also profoundly impacts e-learning success. According to Madi Odeh et al., (2023), the availability of technological resources and continuous support are critical for sustaining effective online learning, particularly during crises like the COVID-19 pandemic. The Technology Acceptance Model (TAM) demonstrates that ease of use and perceived usefulness are significant factors influencing learners' engagement with e-learning platforms (Demirer & Baki, 2018). Alshammari, (2020) further highlights that instructional design and self-efficacy play important roles in facilitating students' use of Learning Management Systems (LMS).

The COVID-19 pandemic spurred innovative approaches to e-learning, including the increased adoption of blended learning models, which have been shown to improve student satisfaction and outcomes (Cakir & Solak, 2014). However, studies like that of Kisacik et al., (2023) $p = 0.001$ also recognize the limitations of fully online education, particularly in fields like nursing, where hands-on training remains indispensable.

Finally, the evaluation of e-learning practices is vital for continual improvement. Frameworks proposed by Barbera et al., (2016); Gomez-Rey et al., (2016) for assessing the quality of online education through both teacher and student perceptions, align with the findings of Cigdem & Ozturk, (2016) on the importance of evaluating e-learning readiness in relation to learner achievement. By continually refining these practices, institutions can better meet the diverse needs of their learners and enhance the efficacy of e-learning systems.

Knowledge Management

The integration of knowledge management (KM) into e-learning systems is critical, particularly in the context of distance education, such as at the Open University of Indonesia (OUI). KM involves processes for creating, sharing, and managing knowledge within an organization, and its application in e-learning can significantly improve educational outcomes, encourage collaboration, and drive continuous enhancements in pedagogical approaches.

A key dimension of KM in e-learning is the facilitation of knowledge sharing and collaboration through technology. Cakir & Solak. (2014) demonstrate that blended learning models, which combine face-to-face interaction with online components, can lead to enhanced student satisfaction and better learning outcomes. Tan (2016) universities face issues that may hinder active sharing among its faculty members such as the absence of trust among its members or insufficient incentives rewarded to those who deserved it. The aim of this research is to focus on the impact of knowledge management (KM expands on this by emphasizing the role of student interactions in open distance learning, where effective KM practices foster meaningful exchanges of knowledge among learners and educators. These findings highlight that technological integration is essential not only for the dissemination of knowledge but also for cultivating a collaborative learning environment, crucial for the success of KM.

Additionally, the experiences of both educators and learners in online settings play a pivotal role in determining the effectiveness of KM practices. Radiansyah et al. (2023) reveals that educators' proficiency with technology and pedagogical strategies in online learning environments directly influences the success of KM. This is particularly relevant for open universities, where faculty often face unique challenges in adapting to digital teaching methods. Strengthening educators' KM competencies can enhance overall teaching effectiveness and student outcomes.

Another vital component is self-regulated learning, which is closely linked to KM. Ucar & Ugurhan, (2023) highlights that learners with strong e-learning readiness are better at self-regulating their learning processes. This ability to manage one's own learning is integral to KM, as it empowers students to actively seek knowledge, engage with peers, and collaborate in the creation of new learning experiences. The interplay between self-regulation and KM emphasizes the need for educational environments that promote learner autonomy.

Institutional support is also essential for the successful integration of KM into e-learning. Kisacik et al. (2023) argue that innovative teaching methods are critical for incorporating e-learning into various disciplines, such as nursing education, which can serve as a model for other fields. This underscores the importance

of institutions providing frameworks that encourage KM practices, such as collaborative platforms and resources that facilitate knowledge exchange among both faculty and students.

Finally, ongoing evaluation of e-learning practices is crucial for the continuous improvement of KM. (Afify Et Al., 2023) highlights the necessity of establishing clear criteria for assessing the quality of virtual learning environments. This approach allows institutions to identify best practices in KM and refine their strategies to ensure the continuous development of effective e-learning environments. The challenges posed by the COVID-19 pandemic have further demonstrated the need for adaptive KM frameworks to support evolving educational demands, as noted by Henderikx et al. (2019), who observed that barriers to participation in MOOCs can significantly impact learner satisfaction and outcomes.

In conclusion, effective knowledge management within e-learning is fundamental to improving educational outcomes and fostering collaboration in open universities. The integration of technology, learner engagement, institutional support, and continuous evaluation are all vital components that contribute to the success of KM in these contexts. As educational institutions adapt to the increasing demands of online learning, a robust focus on KM will be essential to achieving sustainable success.

Massive Open Online Courses (MOOCs)

Massive Open Online Courses (MOOCs) have significantly transformed the educational landscape by making learning opportunities more accessible and flexible to a global audience. This innovation in e-learning spans various dimensions, including learner engagement, course design, retention challenges, and the influence of technological advancements. These aspects, when examined through the lens of existing scholarly literature, reveal both the potential and challenges associated with MOOCs in promoting effective online education.

A crucial factor influencing the effectiveness of MOOCs is learner engagement. Henderikx et al. (2019) discuss how participant interaction is critical in enhancing satisfaction within online learning environments, particularly in MOOCs where traditional interaction is often limited. Peer assessment is highlighted as a valuable strategy for fostering community and providing feedback among learners. This aligns with Lan & Hew. (2020) and helping learners and instructors understand how learning engagement is constructed in a MOOC context is of increasing importance. Although previous research has undoubtedly enriched our knowledge of MOOCs, our understanding of student engagement in the MOOC context is still limited. This study adopts a sequential explanatory mixed-methods approach to examine student engagement in MOOCs from the self-determination theory (SDT) findings that positive student experiences in MOOCs are often tied to meaningful interactions with peers and instructors. These studies emphasize that designing MOOCs with interactive components is essential for enhancing learner engagement and overall satisfaction.

However, retention rates remain a significant challenge in MOOCs. Gomez-Rey et al. (2016) report dropout rates as high as 86%, consistent with findings that online courses typically face higher abandonment rates compared to traditional settings. Henderikx et al. (2019) further explore factors influencing persistence in MOOCs, noting the importance of course relevance and the role of the instructor. Addressing these factors is critical for developing strategies that improve completion rates, a key barrier to the effectiveness of MOOCs.

The design of MOOCs plays a central role in shaping the learning experience. Tlili et al. (2022) reflect on the challenges posed by the transition to online learning during the COVID-19 pandemic, underscoring the importance of robust pedagogical strategies and technological infrastructure to support learners. Zhu et al., (2021) argue that MOOC design must cater to diverse learner needs, incorporating strategies to address cultural diversity in both design and delivery. Inclusive design principles are essential for making MOOCs accessible and effective for a global audience.

Technological advancements have also had a profound impact on MOOCs. Innovations like artificial intelligence and gamification are being integrated to improve learner engagement. Medina-Labrador et al., (2023) explore the use of biometric recognition technology in MOOCs, suggesting that such advancements could enhance personalized learning experiences. As technology continues to evolve, it is imperative that MOOCs adapt to leverage these innovations for better engagement and learning outcomes.

Self-regulated learning is another key factor in MOOC success. Albelbisi & Yusop. (2019) emphasize

that learners with strong self-regulation skills are more likely to actively engage with course materials and complete MOOCs. Therefore, MOOC designers should incorporate elements that promote self-regulation, such as goal-setting and reflection activities, to help learners manage their learning processes more effectively.

The impact of MOOCs on traditional educational models raises important considerations for the future of higher education. Albelbisi & Yusop, (2019) highlights the need for a shift towards more learner-centered approaches, where educators facilitate rather than dictate the learning experience. This transition challenges conventional pedagogical models, necessitating a reevaluation of the role of educators in the context of MOOCs and online education.

MOOCs represent a significant innovation in the field of e-learning, offering the potential to democratize education and provide flexible learning opportunities. However, the complexity of MOOCs requires careful consideration of various factors, such as learner engagement, course design, retention rates, and technological integration. By addressing these challenges and maximizing the strengths of MOOCs, educational institutions can enhance the effectiveness of online learning and better meet the needs of a diverse and evolving learner population.

Research Frameworks

E-learning practices play a significant role in promoting knowledge management (KM) and facilitating knowledge transfer within organizations and educational institutions. KM, in conjunction with e-learning, supports the development of organizational learning and enhances both teaching and learning processes (Abass et al., 2021; Al-Emran & Teo, 2020; Razzaque, 2020; Soltani et al., 2020) this requires online participation through quality knowledge sharing (KS). In higher education, e-learning has been linked to improvements in student performance and satisfaction, particularly as digital technologies reshape educational models.

A widely recognized model in the context of e-learning and information systems (IS) is the DeLone and McLean IS Success Model, originally proposed by DeLone & McLean, (2002, 2003, 2004). This model assesses the success of information systems through six key dimensions: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. When applied to e-learning, these dimensions provide a framework for evaluating the effectiveness of e-learning platforms, particularly regarding their ability to enhance student satisfaction, learning experiences, and academic achievements (DeLone & McLean, 2003).

Extended this model within the context of higher education, emphasizing its application in the development of students' skills, learning styles, and overall academic achievements. This extension highlights the significance of adapting the D&M IS Success Model to suit the evolving digital and technological landscape of education, particularly in fostering self-regulated learning and improved performance in e-learning environments.

Based on this theoretical foundation, the following hypotheses are proposed to examine the impact of e-learning innovations and KM on postgraduate students' (El-Sabagh, 2021) academic achievement at the Open University of Indonesia:

Hypothesis 1: E-learning practices innovation effects on knowledge management in Open University in Indonesia.

Hypothesis 2: E-learning practised innovation effects on Massive Open Online Courses (MOOCs) in Open University in Indonesia.

Hypothesis 3: Knowledge management effects on Massive Open Online Courses (MOOCs) in Open University.

Hypothesis 4: Knowledge management effects on the postgraduate student's academic achievement in Open University.

Hypothesis 5: Massive Open Online Courses (MOOCs) effects on postgraduate student academic achievement in Open University in Indonesia.

Figure 1 this research framework seeks to analyze how e-learning innovations and KM practices contribute to students' academic success in open universities, where online platforms such as MOOCs have become an important tool in delivering educational content and encouraging student engagement.

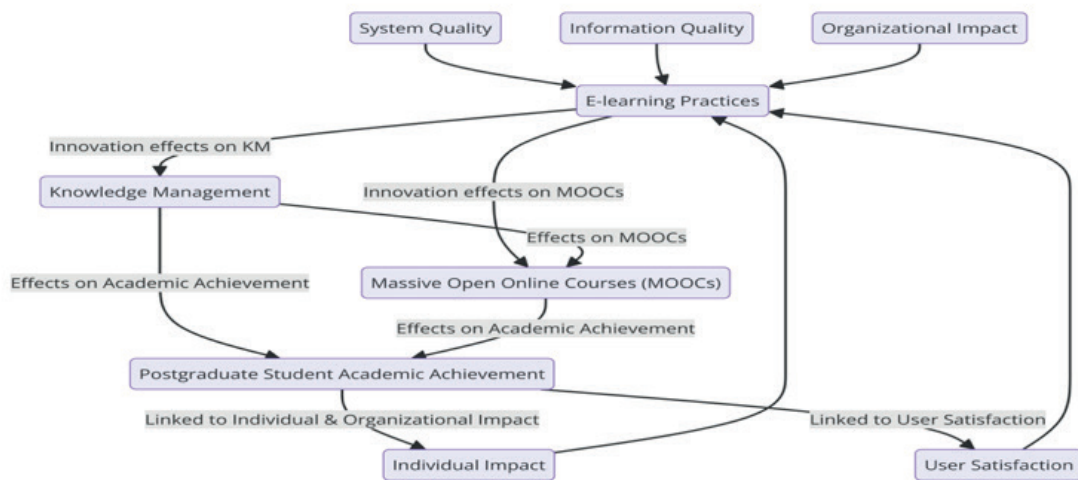


Figure 1. Research framework of e-learning and knowledge management

RESEARCH MODEL

In developing MOOCs model, we combine two perspective of MOOCs such as efficacy based on Ghazali et al. frameworks such as information searching, making queries, MOOC Learning, MOOC usability (El-Sabagh, 2021) also involved media unit for production, platform digitalization, social media team, academic content, and academic development (Kerr et al., 2019). Meanwhile, regarding postgraduate students' achievement, in this study, we use five dimensions such as cooperative learning, active learning, authentic learning, constructive learning, and intentional learning. According to the relevant literature description previously, we then provide the research frameworks as seen in the following figure:

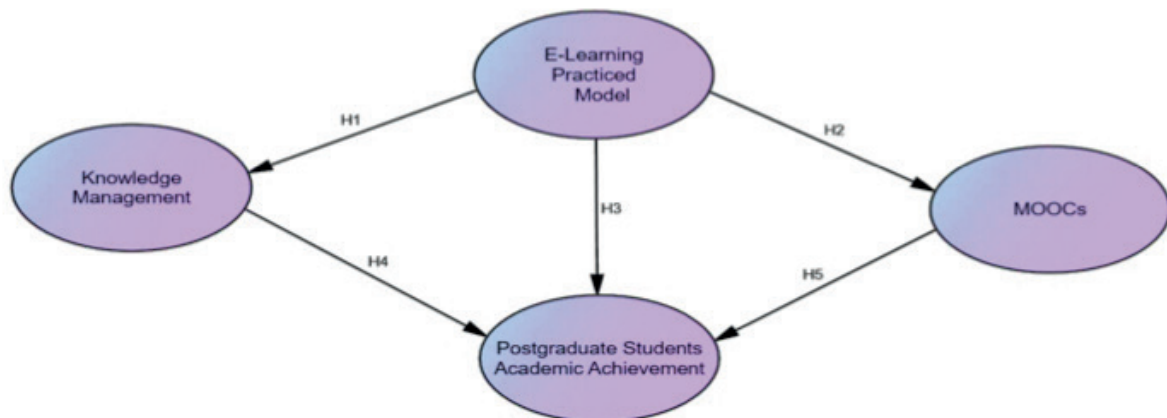


Figure 2. Theoretical Model

METHOD

The structural equation modelling (SEM) was applied using AMOS windows version 24 has had which was beneficial in analyzing data and measuring the five hypotheses proposed in the study. AMOS was chosen as is is a popular software with a distinctive Graphical User Interface (GUI) for resolving structural equation modeling issues. AMOS offers a user-friendly graphical or programmatic interface for assessing the intricate connections between the components (Arbuckle, 2013; Hair Jr Joseph et al., 2009; Thakkar, 2020). The sample was selected using a stratified random sampling technique, targeting 155 postgraduate students across Open University, Indonesia, ensuring representative coverage. Data was collected through structured questionnaires using a 6-point Likert scale. The structural model employed in this study included relationships between continuous or discrete independent variables (IVs) and dependent variables (DVs), analyzed through SEM(Ullman, 2015).

Variable Measurement

This study investigates four core variables: e-learning practices, knowledge management systems (KMS), Massive Open Online Courses (MOOCs), and postgraduate student academic achievement. Each variable was measured using a set of indicators grounded in existing literature to ensure comprehensive analysis.

1. *E-Learning Practices:*

The measurement of e-learning practices includes a variety of elements that reflect the diverse nature of online education. These include proactive searching, repetition, interactive learning, presentation style, computer operation skills, e-learning content, media-based learning, technology and equipment availability, and video-based learning (Bonk et al., 2006; Ghazali et al., 2020; Ullman, 2015). These factors collectively capture the technological and instructional aspects necessary for effective e-learning environments.

2. *Knowledge Management Systems (KMS):*

KMS in this study encompass dimensions such as the ability to capture knowledge, socialization, externalization, skill development, collaboration in learning, pedagogical techniques, cognitive structuring, and internalization (Al-Sharafi et al., 2021; Alavi & Denford, 2012; Garcia-Penalvo et al., 2017; Nonaka & Toyama, 2005). These dimensions highlight the processes by which knowledge is created, shared, and utilized, with a focus on enhancing collaborative learning and pedagogical effectiveness.

3. *Massive Open Online Courses (MOOCs):*

MOOCs were measured based on accessibility, user interaction, learning content quality, and technical usability. These factors align with the increasing reliance on MOOCs in higher education and their impact on educational inclusivity and learner engagement (Albelbisi & Yusop, 2019a, 2019b; Tlili et al., 2022). MOOCs offer flexible learning opportunities and address diverse learner needs through adaptive course designs.

4. *Postgraduate Student Academic Achievement:*

The academic achievement of postgraduate students is the final dependent variable, measured through indicators such as student engagement, satisfaction, learning outcomes, and skill development. These indicators reflect the broader goal of improving educational quality and student success in distance learning contexts (Solak & Cakir, 2014; Williams, 2015).

Then, the research instruments based on those literature review for measuring the validity and reliability items previously. Before measuring the research hypotheses, we need to conduct the piloting research for measuring the validity and reliability data. We have tested the instruments by using 45% of respondents of this research. According to the piloting research, we found each dimension of this study as presented in the following table:

Table 1. The central tendency values, reliability, and validity instrument test results.

Variabel	Indicators	Codes	Min.	Max.	Mean	Mean	SD	Validity	Reliability
E-Learning Practoiced (ELP)	Interactive learning	ELP3	1	6	3.71	3.71	1.49	0.631	0.933
	Presentation style	ELP4	1	6	3.929	3.929	1.3	0.709	0.932
	Computer operation	ELP5	1	6	3.923	3.923	1.307	0.7	0.932
	Media based learning	ELP7	1	6	3.916	3.916	1.297	0.696	0.934
	Technology & equipment availability	ELP8	1	6	3.916	3.916	1.297	0.696	0.934
Knowledge Management (KM)	Individual ability	KM5	1	6	3.845	3.845	1.538	0.646	0.933
	Skillful learning	KM6	1	6	4.381	4.381	1.397	0.55	0.935
	Learning collaboration	KM7	1	6	3.961	3.961	1.111	0.551	0.935
	Pedagogical techniques	KM9	1	6	4.194	4.194	1.542	0.624	0.934
	Cognitive structure	KM10	1	6	4.813	4.813	1.566	0.659	0.934
Massive Open Online Courses (MOOCs)	MOOC learning	MOOC3	1	6	3.639	3.639	1.456	0.633	0.933
	MOOC usability	MOOC5	1	6	3.761	3.761	1.464	0.735	0.934
	Media units for production	MOOC6	1	6	5.826	5.826	1.512	0.728	0.932
	Platform adaptation	MOOC7	1	6	5.995	5.995	1.512	0.728	0.932
	Academic content	MOOC9	1	6	5.955	5.955	1.34	0.65	0.933
Postgraduates Student Academic Achievement (IPSA)	Cooperative learning	PSAA4	1	6	4.187	4.187	1.393	0.418	0.934
	Constructive learning	PSAA6	1	6	4.391	4.391	1.191	0.566	0.937
	Self-regulated learning	PSAA7	1	6	4.329	4.329	2.11	0.585	0.956
	Learning outcome refocusing	PSAA9	1	6	4.477	4.477	1.107	0.531	0.935

Source: Author 2022

The results of items measured based on SPSS analysis shows that the validity and reliability of the measurement instruments were evaluated through piloting with 45% of the total respondents. Each dimension was rigorously tested for internal consistency using SPSS, yielding a reliability coefficient above 0.91, indicating high instrument reliability. In terms of validity, the analysis produced values above 0.55 for each variable, confirming the construct validity of the instruments, we find the factor loading, AVE, and CR which describe in the Table 2.

Table 2. Standardized Loading Factor, Average of Variance Exracted, and Composite Reliability

Variable	Indicators	Codes	Standardized Factor Loading	AVE	CR
E-Learning Practiced (ELP)	Interactive learning	ELP3	0.796	0.781	0.889
	Presentation style	ELP4	0.794		
	Computer operation skill	ELP5	0.99		
	Media based learning	ELP7	0.991		
	Technology digitalization equipment availability	ELP8	0.978		
Knowledge Management (KM)	Individual ability	KM5	0.809	0.723	0.836
	Skillful learning	KM6	0.788		
	Learning collaboration	KM7	0.901		
	Pedagogical techniques	KM9	0.893		
	Cognitive structure	KM10	0.856		

Massive Open Online Courses (MOOCs)	MOOC learning	MOOC3	0.678	0.721	0.838
	MOOC usability	MOOC5	0.861		
	Media units for production	MOOC6	0.898		
	Platform digitalization	MOOC7	0.922		
	Academic content	MOOC9	0.834		
Postgraduates Student Academic Achievement (PSAA)	Cooperative learning	PSAA2	0.737	0.748	0.858
	Active learning	PSAA4	0.804		
	Constructive learning	PSAA7	0.914		
	Self-regulated learning	PSAA9	0.873		
	Learning outcome refocusing	PSAA10	0.976		

Source: Author 2022

Table 2 shows that Using AMOS, the study analyzed convergent validity and factor loading for each item, along with the **average variance extracted (AVE)** and **composite reliability (CR)**. The analysis revealed that all items met the required thresholds, ensuring no violations of statistical assumptions. The results showed:

- *E-learning practices*: AVE = 0.781, CR = 0.889
- *Knowledge management*: AVE = 0.723, CR = 0.838
- *MOOCs*: AVE = 0.721, CR = 0.838
- *Postgraduate student academic achievement*: AVE = 0.748, CR = 0.858

These values confirm that each construct's variance exceeds 70%, establishing the robustness of the measurement model.

To ensure the validity of the structural equation modeling (SEM), various fit indices were calculated, including Chi-Square, CMIN/DF, RMSEA, GFI, AGFI, TLI, and CFI. All indices met the acceptable thresholds (Hair et al., 2014), confirming that the proposed model adequately fits the data and can be used to test the hypotheses.

Table 3. The Statistical Measurements of Goodness of Fit of Structural Modelling Results.

Fit Model Criteria	Cut-Of Values Model	The Obtained Results	Labelling
X²-CHI-SQUARE	Intended small value	235.664	Fitted
Probability	≥ 0.05	0	Fitted
CMIN/DF	< 2.00	1.473	Fitted
GFI	≥ 0.90	0.987	Fitted
AGFI	≥ 0.90	0.938	Fitted
TLI	≥ 0.95	0.976	Fitted
CFI	≥ 0.95	0.979	Fitted
RMSEA	≤ 0.08	0.55	Fitted

Source: Adapted from Hair et.al. (2014)

Hypotheses Measurement

The results of the structural equation modeling (SEM) indicate that the proposed model fits well with the data, as confirmed by Table 3. This model was used to test the five hypotheses set forth in this study, all of which were found to be significant. Each hypothesis showed a positive and significant relationship, supporting the study's framework for understanding how e-learning innovations, knowledge management (KM), and MOOCs impact postgraduate student academic achievement at the Open University of Indonesia.

The findings are as follows:

1. *Hypothesis 1:* E-learning practice innovations have a positive and significant impact on knowledge management at the Open University of Indonesia. This supports existing theories that highlight the role of e-learning in enhancing knowledge creation, sharing, and management within educational institutions (R. Maier & Schmidt, 2007; Yordanova, 2007). The findings suggest that when designed effectively, e-learning can foster better knowledge management processes, which, in turn, improve learning outcomes.
2. *Hypothesis 2:* E-learning practice innovations positively and significantly affect the implementation of MOOCs at the Open University of Indonesia. This confirms prior research indicating that well-structured e-learning systems can facilitate the growth and effectiveness of MOOCs (Solak & Cakir, 2014). The success of MOOCs, in this context, is enhanced by technological readiness and instructional design, which align with theories on digital learning frameworks (Ghazali et al., 2020) making queries, MOOC learning, and MOOC usability.
3. *Hypothesis 3:* Knowledge management has a positive and significant impact on MOOCs. This supports the idea that successful knowledge management systems are crucial for the development and scalability of MOOCs (Al-Sharafi et al., 2021). Effective KM systems ensure the quality of content, support collaborative learning, and help students navigate vast digital resources more efficiently, which enhances the MOOC experience.
4. *Hypothesis 4:* Knowledge management significantly influences postgraduate student academic achievement at the Open University of Indonesia. This aligns with existing literature, which suggests that knowledge management is essential for improving academic performance by providing a structured approach to knowledge dissemination and student engagement (Alavi & Denford, 2012). The results suggest that institutions focusing on robust KM practices can better support student learning and innovation.
5. *Hypothesis 5:* MOOCs have a positive and significant effect on postgraduate student academic achievement at the Open University of Indonesia. The findings support the theory that MOOCs offer flexible, accessible learning opportunities that can positively impact student success (Williams, 2015). The success of MOOCs in enhancing academic performance is tied to their ability to provide engaging, high-quality content that aligns with student needs and learning styles (Medina-Labrador et al., 2023).

These findings have significant implications for educational policy and practice, particularly in open universities and distance learning settings:

- *For Educational Settings:* The study demonstrates that e-learning innovations, combined with effective knowledge management systems, are critical for improving both MOOCs and overall academic achievement. Institutions should invest in the development of e-learning infrastructures that promote interaction, accessibility, and collaboration to maximize student outcomes.
- *For Policy-Making:* Policymakers should consider these results when designing educational programs, especially in the context of distance learning and MOOCs. A focus on integrating knowledge management into e-learning systems can enhance the effectiveness of MOOCs, making education more accessible to diverse populations

The positive and significant relationships between the variables confirm that e-learning practices, knowledge management, and MOOCs are critical components for improving academic achievement in open university settings. These findings reinforce existing educational theories and provide a foundation for future research and policy-making focused on the intersection of technology, knowledge management, and student success.

Here, we describe the structural model analysis in the next table:

Table 4. The standardized regression weights result analysis.

Variable	Relation	Estimate	S.E.	C.R.	P	Label
KSM	<--- ELP	0.313	0.078	4.002	***	Accepted
MOOC	<--- KSM	0.25	0.059	4.258	***	Accepted
MOOC	<--- ELP	0.423	0.061	6.895	***	Accepted
PSAA	<--- KSM	0.194	0.084	2.319	0.02	Accepted
PSAA	<--- MOOC	0.288	0.108	2.654	0.008	Accepted

Source: Primary Data Anaysis, 2022; S.E=Standard Error; C.R=Critical Ratio; P= Probability.

***=significant for ----=0.01,0r ...=0.05

DISCUSSIONS AND CONCLUSION

The results of this study confirm that e-learning practice innovation has a significant impact on knowledge management at the Open University of Indonesia. This aligns with previous research, showing that that e-learning innovations enhance students' abilities, motivation, satisfaction with learning, and overall educational outcomes (Afify et al., 2023; Fung Choy & Quek, 2016)design, and goal setting to create an effective learning environment. Virtual distance education involves more than just uploading educational content; it is rather an educational process that provides choice for learners, as well as flexibility and responsibility for learning and academic support. In this context, the aim of this research is to determine the quality criteria for designing virtual classrooms with their different styles (synchronous, asynchronous, and blended. Improved e-learning systems foster better engagement, making education more accessible and interactive (Bilgic & Tuzun, 2020; Venugopal & Jain, 2016). These results support the hypothesis that e-learning innovations positively affect knowledge management, enhancing student experiences and optimizing knowledge-sharing systems within educational institutions.

Similarly, the second hypothesis was confirmed: e-learning practices positively influenced the effectiveness of MOOCs at the Open University of Indonesia. This finding supports prior studies that emphasize the importance of well-designed e-learning platforms in increasing the accessibility and success of MOOCs (Albelbisi & Yusop, 2019a; Solak & Cakir, 2014). The positive relationship between e-learning innovations and MOOCs suggested that technological enhancements and improved instructional design could make MOOCs more effective learning tools.

The third hypothesis, which suggests that knowledge management positively affects MOOCs, was also supported. Knowledge management systems provide essential frameworks for the success of MOOCs by ensuring content quality and facilitating collaborative learning (Al-Sharafi et al., 2021; Mirmoghtadaie et al., 2019). These findings confirm that effective knowledge management enhances adaptive learning and the scalability of MOOCs, especially in higher education. This is consistent with theories that integrate knowledge management with e-learning to enhance adaptive learning and MOOC development (Sein-Echaluze et al., 2017). The study highlights five key elements of knowledge management—individual ability, collaboration, pedagogical techniques, cognitive engagement, and student involvement—which were crucial for the growth and effectiveness of MOOCs in higher education.

The fourth hypothesis—that knowledge management has a positive effect on postgraduate academic achievement—was validated by the findings. Knowledge management served as the foundation for developing student performance by fostering innovation and ensuring that learners had access to updated, relevant information (Barbaroux, Pierre, Amel Attour, 2016). The integration of knowledge management into e-learning systems also supported the infrastructure needed for data security, student confidence, and technological adaptability (Alavi & Denford, 2012; Cakir & Solak, 2014) . Thus, knowledge management was critical for optimizing learning environments in universities

The fifth hypothesis was confirmed that MOOCs positively affected postgraduate academic achievement. This aligns with existing research, which shows that MOOCs offer participatory and interactive learning opportunities that contribute to student satisfaction and knowledge development (Alhazzani et al., 2020; Lan & Hew, 2020). MOOCs provide flexibility, enabling students to access high-quality educational materials at

their own pace. These platforms also offered students access to pre-recorded lectures and other educational resources from experts, which enhanced their learning experiences (Waldrop, 2013) . As such, MOOCs were an effective tool for improving academic achievement in open universities, especially in remote and digital learning contexts.

The findings of this study had significant implications for educational policy and practice. First, universities needed to prioritize the development of e-learning systems that integrate knowledge management to enhance student engagement and learning outcomes. E-learning platforms needed to be designed with interactive features that foster collaboration and enable seamless access to educational resources. For policymakers, these findings suggested that investment in technological infrastructure and teacher training was crucial for improving the quality of MOOCs and e-learning in higher education. Furthermore, knowledge management systems needed to be incorporated into the broader educational framework to ensure that both students and faculty could access, share, and manage knowledge effectively (Luisa Sein-Echaluce et al., 2016).

In conclusion, e-learning innovations, when combined with effective knowledge management practices, significantly enhanced the academic achievement of postgraduate students at the Open University of Indonesia. The findings confirm that e-learning practices and MOOCs were critical for improving educational outcomes in open and distance learning environments. By integrating technological advancements and fostering collaboration through knowledge management, universities can create flexible, engaging learning environments that meet students' diverse needs. This highlighted the importance of prioritizing e-learning systems and knowledge management to maximize educational success.

Limitations and Future Research

This study is limited to the context of the Open University of Indonesia, which may affect the generalizability of the results to other institutions or countries. Additionally, the study focuses on postgraduate students, and further research could examine how e-learning practices and MOOCs impact undergraduate or professional learners. Future research should also explore the long-term effects of knowledge management on academic achievement and investigate how MOOCs can be further improved to increase retention rates, given the high dropout rates typically associated with these courses.

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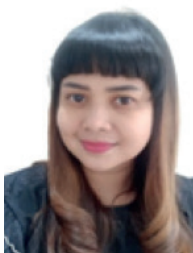
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WHAT DO TEACHERS SAY ABOUT METAVERSE IN EDUCATION?

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ABSTRACT

The metaverse, which has a history of about thirty years in written literature, became the agenda of humanity again in the first quarter of the twenty-first century. Although it seems almost impossible today to draw the boundaries of the experience that this technology, which arouses great excitement, will offer, it is possible to say that humanity is on the verge of going beyond reality. Similarly, for the metaverse, which is expected to offer new generation solutions in terms of educational applications, teachers' opinions and expectations on the subject constitute an important reference when planning the near future. Considering this situation, 333 teachers were asked about their opinions, expectations, and suggestions regarding the use of metaverse in education. The responses of the teachers participating in the research indicate that teachers are optimistic about the advantages to be gained in the educational context with the metaverse, but the education system is not yet ready for this.

Keywords: Metaverse, augmented reality, virtual reality, three-dimensional virtual world, distance education.

INTRODUCTION

Many technologies that increase the quality of life of individuals and save speed and time are first described in science fiction books or films. For this reason, science fictional outputs can be defined as one of the important proofs of what people can achieve if they follow their dreams. It can be said that a similar situation is the case with the metaverse, in which large technology companies invest and are the subject of research today. The metaverse, which found its place only in science fiction books in the nineties, was introduced to Second Life in 2003, followed by Roblox in 2006, Pokemon Go in 2015, and finally Fortnite in 2016. The metaverse, which has reached millions of users in this process, has recently started to lead the investment, and working areas of technology companies such as Facebook and Microsoft.

The ability to collaborate, experience a scenario firsthand, or closely inspect an object makes the metaverse stand out when examining current research and applications. Because of this, the metaverse enables students to interact practically with difficult ideas. For example, students can engage in simulations of scientific investigations or digitally tour ancient civilizations rather than only reading about historical events (Eschenbrenner, Nah, & Sau, 2008). Additionally, teachers can customize learning experiences to meet the

requirements and preferences of each individual student thanks to the flexibility of metaverse environments. Because students may work at their own pace and get guidance that is appropriate to their needs, this personalization can result in more effective learning results (Onu, Pradhan, & Mbohwa, 2024; Tinmaz & Fanea-Ivanovici, 2024). Beyond all of these advantages, the metaverse offers a risk-free environment for honing abilities that could be hazardous or unfeasible in the actual world, including performing laboratory tests or medical treatments. In disciplines like engineering and medicine, where students can learn through simulations with no real-world repercussions, this characteristic is very helpful (Hwang & Chien, 2022; Onu et. al., 2024)

On the other hand, metaverse has some limitations in terms of pedagogical use. For example, although it is possible to observe and experience the situation from a first-person perspective with metaverse, it becomes difficult for the teacher to monitor the students in this situation (Eschenbrenner et al., 2008). However, simulations enriched with augmented reality require more mental effort and effort from the user (Xi, Chen, Gama, Riar, & Hamari, 2022). Similarly, although virtual reality applications offer users a more entertaining and highly present learning experience compared to traditional media, they do not create a significant difference in terms of learning (Makransky, Andreasen, Baceviciute, & Mayer, 2021). Similar requirements apply to the usage of the metaverse in education: dependable platforms, high-quality network connectivity, and device accessibility (Onu et., al., 2024). It is also necessary to provide educators with training, both before and during their careers, in order to enable them to utilise metaverse tools effectively in their teaching practices (Tinmaz& Fanea-Ivanovici, 2024). In consideration of the aforementioned results, it is evident that the metaverse will not serve as a straightforward replacement for the conventional learning environment. (Sharma, Devreaux, Scribner, Grynovicki, & Grazaitis, 2017). Metaverse indicates that it promises great changes and transformations in terms of education. Therefore, there is a need for research on metaverse applications in educational context. In this context, first of all, there is a need to determine the opinions and readiness of teachers as the implementer of the system. The objective of this research is to ascertain the potential of metaverse integration in the field of education and to identify the requirements for its implementation. To this end, the study will investigate the extent of teachers' knowledge about the use of metaverse in education, their perceptions of its advantages and disadvantages and their views on its areas of application. Furthermore, the following are the sub-objectives of this study:

- to find out how much instructors know about using the metaverse in the classroom.
- to find out how educators view the benefits and drawbacks of the metaverse in the classroom.
- to ascertain which educational domains, in the perspective of educators, are more suited for the metaverse.
- to ascertain when it would be best to incorporate Metaverse applications into classroom settings.
- to discuss the possible obstacles to integrating the Metaverse into the classroom and the recommendations made by educators.

Theoretical Background

The metaverse is a bi-located virtual universe that allows individuals to be both “here” and “there” at the same time through their own avatar (Diaz, 2020; Schlemmer & Backes, 2015). From another perspective, as the end product of the development of artificial intelligence, robots, and intelligent systems, the metaverse is defined as a hybrid platform where technologies such as gaming, social media, and digital communities come together at the center of web 3.0, which offers the opportunity to create three-dimensional virtual worlds through the internet (Crespo, Escobar, Aguilar, Velazco, & Sanz, 2013; Schlemmer & Backes, 2015). Therefore, the metaverse is a technology built on the two axes illustrated in Figure 1, which is beyond the many platforms known today (Smart, Cascio, & Paffendorf, 2007).

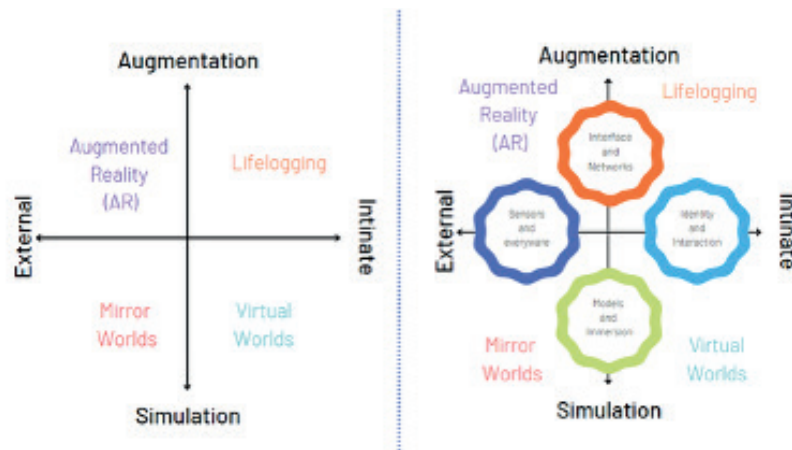


Figure 1. Metaverse types (Smart, Cascio and Paffendorf, 2007).

Considering Figure 1, it is classified that there are four metaverses that offer different experiences to users as (1) augmented reality, (2) lifelogging, (3) mirror world, and (4) virtual reality metaverse (Kye, Han, Kim, Park, & Jo, 2021). While augmented reality metaverses are smart environments networked with location-based technologies, life diary metaverses are platforms where people share information and experience (Lee, 2020; Smart et al., 2017). Mirror world metaverses are environments where real life is imitated (Lee, 2020; Smart et al., 2017). In this context, while the life diary metaverse is more focused on personal experience and is an environment where the individual shares, the mirror world metaverse is a platform where information about the external environment is integrated and shared. Finally, the virtual reality metaverse is a three-dimensional virtual world created using digital data (Lee, 2020; Smart et al., 2017).

Table 1. Types of Metaverse (Lee, 2020)

	Augmented Reality	Life Diary	Mirror World	Virtual Reality
Description	Creating smart systems with location- based and internet technology	Technology for storing and sharing everyday experiences and information about objects or people	A reflection of the real world	A virtual world in the light of digital data
Features	Intelligent systems Location based	Saving information	Modelling virtual maps and GPS technologies	Interaction through avatars
Assistive Technologies	Smartphones Head up display	Wearable technologies	Map services	Multi-user online games
Example of Metaverse Applications	Pokeman Go	Facebook, Instagram, Apple Watch	Google Earth, Yandex Navigation	Second Life, Minecraf, Roblox, Zepeto

When Table 1 is considered, it is seen that the virtual worlds expressed as the metaverse are not a brand new technology for humankind. However, when the recent search engine statistics are analyzed, it is possible to say that the metaverse has become a technology that attracts the attention of much wider masses (Google, 2022). In addition, although metaverse-focused studies in Web of Science and Scopus have existed since 2007, it is seen that the interest has increased, especially in recent years (Tlili et al., 2022). However, it is seen that not only the investments in this field but also the rapid remote working with pandemic conditions and the recognition of online platforms is an important factor supporting the interest in the metaverse (Tlili et al., 2022).

On the other hand, studies focusing on the metaverse have so far found a wide range of applications ranging from art (Romero, Viana, & Angel, 2016), media (Brennen, & Dela Cerna, 2010), education (Quintana & Fernandez, 2015), architecture and design (Jovanovic & Milosavljevic, 2022) to cultural events (Choi & Kim, 2017). Therefore, it is possible to say that metaverse is “a technology that will go beyond being a

means of entertainment and socialization” for the near future. However, from a philosophical point of view, especially from a constructivist perspective, the learning process is defined as the process that individuals realize together by sharing and in harmony (Steffe & Gale, 1995). The learner is not the object in education, but the leading role of the process itself, that is, the subject (Freire, 2015). Therefore, it is clear that it is essential to make the learning experience more flexible rather than confining it only within the school walls (Schlemme & Backes, 2015). In addition, with the developments in the field of artificial intelligence, programming, and intelligent systems, the need for studies in the field of technology, especially in these fields, is increasing day by day. For this reason, new generations need to follow technological developments and even provide them with learning opportunities where they can lead these developments (Giarratano & Ricley, 1998). From this point of view, it is possible to say that digital technologies in the learning environment are as natural as pen and paper for today’s generation compared to previous generations.

Although metaverse is a new technology, there are studies showing that it is as effective in terms of academic achievement as traditional methods in the learning-teaching process, as well as providing learners with digital competence, as well as providing the opportunity to practice more safely with less cost (Heo & Kim, 2021). For example, Siyav and Jo (2021) found in their research that metaverse-based nursing education encourages experiential learning for nursing students and that the learning experience becomes more efficient. In addition, the results indicated that students showed much more participation in the metaverse learning environment than in traditional learning environments and also attracted attention (Estudante & Dietrich, 2020). Metaverse has been used not only at university but also at many different levels up to secondary school level (Heo & Kim, 2021; Lopes & Gonalves, 2021). Similarly, it is seen that metaverse is used in the teaching of disciplines such as mathematics, and history as well as in direct application areas such as piloting (Choi & Kim, 2017; van der Stappen, Liu, Xu, Yu, Li, & van der Spek, 2019; Wangid, Rudyanto, & Gunartati, 2020). In addition to providing the opportunity to experience a situation as it really is, metaverse can also be used as a support system in the development of learning skills, especially in special education. In this context, Stichter, Laffey, Galyen, and Herzog (2013) state that it is useful to use this technology to help students with autism spectrum disorder gain social communication and interaction competencies.

Providing a freer learning experience to an individual has also become possible with the metaverse (Lopes & Gonalves, 2021). In addition, the cooperation and collaborative learning environment required to build knowledge together without the necessity of physically coming together becomes possible with the metaverse (Schlemme & Backes, 2015). Therefore, the metaverse has the potential to be an important aid in overcoming the transactional distance in distance education. At this point, it can be said that the fact that many virtual world universes, especially Second Life, can be integrated into the learning management system will contribute to the effective use of this potential (Warburton, 2009).

Teachers’ perspectives on the metaverse can provide valuable insights into its potential to enhance student engagement and learning outcomes. Research indicates that the metaverse can facilitate interactive and immersive learning experiences, which are essential for fostering student engagement. For instance, Pahmi highlights that teachers recognize the metaverse’s ability to enhance interaction, visualization, and accessibility, which can revolutionize student engagement, particularly for those who struggle with traditional teaching methods (Pahmi, 2023). This aligns with findings from Chen et al., who assert that the metaverse supports student-centered education and cultivates positive learning attitudes, thereby enhancing educational outcomes (Chen et al., 2023). Teachers’ opinions on these aspects are vital for understanding how to leverage the metaverse effectively in their classrooms.

Moreover, teachers’ attitudes towards the metaverse can influence their willingness to adopt and integrate this technology into their teaching practices. Jafari’s study reveals that the majority of teachers hold a positive attitude towards using the metaverse in science classes, believing it can simulate real-life activities and enhance social communication (Jafari, 2023). Such positive perceptions are crucial, as they can lead to increased adoption rates of metaverse technologies in educational settings. Conversely, negative perceptions or concerns about the metaverse’s effectiveness could hinder its integration. Therefore, understanding teachers’ opinions is essential for addressing potential barriers to adoption. Additionally, exploring teachers’ views on the metaverse can shed light on the necessary support and training required for effective implementation. Research by Yilmaz and Simsek emphasizes the need for well-informed individuals, including teachers and students, to facilitate the effective use of virtual reality and metaverse technologies in education (Yilmaz

& Simsek, 2023). This indicates that teachers may require professional development and training to feel confident in utilizing these technologies. By gathering teachers' opinions, educational institutions can better tailor their training programs to meet the specific needs and concerns of educators, ensuring a smoother transition to metaverse-based learning environments.

Furthermore, teachers' insights can help identify the challenges and limitations associated with the use of the metaverse in education. Gurkan and Bayer note that while metaverse platforms can enhance the quality of education, there are various factors to consider, such as infrastructure and accessibility issues (Gurkan & Bayer, 2023). Teachers can provide firsthand accounts of the challenges they face when integrating new technologies, which can inform policymakers and educational leaders about the necessary resources and support systems required for successful implementation. Understanding these challenges is crucial for developing strategies to overcome them and maximize the potential of the metaverse in education.

Lastly, exploring teachers' opinions on the metaverse can contribute to the broader discourse on educational technology and its implications for future teaching and learning practices. Research by Rahman emphasizes the need for educators to understand how metaverse technology can impact student engagement and academic performance (Rahman, 2023). By incorporating teachers' insights into the conversation, stakeholders can develop a more comprehensive understanding of the metaverse's role in education and its potential to reshape traditional pedagogical approaches.

METHOD

In this section, research design, sampling, data collection tool and analysis process will be discussed.

Research Design

This research, which aims to reveal the potential use of metaverse in education, its advantages and disadvantages, stakeholders' knowledge of the metaverse, the appropriate areas for its applications, the suitable timing for its implementation, and awareness of the stakeholders of the education system regarding metaverse practices in education, was designed as a survey study. Survey studies are studies that aim to objectively reveal the views of a large group of people on a specific topic based on questions such as "What is it?", "How is it?" or "What is it about?" (Buyukozturk, Ozturk, Kilic, Akgun, Karadeniz, & Demirel, 2016). From this point of view, it is possible to characterize survey studies as studies that explain the current situation in the light of the statistics obtained from the participants.

Within the scope of the research, 333 teachers from Türkiye were reached. Most of the participants were teachers working in private schools (N=171) or public/public schools (N=146). However, there are also those who continue their studies in different fields of the education sector (N=4) and those who are not actively teaching (N=12). However, among the participants; primary school teachers (18.6 %), English teachers (17.4 %) and computer and instructional technology teachers (14.7 %) stand out.

Table 2. Branches of the teachers participating in the study

Branch	Frequency (f)	Percentage (%)
ICT (Computer & Instructional Technologies)	49	14.7 %
Science	15	4.5 %
English Language	58	17.4 %
Mathematics	39	11.7 %
Pre-school	18	5.4 %
Counselling	11	3.3 %
Primary school teacher	62	18.6 %
Turkish Language	14	4.2 %
Other	67	20.1 %
Total	333	100%

While a great majority of the participants (59.5 %) had a bachelor's degree, the other big majority (37.8 %) of teachers consisted of teachers who had a master's degree.

Table 3. Educational background of the teachers participating in the study

Educational status	Frequency (f)	Percentage (%)
Associate degree	2	0.6 %
Bachelor's (Undergraduate) Degree	198	59.5 %
Master's (Graduate) Degree	126	37.8 %
Doctorate (PhD)	7	2.1 %
Total	333	100%

It was found that most of the teachers participating in the study had 6-10 years of experience (29.1%), but also 11-15 years (24%), 16-20 years (21%), 1-5 years (17.4%), 21 and over years (8.4%).

Table 4. Experience (years) of the teachers participating in the study

Teaching experience (years)	n	%
1-5	58	17,4
6-10	97	29,1
11-15	80	24,0
16-20	70	21,0
21+	28	8,4
Total	333	100%

Data Collection Tool

A questionnaire was devised by the researchers in accordance with the research objectives. In addition to demographic information, including age, employment status, and institution, the questionnaire comprises multiple-choice and open-ended questions exploring the metaverse in education from the perspective of teachers.

To guarantee the content validity and reliability of the questionnaire, a number of measures were implemented. Three experts in the field of educational technology were consulted during the development phase to refine the questions and ensure their alignment with the research objectives. The questions deemed appropriate for the research purposes by the three experts were incorporated into the questionnaire. The questionnaire comprises a total of 28 questions.

Data Collection Process

The questionnaire prepared by the researchers was shared online through social media and digital communication tools. In the online questionnaire, participants were informed that their data would only be used within the scope of the research and their data was processed after their approval. The data obtained from the questionnaire was analyzed using thematic analysis method. The questionnaire, which was available to join for one week, were compiled by the researchers. In the following process, the researchers categorised the participants' responses in line with the research questions and descriptive statistics were obtained.

FINDINGS

When the responses of the teachers participating in the study to various questions on a 9-point Likert-type questionnaire were analyzed and according to the findings obtained by simple statistical calculation; the teachers' knowledge of the concept of metaverse was calculated as 5.25 points on average. Similarly, more than three out of four teachers (N=260), 78.1% of them stated that they had experienced the metaverse

environment before. When the details of these experiences were examined, it was found that teachers generally responded positively due to experiences in virtual reality or three-dimensional virtual worlds rather than the current concept of “metaverse”. For example, P13 said “I can say that it makes you feel both happy and uneasy. I had a short-term space station experience. I can say that it was inspiring to experience a situation that is normally impossible to experience, even if it was “as if”. Also, VR goggles felt a little heavy, causing neck pain and headache in long-term use”. Similarly, P9 said “My experience started with the Second Life application.” It is seen that very few users talk about an experience suitable for the metaverse in the current sense. For example, P93 is one of them and the details of this experience are as follows; “We met with teachers from different cities of Türkiye in a virtual environment in the conference hall with my avatar through the link given in a training introducing Web 3.0 tools.”. Therefore, it is possible to say that teachers have limited metaverse experience but are familiar with three-dimensional virtual world and virtual reality applications.

Although their metaverse experiences are limited, in the light of the findings of the research, there are clues that teachers closely follow the studies in this field. The continuation of the studies in the field of metaverse was calculated as 4.80 out of 9, and it was determined that the teachers had a positive attitude towards the use of metaverse in education (6.23 points). Similarly, the teachers’ score was calculated as 6.19 for the advantageous use of metaverse. In this context, teachers listed the advantages of using metaverse in education as producing materials that will attract students’ interest (N=258), providing the opportunity to apply knowledge (N=250), creating learning by doing and experiencing (N=229) experience for students much more easily (N=229), providing the opportunity to get to know new technologies closely (N=229) and eliminating the boundaries in education (N=200). The advantages of the use of metaverse in education are presented in Table 5.

Table 5. Educational advantages of using Metaverse

Advantages	Frequency (f)	Percentage (%)
Real-world-like environments to enable practice	250	74
To be able to provide experiences that can attract students’ interest	258	76.3
Learning by doing and experiencing environment	229	67.8
Experiencing new technologies closely	229	67.8
Elimination of limitations in education	200	59.2
Making the impossible possible	200	59.2
Digital competence	195	57.7
Personalized learning experience	186	55
Obtaining more data about the student’s learning experience	150	44.4
Increasing engagement	146	43.2
Time and cost savings	135	39.9
Cooperative learning environment	113	39.3
Accessibility	78	23.1
Safe learning experience	69	20.4
Students’ readiness	67	19.8
Equal opportunities	47	13.9

There are also teachers who think in the opposite direction. The scores of the teachers who have concerns about the use of metaverse in education were calculated as 5.38. This situation indicates that although teachers have a positive attitude towards metaverse in education, they still have a view that it should be approached cautiously. At this point, teachers are most concerned about technical problems (n=260), psychological problems, especially addiction (n=235), inequality of opportunity (n=229), data security (n=193) and teachers’ readiness (n=189). The challenges and perils anticipated/foreseen/projected by the teachers regarding the use of metadata in education are summarised in Table 6.

Table 6. Challenges and perils anticipated/foreseen/projected by the teachers

Challenges and perils anticipated/foreseen/projected by the teachers	Frequency (f)	Percentage (%)
Technical problems (internet connection loss, freeze, etc.)	260	76.9
Psychological problems (such as addiction)	235	69.5
Inequality of opportunity	229	67.8
Data Security	193	57.1
Teachers' readiness	189	55.9
Difficulty in preparation / expert requirement	183	54.1
Physical problems (such as eye pain, nausea)	173	52.7
Cost	160	47.3
classroom management problems	143	42.3
Can't find suitable content	136	40.2
Inability to develop content	123	36.4
estrangement from real life	117	52.4
Material not found	117	34.6
Students' readiness	116	34.3
Relevance of content (age-appropriate content)	113	33.4
Parent complaints	95	28.1
Dissatisfaction of school administration	59	17.5
Not taking students' attention	29	8.6

Although teachers have concerns about the use of metaverse, it can be stated that the participants in the study are willing to use metaverse in their lessons. While the score of the teachers participating in the study regarding the willingness to use metaverse in their lessons was 6.37, the score for the suitability of their lessons for metaverse was calculated as 6.05. In addition to this situation, teachers' scores for participation in training on metaverse integration in education were found to be 8.08. This situation indicates that teachers are willing to use metaverse in their lessons despite all their concerns.

The teachers who participated in the research stated that information technologies (N=240), physics (N=237), biology (N=229), chemistry (N=228) and mathematics (N=221) courses are more suitable for metaverse. This situation indicates that teachers mostly think that the contents in science and mathematics are suitable for metaverse environment. The disciplines that the teachers participating in the study think are suitable for metaverse are listed in Table 7.

Table 7. Metaverse applicable courses

Lesson	Frequency (f)	Percentage (%)
Information Technology	240	72,07
Physics	237	71,17
Biology	229	68,77
Chemistry	228	68,47
Mathematics	211	63,36
Foreign Languages	195	58,56
Painting / Visual Arts	192	57,66
Music	153	45,95
Turkish (Language)	137	41,14
Physical Education	124	37,24
Philosophy Group	104	31,23
Guidance and Counseling	78	23,42
History	15	4,50
Geography	12	3,60
Life Science/social Sciences	4	1,20
Drama	1	0,30
Intelligence and Mind Games	1	0,30

Teachers' responses that they think that metaverse is more suitable for concretising abstract concepts, conducting experiments, collaborative learning and creating real-like learning environments are also noteworthy. However, teachers who think that the education system is almost never ready for metaverse (2.26%) state that the situation is similar for the stakeholders of the system. In the light of the findings of the research, it was determined that teachers think that their colleagues (2.35%), parents (2.05%) and schools (2.35%) are almost never ready, but relatively students (4.59%) are more ready in this regard. However, the teachers participating in the study estimated that they will use metadata effectively in education within five years at the latest. Teachers' predictions about the effective use of metadata in education are presented in Table 8.

Table 8. Projected time for the widespread implementation of Metaverse (years)

Estimated year range	Number of Teachers (n)	Percentage (%)
3-5 years	124	37,24
In 1-2 years	79	23,72
5-10 years	76	22,82
10+	36	10,81
Ever	18	5,41

When Table 8 is analyzed, it is determined that teachers foresee that the education system needs a few years to prepare for the metaverse. At this point, it can be said that it is natural to need time since education is a very large system.

DISCUSSION

The integration of the metaverse into educational has transformative possibilities, including immersive and interactive learning experiences that surpass physical constraints (Onu et. al., 2024). According to research, it can lower cognitive load (Gomez-Rios, Paredes-Velasco, Hernandez-Beleno & Fuentes-Pinargote, 2023), save traditional education expenses like lodging and transportation, and allow for safer and more effective instructional designs (Heo, Kim, Jeong, Kim, & Yoon, 2022). Furthermore, the metaverse represents a cost-effective solution for modern education, particularly in terms of recent literature (Hwang et. al., 2022; Onu et. al., 2024),

Despite these benefits, research have indicated that a virtual reality environment, such as the metaverse, may not necessarily be an optimal learning environment in all contexts (Makransky et. al., 2021). Additionally, recent research has highlighted significant concerns, serious issues, especially with regard to the long-term health effects of virtual reality use, including effects on vision and balance (Guna, Gersak, Humar, Krebl, Orel, & Pogacnik, 2020; Song & Jung, 2017). The teachers involved in this study expressed serious concerns about the physical and mental health implications for students using metaverse technologies. Although teachers generally hold an optimistic view of the metaverse, their concerns about student health are significant and warrant careful consideration by educators and developers alike. Planning must take into account the health status of students, especially as virtual reality technology becomes more integrated with metaverse applications (Guna et al., 2020).

The pedagogical challenges associated with the transition to using the metaverse for educational purposes are significant and multifaceted. These include the need for robust infrastructure, effective integration strategies and teacher involvement in resource design (Lee & Hwang, 2022). Our study's finding that teachers should have the knowledge and expertise to use this new technology efficiently, beginning with pre-service, is consistent with existing literature (Lee & Hwang, 2022; Onu et. al., 2024). The limited metaverse experience among the teachers in the study, coupled with their negative perceptions of the system's readiness, underscores the need for immediate action by relevant authorities (e.g., ministries of education, technology, and infrastructure). These authorities should facilitate the acquisition of metaverse experience and its integration with technological-pedagogical knowledge. This process can be initiated with low-risk, small-scale implementations, allowing teachers and students to gradually adapt to the new approach. For instance, it could focus on interactive simulations or virtual field trips in disciplines such as science and history.

The concerns raised by the teachers who participated in the study are pertinent to the current state of the education system. The initial step in this process involves educators, technology developers, policymakers, and researchers establishing cooperative relationships with the aim of working together to create metaverse tools and resources that support educational goal (Camilleri, 2024). The availability of a strong technological infrastructure is essential for the successful implementation of metaverse education. This includes the supply of powerful hardware, quick internet access, and gadgets that can create immersive experiences (Hwang & Chien, 2022). Currently, many educational institutions may find it difficult to adopt virtual reality (VR) and augmented reality (AR) technologies due to their high cost and technical complexity, which calls for a large investment in these resources. It would be beneficial to invest in the creation of a diverse range of metaverse-compatible content, catering to a variety of subjects and age groups. For this purpose, it is recommended to include interactive and gamified elements to increase engagement and adapt to different learning styles. Additionally, supporting the gradual enhancement of metaverse tools and to enable the timely resolution of any new problems, a mechanism for the regular gathering of user feedback—including that of students and educators—must be put in place. Such an approach would foster respectful and constructive interaction between participants. It is recommended that clear rules and expectations for behaviour in the metaverse be established to facilitate process management. This would encourage participants to interact politely and constructively.

In summary, it is encouraging that the metaverse may be incorporated into educational environments. Nonetheless, it's clear that a lot of teachers are still wary of creating secure and effective learning environments in metaverse. This cautious enthusiasm should drive the adoption of systemic improvements and changes. It is imperative that the entire educational system be prepared to embrace the metaverse, addressing pedagogical challenges, infrastructure needs, and health issues in order to create a comprehensive and dynamic learning experience.

CONCLUSION

Recent studies indicate an increasing trend in which students are engaging with metaverse environments such as Minecraft and incorporating these experiences into their social and leisure activities (Dean, 2021; Suh & Ahn, 2022). Remarkably, research suggests that students are keen to extend their game experiences into the school environment to socialise, have fun and spend time with friends (Samur & Ozkan, 2019). This shift suggests that metaverse games are replacing traditional group activities such as football, basketball, and other social games (Comert & Akgun, 2021; Kerdvibulvech, 2022).

The metaverse's potential for immersive learning is widely supported in the literature (Estudante, & Dietrich, 2020; Heo, Kim, Jeong, Kim, & Yoon, 2022; Lee, Yi, Moon, & Yeo, 2023). This emerging technology has the potential to be integrated into educational settings to match students' interests and experiences results (Onu et. al, 2024; Tinmaz & Fanea-Ivanovici, 2024). Similarly, participants recognise the metaverse as an inevitable tool for creating engaging and realistic learning environments, despite the current lack of preparedness. Nevertheless, for the utilisation of the metaverse in an educational context to yield optimal outcomes, a number of prerequisites must be met. For instance, it is essential to ensure that schools have access to high-quality network connectivity and that the necessary devices are available (Onu et. al., 2024). It is similarly imperative to furnish educators with training, both prior to and throughout the course of their careers, in order to utilise metaverse tools in an efficacious manner within their pedagogical practices (Tinmaz & Fanea-Ivanovici, 2024).

Furthermore, compared to traditional approaches, our results show that the metaverse presents a significant potential for providing distinctive learning experiences. For example, using the metaverse, students could virtually experience historical events like Leonardo da Vinci's painting of the Mona Lisa or the conquest of Istanbul. This finding corroborates the work of Estudante and Dietrich (2020), which emphasises how immersive experiences facilitate more profound comprehension and engagement. Also, metaverse's deployment in high-risk or resource-intensive domains, such as aviation or medical training, aligns with the safety and accessibility benefits outlined (Lee et al., 2023).

In summary, our research supports the metaverse's transformative potential in education, echoing previous research (Heo et. al., 2022; Hwang & Chien, 2022; Lee et. al., 2023; Onu et. al., 2024; Tinmaz & Ivanovici, 2024) while offering fresh perspectives on how it might be used in practical learning situations. The metaverse provides dynamic, interactive, and secure learning environments that have the potential to completely transform education by bridging the gap between virtual and real-world experiences (Onu et. al., 2024). To overcome present constraints and realize its full potential, future study and investment in this field are essential to making the metaverse a vital resource for creative and inclusive education.

Authors' Note: This research was carried out with the decision numbered 2022/09 of Bahcesehir University Senate Ethics Commission at the meeting held on 16.11.2022.

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BOOK REVIEW

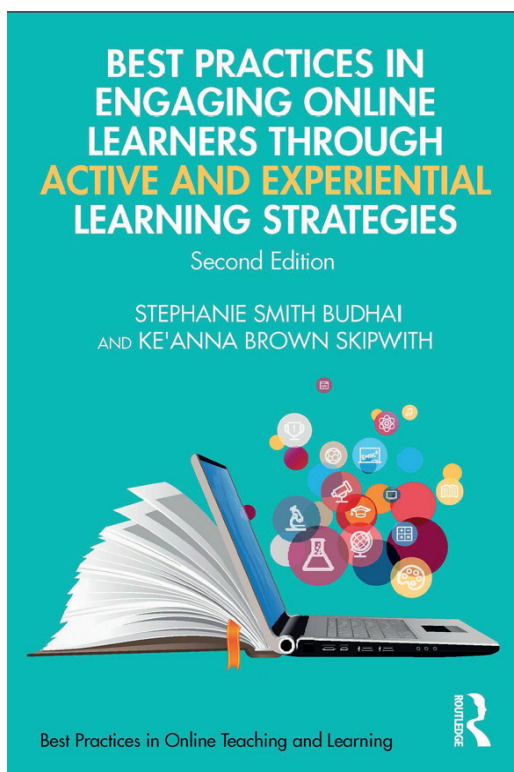
**BEST PRACTICES IN ENGAGING ONLINE LEARNER THROUGH
ACTIVE AND EXPERIENTIAL LEARNING STRATEGIES****Stephanie Smith BUDHAI and Ke'Anna Brown SKIPWITH****Borey BE**

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**INTRODUCTION**

In response to the increasing importance of online learning, *Best Practices in Engaging Online Learners Through Active and Experiential Learning Strategies* by Stephanie Smith Budhai and Ke'Anna Brown Skipwith presents a vital blueprint for creating interactive and engaging online education. The book is designed for educators, instructional designers, and administrators, offering practical techniques to transform virtual classrooms into immersive learning environments through active and experiential approaches (Budhai & Skipwith, 2022). Budhai and Skipwith deliver a wealth of strategies that promote deeper engagement, meaningful interaction, and real-world application. This review synthesizes the book's main insights from each chapter and connects them to current educational research supporting the value of active learning.

REVIEW OF THE BOOK

In Chapter 1, Budhai and Skipwith investigate the constraints of regular online discussion forums and urge teachers to include various engagement methods. They believe that

focusing solely on traditional discussion boards limits active participation and critical thinking, which are crucial to the learning process. To address this, the authors recommend numerous engagement strategies that encourage synchronous and asynchronous participation. Drawing on key ideas such as Kolb's experiential learning model (1984) and Dewey's active learning principles (1938), Budhai and Skipwith advocate for integrating active learning technology that allows students to interact directly with course content and with one another. Studies indicate that interactive techniques, such as organized peer discussions, collaborative projects, and feedback-driven activities, significantly boost online learning outcomes and encourage critical engagement (Martin & Bolliger, 2018). By putting these activities within a solid theoretical framework, this chapter sets up the environment for a modern approach to online education.

Chapter 2 highlights the significance of developing real-world interactions in virtual learning settings through field-based tasks, service learning, and simulations. Budhai and Skipwith highlight how these experiential approaches, particularly simulations, may integrate real-world context into online courses, allowing students to engage in hands-on experience in disciplines like healthcare, social work, and education. The chapter examines numerous methods for integrating experiential learning, from virtual simulations that imitate real-life events to service-learning activities that combine coursework with community participation. Research corroborates these techniques, as studies indicate that experiential learning boosts student confidence, enhances engagement, and creates practical abilities that students can employ in their future careers (Cook et al., 2011; Foronda et al., 2020). By investigating these strategies, Budhai and Skipwith suggest that experience learning may make online education more relevant, engaging, and effective.

Chapter 3 discusses project-based and scenario-based learning (PBL and SBL) as effective strategies for constructing active involvement and critical thinking. The authors discuss how technologies such as virtual laboratories, artificial intelligence (AI), and augmented reality (AR) may build immersive and engaging learning environments. Budhai and Skipwith give practical techniques for implementing PBL and SBL in numerous fields, highlighting how these tools enable students to address real-world issues cooperatively and independently. Research supports the educational usefulness of these technologies, demonstrating that virtual laboratories, AI, and AR can increase engagement and enhance retention by allowing students opportunities to interact with course content in creative ways (Zhang et al., 2022). By concentrating on these sophisticated technologies, Budhai and Skipwith present a forward-looking perspective on how instructors may harness modern technology to encourage critical thinking and problem-solving competencies.

In Chapter 4, Budhai and Skipwith examine the roles of gamification and social media in promoting online learning. They claim that gamified aspects, such as points, badges, and leaderboards, can considerably improve student motivation, while social media encourages informal peer engagement and connection. The authors provide suggestions for incorporating these technologies into online courses, noting that gamification may boost motivation by rewarding accomplishment and that social media promotes collaborative learning by imitating the informal interactions of traditional classrooms. This approach is in line with recent studies, which show that gamification might boost student engagement and academic achievement by motivating learners to actively participate in course activities (Landers et al., 2015). Furthermore, research suggests that social media promotes social presence in online education, allowing students to connect outside of planned coursework and building a sense of belonging (Manca & Ranieri, 2016). This section gives excellent ideas on how teachers might use these digital technologies to create community and connection in virtual classrooms.

Chapter 5 focuses on developing a social presence in online education through interactive and peer-learning options. Budhai and Skipwith stress that creating a social presence is crucial for decreasing isolation and improving student satisfaction. The authors suggest solutions include collaborative group projects, online study groups, and scheduled peer feedback activities that assist students build relationships with their peers. They argue that peer participation fosters a sense of community and accountability, which are critical for online student success. Studies confirm this assumption, with studies proving that social presence is positively associated with satisfaction with learning, engagement, and retention in online contexts (Ensmann et al., 2021; Richardson et al., 2017). The chapter gives a thorough framework for developing social presence, showing that well-designed participatory activities may successfully replicate the peer interaction that occurs in traditional classrooms, thus making online learning more supportive and integrated.

In the concluding Chapter 6, Budhai and Skipwith address assessment practices for evaluating active and experiential learning, presenting both formative and summative approaches. They advocate for reflective practices and clear rubrics as essential tools for assessing student progress in experiential contexts. Budhai and Skipwith argue that effective assessment not only validates learning outcomes but also encourages students to reflect on their experiences, enhancing the depth of their learning. Current literature on online assessment supports these approaches, as formative assessments—like reflective journaling and self-assessment—are shown to facilitate student engagement, self-awareness, and understanding of learning objectives (Czerkawski, 2019). Additionally, rubrics give clarity and direction, ensuring that students understand the criteria by which they are evaluated. This covers essential techniques for analyzing the impact of active learning practices, allowing teachers practical resources to monitor and encourage student performance in online contexts.

CONCLUSION

Stephanie Smith Budhai and Ke'Anna Brown Skipwith's *Best Practices in Engaging Online Learners Through Active and Experiential Learning Strategies* is a comprehensive and practical guide for enhancing student engagement and interactivity in online courses. The book integrates current educational theories with research-backed techniques, making it an invaluable resource for educators and course designers. While it could address additional logistical challenges for asynchronous settings, the text presents robust frameworks and strategies that empower educators to create meaningful, dynamic, and impactful online learning experiences.

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