



Higher Education Faculty Perceptions and Implementation of Mobile Learning in Graduate Education (A Mixed-Methods Investigation)

Afnan Ghneim Alyanbaawi

Assistant Professor of Learning, Design, and Technology, College of Education,
University of Jeddah, Kingdom of Saudi Arabia

Email: agAlyanbaawi@uj.edu.sa

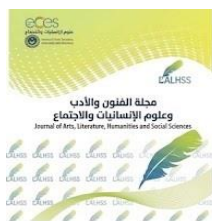
ABSTRACT

Mobile learning (M-Learning) has emerged as a transformative pedagogical approach in higher education, leveraging the ubiquity of mobile devices to enhance teaching and learning experiences beyond the constraints of traditional classroom settings. This study investigates graduate faculty perceptions of M-Learning and examines how faculty members implement mobile technologies in graduate education. Three research questions guided the investigation: (1) What are graduate faculty perceptions of using M-Learning in graduate learning experiences? (2) Do graduate faculty perceptions toward M-Learning differ according to demographic variables (age, gender, years of teaching experience, and area of expertise)? (3) How do graduate faculty implement M-Learning in graduate education?

Employing a sequential explanatory mixed-methods design, the study collected quantitative data through an electronic survey administered to 89 graduate faculty members at a major research university in the eastern United States. Qualitative data were obtained through semi-structured individual interviews with 10 faculty members representing diverse academic disciplines. One-way Analysis of Variance (ANOVA) was used to analyze quantitative survey data, while inductive thematic analysis was applied to interview transcripts and open-ended survey responses.

Findings revealed statistically significant differences in faculty perceptions of M-Learning based on age group and area of expertise, while no significant differences were found according to gender or years of teaching experience. Overall, faculty exhibited neutral perceptions regarding M-Learning use in graduate education. Interview data illuminated diverse perspectives, with some faculty demonstrating substantial M-Learning experience while others had not contemplated its pedagogical use. The study concludes that graduate faculty primarily conceptualize M-Learning as hardware or software fulfilling basic course requirements—such as accessing learning management systems and video conferencing platforms—rather than as a transformative pedagogical strategy.

Keywords: Mobile learning, faculty perceptions, graduate education, higher education, pedagogical implementation, mobile devices, technology integration.

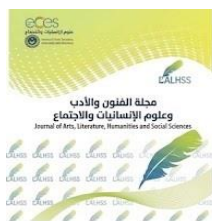


1. Introduction

The landscape of higher education has undergone profound transformation over the past two decades, driven by rapid advancements in information and communication technologies and the pervasive proliferation of mobile devices. Mobile learning, commonly referred to as M-Learning, has emerged as a pedagogical paradigm that fundamentally reconfigures the educational environment by enabling learners to access educational resources, engage with course content, and interact with peers and instructors anytime and anywhere (Sung et al., 2016; Kuhnel et al., 2018; Jie & Sunze, 2022). At its conceptual core, M-Learning represents the convergence of electronic learning (E-Learning) with portable computing devices, producing a flexible pedagogical model capable of transcending the spatial and temporal constraints traditionally associated with formal education (Elfeky & Masadeh, 2016). The pedagogical significance of M-Learning extends beyond mere technological convenience. Abdalla and Devi (2023) argue that M-Learning constitutes a pedagogical method emerging in response to the transformative impact of mobile and wireless technologies within educational environments. Hwang et al. (2021) further contend that M-Learning has become a defining trend in education over the past decade, characterized by three fundamental capabilities: facilitating interaction, enabling access to learning materials, and providing access to educational services. The integration of these capabilities positions M-Learning as a uniquely powerful educational modality, particularly suited to the demands of contemporary learners who increasingly expect immediate, personalized, and contextually relevant educational experiences.

Despite the growing scholarly attention devoted to M-Learning, a notable gap persists in the literature regarding faculty perspectives, particularly within graduate education contexts. Much of the existing research has focused predominantly on undergraduate students' perceptions, acceptance, and use of mobile technologies (Korucu & Bicer, 2018; Pollara, 2011), while comparatively little empirical attention has been given to the perspectives of graduate faculty—the individuals whose pedagogical decisions ultimately determine whether and how M-Learning is integrated into graduate curricula. This gap is particularly consequential given that successful implementation of any educational technology hinges substantially on faculty readiness, beliefs, and pedagogical commitments (Mohammadi et al., 2020; Miglani & Awadhiya, 2017).

The present study addresses this gap by investigating graduate faculty perceptions of M-Learning and examining the actual implementation practices of M-Learning in graduate education. The investigation is situated within a particular institutional context—a major research university in the eastern United States—and employs a mixed-methods research design to capture both the breadth of faculty perceptions across multiple disciplines and the depth of individual implementation experiences. By combining quantitative survey data with qualitative interview data, the study aims to provide a comprehensive understanding of the current state of M-Learning in graduate education and to identify factors that may facilitate or impede its broader integration.



1.1 Background and Significance

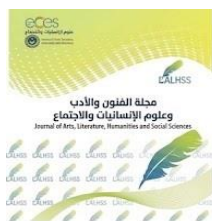
The historical trajectory of mobile learning extends considerably further than many contemporary observers might assume. While the explosion of smartphone and tablet adoption over the past fifteen years has dramatically accelerated interest in mobile educational technologies, the conceptual foundation for M-Learning was established as early as the 1970s, when Alan Kay envisioned the Dynabook—a portable educational apparatus designed to display textual and visual content in a manner analogous to a traditional book (Crompton, 2013). Kay's prescient vision anticipated by several decades the technological capabilities now embedded in ubiquitous mobile devices, illustrating that the pedagogical promise of mobile computing has long preceded its practical realization.

The advent of contemporary smartphones can be traced to the autumn of 2003, marked by the introduction of the Nokia 6600, which combined compact form factor with substantial storage and processing capabilities (Raento et al., 2009). Subsequent technological evolution has produced increasingly sophisticated mobile devices that integrate multimedia capabilities, internet connectivity, application ecosystems, and computational power that rivals that of personal computers from previous generations. This technological evolution has been accompanied by widespread adoption of mobile devices among university students, with research consistently documenting that the overwhelming majority of higher education students own smartphones (Aresta et al., 2015; Delcker, 2016; Fox, 2019). Morris and Sarapin (2020) report that American students typically use computers and tablets in academic settings between one and four times per week, while mobile phone use in classroom contexts occurs between five and ten times weekly—statistics that underscore the deep integration of mobile devices into the daily lives and academic practices of contemporary students.

The significance of investigating faculty perceptions of M-Learning in graduate education is heightened by several converging factors. First, graduate education differs substantively from undergraduate education in its emphasis on advanced disciplinary content, scholarly inquiry, professional development, and self-directed learning—features that may render M-Learning either particularly valuable or uniquely challenging to implement effectively. Second, graduate students are frequently working professionals whose schedules and geographic distribution may make M-Learning's flexibility especially beneficial. Third, the COVID-19 pandemic catalyzed unprecedented adoption of digital and mobile educational technologies across higher education, fundamentally altering both faculty practices and student expectations regarding technology-mediated learning (Castellanos-Reyes et al., 2022; Omirzak et al., 2021). The post-pandemic landscape thus presents a critical moment for understanding how faculty conceptualize and implement M-Learning in their teaching practices.

1.2 Statement of the Problem

The integration of mobile devices into daily life has reached unprecedented levels (Viberg & Grönlund, 2013; Aresta et al., 2015; Sung et al., 2016; Kuhnel et al., 2018; Popov et al., 2020), with higher education students increasingly viewing smartphones



and tablets as essential tools for academic achievement (Aresta et al., 2015). In response, higher education institutions in both developed and developing countries are actively developing strategies to incorporate M-Learning into educational processes (Vazquez-Cano, 2014; Aresta et al., 2015). Numerous scholars anticipate that M-Learning will profoundly transform educational practice by introducing innovative methods, tools, applications, and resources that realize the potential of ubiquitous, pervasive, personal, and connected learning (Pimmer et al., 2016).

However, despite this technological enthusiasm and institutional momentum, several substantial gaps persist in the empirical literature. First, the majority of existing M-Learning research has examined the technology's effectiveness from student perspectives or has focused on undergraduate education (Sung et al., 2016; El-Sofany & El-Haggar, 2020; Crompton & Burke, 2018), with comparatively little attention given to faculty perspectives in graduate contexts. Second, much existing research has focused on isolated tasks or short-term projects rather than examining how M-Learning is integrated into the broader educational ecology of graduate programs. Third, the rapid pace of technological evolution renders findings from research conducted even five or ten years ago potentially obsolete, as the capabilities of contemporary mobile devices substantially exceed those available during earlier investigations.

Additionally, prior research has identified important challenges that may impede effective M-Learning integration. Qazi et al. (2024) document that inadequate infrastructure, insufficient training, ambiguity regarding pedagogical approaches, and unclear assessment practices constitute significant obstacles to mobile device integration in classrooms. While instructor concerns about potential disruptions are understandable, the field requires deeper empirical understanding of how mobile devices can be effectively leveraged for educational purposes. Furthermore, students have reported that some instructors are hesitant to fully utilize technology's potential and fail to provide adequate support for student engagement with course materials (Miglani & Awadhiya, 2017), while other research suggests that M-Learning offers valuable convenience and accessibility (Qazi et al., 2024). These contradictory findings underscore the need for additional research examining instructor perspectives and institutional readiness for widespread M-Learning adoption.

1.3 Purpose and Research Questions

The purpose of this study is to investigate graduate faculty perceptions of M-Learning and to examine how faculty implement M-Learning in graduate education. Specifically, the study addresses the following research questions:

RQ1: What are graduate faculty perceptions of using M-Learning in graduate learning experiences?

RQ2: Do graduate faculty perceptions toward M-Learning differ according to demographic variables?

- RQ2a: Do perceptions differ according to age?
- RQ2b: Do perceptions differ according to gender?



- RQ2c: Do perceptions differ according to years of teaching experience?
- RQ2d: Do perceptions differ according to area of expertise?

RQ3: How do graduate faculty implement M-Learning in graduate education?

For the purposes of this investigation, M-Learning is operationally defined as a type of learning across multiple contexts through social and content interactions, without limitations of time and place, using tablets and smartphones (Crompton & Burke, 2018; Hilao & Wichadee, 2017; Dunleavy et al., 2019).

2. Theoretical Framework and Literature Review

2.1 Conceptualizing Mobile Learning

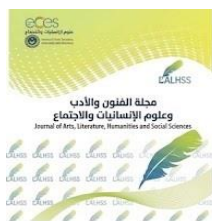
The conceptualization of M-Learning has evolved considerably as the underlying technologies have matured and as scholars have developed more nuanced understandings of the pedagogical possibilities afforded by mobile devices. Early definitions tended to emphasize the technological dimension—mobile learning as learning conducted with mobile devices—while later definitions have foregrounded the pedagogical and contextual dimensions of the construct. Ktoridou et al. (2007) defined M-Learning as a learning experience in which the network serves as the locus of production, circulation, and consumption of knowledge. Lee et al. (2020) characterize M-Learning as "a dynamic learning environment through the use of mobile technologies especially in the field of education" (p. 108).

Gikas and Grant (2013) articulated a more comprehensive conceptualization, identifying three fundamental components of M-Learning: (1) M-Learning encompasses more than the mere delivery of educational content via mobile computing devices; (2) it encompasses both formal and informal modes of learning; and (3) M-Learning is characterized by its capacity to adapt to learners' situations and provide authentic learning experiences. This tripartite conceptualization positions M-Learning not simply as a technological innovation but as a pedagogical paradigm with distinctive characteristics that differentiate it from both traditional classroom instruction and conventional e-learning approaches.

2.2 Benefits and Challenges of Mobile Learning

The educational benefits of M-Learning have been extensively documented in the scholarly literature. Research consistently demonstrates that M-Learning can bridge formal and informal learning, extend learning beyond traditional classroom boundaries, enhance teacher and peer engagement, and provide convenient access to learning materials (Viberg & Grönlund, 2013; Vazquez-Cano, 2014; Hoi, 2020). When effectively implemented, M-Learning environments can incorporate features such as scientific comprehensiveness, visual richness, auditory richness, interactive content, self-assessment capabilities, and user support (Bolatli & Kizil, 2022).

M-Learning offers learners prompt access to information, contextualized learning experiences, and enhanced autonomy in the learning process (Demir & Akpınar, 2018). For example, students in many higher education institutions can conveniently access course materials and monitor their academic progress through mobile applications associated with learning management systems. According to Alzaza and



Yaakub (2011), M-Learning provides opportunities for flexible, low-cost educational engagement, allowing students to use mobile devices to access asynchronous online courses or participate in collaborative group projects. The integration of mobile applications as pedagogical tools has been associated with enhanced student motivation, knowledge construction, and collaborative learning (Vazquez-Cano, 2014; Abdalla & Devi, 2023).

However, the implementation of M-Learning is not without challenges. The use of mobile devices in classroom settings for non-educational purposes can negatively impact students' learning behaviors. Morris and Sarapin (2020) found that learners who use cell phones during lectures typically take fewer notes, retain less knowledge, and perform poorer on examinations than students who refrain from such use. Consequently, instructors must carefully consider how mobile devices are integrated into instruction, ensuring that their use enhances rather than detracts from the learning experience (Bose & Lowenthal, 2016).

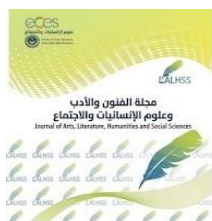
Beyond classroom-level challenges, higher education institutions face systemic barriers to M-Learning adoption. Cant et al. (2021) identify several institutional challenges including insufficient institutional support, absence of cultures supportive of e-learning, exclusion of academics from e-learning development programs, instructor attitudes toward technological advancement, and inadequate information and communication technology infrastructure. Successful integration of M-Learning thus requires both pedagogical innovation (Romero-Rodriguez et al., 2020) and systemic institutional change.

2.3 Mobile Learning in Higher Education

Mobile learning has been extensively explored in higher education contexts worldwide. Universities such as Seton Hill University and George Fox University have integrated mobile devices into their curricula, recognizing the pedagogical benefits these devices afford (Foti & Mendez, 2014). Many universities have customized their websites and learning platforms to be mobile-friendly, with Ally (2013) noting that most university libraries have developed mobile-friendly websites that facilitate resource accessibility across diverse platforms.

M-Learning facilitates accessibility to learning resources, enhances information delivery, and provides tools for knowledge development (Alshehri & Cumming, 2020). Research by Alshehri and Cumming (2020) demonstrated that mobile technology enhances student knowledge management, enabling easier access to resources without requiring instructor mediation, supporting self-paced learning, and facilitating mobile-based discussions. Higher education institutions have implemented M-Learning to enhance student collaboration; for instance, Vazquez-Cano (2014) describes the Stanford Mobile Inquiry Learning Environment (SMILE) program, developed by Paul Kim, which enables students to use mobile devices to create, collaborate on, and evaluate questions related to educational topics, effectively transforming students' pockets into research laboratories.

Despite enthusiasm regarding M-Learning's potential, several barriers impede its widespread adoption. Abu-Al-Aish et al. (2013) identify barriers including lack of



knowledge and motivation, technological limitations of mobile devices, and internet connectivity concerns. The increasing use of mobile devices, often accompanied by student mobility across diverse contexts, has generated excitement about M-Learning's possibilities, yet insufficient attention has been given to the critical role of instructors in this educational transformation (Kukulska-Hulme et al., 2015). Instructors comfortable with computer-based instruction may find mobile-based instruction less intuitive (So, 2016), and educators may be susceptible to the persistent fallacy that any single device can revolutionize learning environments—a tendency observed with previous waves of educational technology adoption (Daughtery & Berge, 2017).

2.4 Mobile Learning in Graduate Education

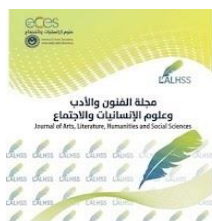
Compared to the substantial literature on M-Learning in undergraduate contexts, research on M-Learning in graduate education is comparatively sparse but reveals several important findings. Studies indicate no statistically significant variation in postgraduate students' average perception ratings for M-Learning activities based on gender (Thiyagu, 2012; Korucu & Bicer, 2018) or educational attainment level (Thiyagu, 2012). Short et al. (2014) demonstrate that smartphone use in graduate medical education produces significant transformation in medical communication, learning, and decision support, with mobile teaching approaches offering accessible learning opportunities that demonstrate considerable promise for enhancing effectiveness and learner satisfaction.

Kim et al. (2013) found that mobile technologies provide innovative educational opportunities in graduate education, expanding graduate students' opportunities to actively participate in educational activities outside formal classroom settings and enhancing their learning experiences within disciplinary communities of practice. The use of mobile devices for logging and tracking study time across various settings has demonstrated potential for enhancing time management skills among graduate students, particularly when coupled with notifications featuring learning statistics and self-regulation recommendations (Tabuenca et al., 2015).

M-Learning appears most beneficial when used as a complement to existing Information and Communication Technology (ICT), online learning, and conventional learning approaches, as this integrated approach can substantially enhance the educational experience (Fouzdar & Behera, 2017). The effectiveness of teaching-learning in graduate contexts may be enhanced when graduate students hold positive attitudes toward M-Learning (Fouzdar & Behera, 2017). Notably, graduate students' views toward M-Learning remain consistent across age groups, education levels, and daily internet use, though they may vary based on mobile device ownership status (Korucu & Bicer, 2018).

2.5 Faculty Use of Mobile Learning

Research on faculty use of M-Learning in higher education has produced varied findings regarding instructor perceptions, practices, and policy approaches. Bose and Lowenthal (2016) found that many educators report enhanced digital literacy skills following mobile device integration into their instructional practices. Some instructors



permit students to use mobile devices for accessing materials during examinations, class discussions, lectures, and assignments, while others express interest in exploring mobile devices as tools for enhancing instructor social presence in online courses (Bose & Lowenthal, 2016).

Al-Emran et al. (2016) report that most educators in their study held positive attitudes toward M-Learning that were associated with their academic positions, academic backgrounds, and smartphone ownership. Morris and Sarapin (2020) found that the majority of college professors (77%) implement classroom mobile phone policies, while 23% do not establish ground rules for student mobile device use during lectures. Among instructors implementing such policies, a substantial majority (88%) include mobile-phone regulations in their syllabi, and 54.1% report that their policies have successfully reduced unsupervised mobile phone use.

2.6 Mobile Learning in the Post-COVID Context

The COVID-19 pandemic substantially accelerated M-Learning's significance in higher education (Castellanos-Reyes et al., 2022; Omirzak et al., 2021). The pandemic compelled countries worldwide to transition to remote learning involving both fixed and mobile equipment (Dolzhich et al., 2021), and the adoption of remote learning by educational institutions prompted students to use mobile devices for class attendance (Milton & Subramaniam, 2023). During the pandemic, mobile devices served as alternatives to face-to-face instruction (Omirzak et al., 2021), proving viable for delivering mandated distance learning through lectures, practical sessions, and other training formats.

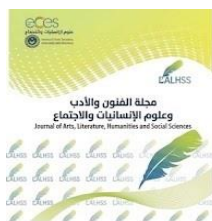
Students proficient in mobile device use demonstrated high competence in engaging with digital M-Learning during this period (Lutfi et al., 2022). The post-pandemic context underscores the importance of exploring effective strategies for integrating digital device use in educational practice (Lutfi et al., 2022), making the present moment particularly opportune for examining faculty perspectives on M-Learning implementation.

3. Methodology

3.1 Research Design and Rationale

This study employed a mixed-methods sequential explanatory design (Creswell, 1999), in which an initial quantitative phase was followed by a qualitative phase intended to elaborate, contextualize, and deepen the findings from the first phase. The mixed-methods approach was selected because it enables the integration of breadth and depth: the survey instrument permitted examination of perceptions across a relatively large sample of faculty representing diverse academic disciplines, while the individual interviews allowed for nuanced exploration of how faculty conceptualize and implement M-Learning in their specific pedagogical contexts. This design choice aligns with the study's dual objectives of characterizing graduate faculty perceptions broadly and understanding implementation practices in depth.

The sequential explanatory design proceeds in two distinct phases (Creswell, 1999). The first phase involves quantitative data collection and analysis, which establishes



patterns and relationships among variables. The second phase employs qualitative methods to elaborate upon and explain the quantitative findings, providing richer context and deeper interpretation. This approach is particularly well-suited to the research questions guiding the present study, as it enables both systematic measurement of perceptions and exploration of the experiential dimensions of M-Learning implementation.

3.2 Setting and Participants

The study was conducted at a major research university located in the eastern United States. The institution employs approximately 1,600 full-time instructional faculty members across diverse academic disciplines, including agriculture, arts and sciences, business, education, health and human sciences, engineering, law, nursing, social work, and veterinary medicine. This disciplinary breadth was deliberately leveraged in participant recruitment to ensure that findings would reflect faculty perspectives from across the academic spectrum rather than being concentrated within a single disciplinary tradition.

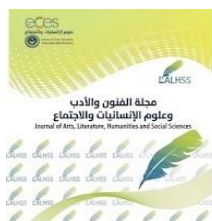
Survey participants were recruited through email invitations sent to approximately 800 faculty members. The email contained a brief description of the study and a hyperlink directing recipients to the web-based survey. At the conclusion of the survey, participants were offered the opportunity to provide their email address if they wished to be contacted regarding individual interview participation. Interview participants were selected using purposive typical instances sampling—an approach designed to provide comprehensive understanding rather than to represent average respondents (Pollara, 2011)—from among survey respondents who had volunteered to participate in interviews.

A total of 89 faculty members fully completed the electronic survey, while 10 faculty members participated in individual interviews. Survey participants represented diverse demographic characteristics: 48 male, 39 female, 1 identifying as other, and 1 preferring not to disclose. The age distribution included 7 participants aged 25-34, 35 participants aged 35-44, 22 participants aged 45-54, 18 participants aged 55-64, and 13 participants aged 65 or older. Years of teaching experience ranged from 5 years or fewer (9 participants) to 26 or more years (18 participants), with the largest group reporting 11-15 years of experience (22 participants). Interview participants included 5 males and 5 females representing eight distinct academic departments: Anthropology, Educational Research, Management and Entrepreneurship, Nutrition, Political Science, Public Health, Supply Chain Management, and Theory and Practice in Teacher Education.

3.3 Instruments

3.3.1 Survey Instrument

The electronic survey instrument was adapted from Miglani and Awadhiya (2017) and comprised five sections. The first section gathered demographic information including teaching experience at the graduate level, gender, age, years of teaching experience, and departmental affiliation. The inclusion of the departmental affiliation question was specifically designed to facilitate analysis of potential variations in M-Learning



experience across institutional units. The second section assessed device readiness through three questions concerning smartphone and tablet ownership and internet capability. The third section examined usage patterns of mobile phones across 15 distinct activity categories. The fourth section evaluated faculty perceptions of M-Learning through nine Likert-scale items addressing various dimensions of M-Learning's pedagogical value. The final section comprised two questions regarding M-Learning's role in courses, including an open-ended question soliciting examples of M-Learning integration.

3.3.2 Interview Protocol

The semi-structured interview protocol, adapted from Pollara (2011), consisted of eight open-ended questions designed to explore faculty experiences with mobile devices, professional applications of mobile technology, classroom integration of M-Learning, and interest in professional development related to M-Learning. The semi-structured format provided structural consistency across interviews while allowing flexibility for participants to elaborate on topics of particular relevance to their experiences.

3.4 Data Collection Procedures

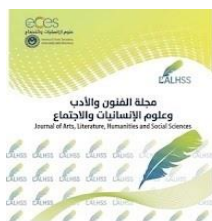
Following Institutional Review Board approval, the researcher generated a comprehensive list of departmental contacts using the university's official directory. Email invitations were distributed to department chairs requesting forwarding to faculty members within their departments. To maximize participation, the researcher also compiled a faculty email list and distributed direct invitations, while the Provost's Office and Digital Learning division facilitated additional survey distribution. A flyer summarizing the research project and intended participants was developed and distributed alongside email invitations. The electronic survey required approximately 15-20 minutes for completion.

For individual interviews, the researcher reviewed survey responses to identify volunteers willing to participate in follow-up interviews. From this pool, 20 participants were invited via email; 10 responded affirmatively and were scheduled for interviews. Synchronous interviews lasting approximately 45 minutes were conducted via Zoom video conferencing software, based on participant availability. Prior to each interview, participants reviewed the consent form outlining study objectives and confidentiality protections. Interviews began with brief explanations of the interview procedure and requests for permission to record, with all participants consenting to recording. Recordings were transcribed using Otter.ai, with transcripts subsequently imported into Microsoft Excel for organization. Pseudonyms were assigned to all participants to protect confidentiality.

3.5 Data Analysis

3.5.1 Quantitative Analysis

Survey data were exported from Qualtrics into Microsoft Excel for formatting and organization, then imported into SPSS for statistical analysis. To address Research Question 1, frequency analyses were conducted to determine the percentages and counts of responses for each survey item. To address Research Question 2, one-way



Analysis of Variance (ANOVA) was employed to examine relationships between the dependent variable (M-Learning perceptions) and four independent variables (age group, gender, years of teaching experience, and area of expertise). One-way ANOVA was selected as appropriate for comparing means across multiple groups and determining whether observed differences reflect statistically significant population-level differences (Kim, 2017). Where ANOVA results indicated statistically significant differences, post hoc Tukey tests were conducted to identify the specific group comparisons producing those differences.

3.5.2 Qualitative Analysis

Interview transcripts and open-ended survey responses were analyzed using inductive thematic analysis (DeJonckheere et al., 2024). The inductive approach allowed themes to emerge from the data rather than imposing a predetermined analytical framework, an approach particularly well-suited to exploratory research seeking to understand emerging phenomena. Following Braun and Clarke's (2006) thematic analysis framework, the researcher progressed through six analytical phases: (1) familiarization with the data through repeated reading; (2) generation of initial codes; (3) searching for themes; (4) reviewing and refining themes; (5) defining and naming themes; and (6) producing the analytical report.

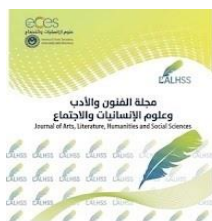
The coding process proceeded through three sequential levels (Williams & Moser, 2019). Open coding constituted the initial level, in which broad subject areas were identified and similar words and phrases were classified into preliminary categories. Axial coding represented the second level, refining, aligning, and categorizing emergent themes from open coding. Selective coding constituted the third level, combining categories of organized data into coherent and meaningful statements. This systematic coding approach ensured methodological rigor and supported the validity and reliability requirements associated with qualitative research.

4. Results

4.1 Device Readiness and Usage Patterns

Analysis of device readiness revealed near-universal smartphone ownership among graduate faculty, with 91 of 92 participants (99%) reporting smartphone ownership. Tablet ownership was substantially lower, with 60 participants (65%) reporting tablet ownership, of whom 57 (95% of tablet owners) had tablets with internet capability. These findings indicate that while smartphone access constitutes a virtually universal foundation for mobile learning implementation, tablet integration would face additional access barriers for approximately one-third of faculty.

Examination of usage patterns revealed several pronounced trends. Faculty members frequently used their mobile devices for fundamental academic and professional activities: 83 participants (90%) reported "often" conducting internet searches and checking email via mobile devices, 70 participants (76%) reported "often" using mobile devices for online calendar management and appointment keeping, and 47 participants (51%) reported "often" using devices for sharing images, audio, or video content. Conversely, certain activities were rarely or never conducted via mobile



devices: 69 participants (75%) reported "never" blogging from mobile devices, 59 participants (64%) reported "never" playing online interactive games, and 40 participants (43%) reported "never" downloading games. These usage patterns suggest that faculty primarily employ mobile devices for productivity-oriented activities rather than entertainment or social media engagement, a finding with implications for understanding the pedagogical orientations these devices might serve.

4.2 Research Question 1: Faculty Perceptions of M-Learning

Analysis of the nine M-Learning perception items revealed a complex pattern of responses suggesting that faculty hold mixed views about the technology's pedagogical value. The strongest agreement was observed for the proposition that M-Learning provides learning opportunities irrespective of place, pace, and time, with 70 participants (78%) either agreeing or strongly agreeing with this statement. Substantial agreement was also observed for the proposition that M-Learning provides access to ICT-based educational opportunities (57 participants, or 64%, agreeing or strongly agreeing) and that M-Learning provides rich learning resources at users' fingertips (46 participants, or 52%, agreeing or strongly agreeing).

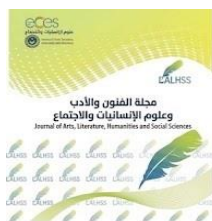
In contrast, faculty perceptions were more reserved or neutral regarding several other M-Learning capabilities. Regarding M-Learning's potential to improve communication between learners and teachers, 27 participants (30%) selected neutral while opinions were divided across agreement and disagreement categories. Similarly, perceptions regarding M-Learning's support for collaborative learning environments were largely neutral or disagreed, with 29 participants (33%) selecting neutral, 21 (24%) disagreeing, and 10 (11%) strongly disagreeing. Regarding time and effort savings, perceptions were skeptical: 25 participants (28%) disagreed or strongly disagreed that M-Learning saves learners' time and effort, while 46 participants (52%) disagreed or strongly disagreed that it saves teachers' time and effort.

The most consistently negative perceptions were observed regarding two specific propositions. First, 48 participants (54%) disagreed or strongly disagreed that M-Learning engages learners to a greater extent than alternative pedagogical approaches. Second, 41 participants (46%) disagreed or strongly disagreed that M-Learning can replace e-learning conducted through conventional devices such as computers or laptops, with an additional 34 participants (38%) selecting neutral. These findings suggest that while faculty recognize specific benefits of M-Learning—particularly regarding flexibility and accessibility—they are skeptical about claims that M-Learning offers superior engagement or can substitute for established e-learning modalities.

4.3 Research Question 2: Demographic Differences in Perceptions

4.3.1 Age Group Differences

One-way ANOVA examining differences in M-Learning perceptions across three age groups (25-44 years, 45-64 years, and 65 years or older) revealed statistically significant differences, $F(2, 92) = 7.28, p = .001$. Post hoc Tukey tests indicated that participants aged 45-64 ($M = 3.15, SD = .23$) rated their perceptions significantly higher than both participants aged 25-44 ($M = 3.02, SD = .07$; mean difference = 0.12,



$p = .001$) and participants aged 65 or older ($M = 3.03$, $SD = .00$; mean difference = 0.12 , $p = .04$). No significant difference was found between the youngest and oldest age groups ($p = .99$). These findings suggest that mid-career faculty hold more favorable perceptions of M-Learning than either earlier-career or later-career faculty, a pattern that may reflect differential exposure to and integration of mobile technologies across career stages.

4.3.2 Gender Differences

One-way ANOVA examining differences across gender categories revealed no statistically significant differences in M-Learning perceptions, $F(3, 85) = 1.88$, $p = .13$. This finding aligns with Al-Hunaiyyan et al. (2017) and Hilao and Wichadee (2017), who similarly reported no gender-based differences in M-Learning perceptions among educators and students respectively. The absence of gender-based differences suggests that any interventions designed to enhance M-Learning integration need not be tailored to gender-specific concerns, allowing institutional resources to be directed toward addressing other sources of perceptual variation.

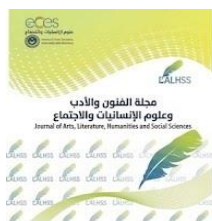
4.3.3 Years of Teaching Experience

One-way ANOVA examining differences across six categories of teaching experience revealed no statistically significant differences in M-Learning perceptions, $F(5, 83) = 0.61$, $p = .69$. This finding is consistent with Al-Emran et al. (2016), who reported similar non-significant relationships between educator experience and M-Learning perceptions. The absence of experience-based differences contradicts intuitive expectations that earlier-career faculty might hold more favorable perceptions of digital technologies than later-career faculty, suggesting instead that perceptions are shaped by factors other than mere length of teaching experience.

4.3.4 Area of Expertise Differences

One-way ANOVA examining differences across nine areas of expertise (Agriculture, Arts and Sciences, Business, Education, Engineering, Law, Nursing, Social Work, and Veterinary Medicine) revealed statistically significant differences, $F(8, 81) = 5.21$, $p < .001$. Post hoc Tukey tests revealed several specific pattern of significant differences. Nursing faculty ($M = 4.11$, $SD = .00$) rated their perceptions significantly higher than faculty in Agriculture ($M = 2.97$, $SD = .57$; mean difference = 1.13 , $p = .05$), Arts and Sciences ($M = 2.70$, $SD = .52$; mean difference = 1.40 , $p = .004$), and Engineering ($M = 2.93$, $SD = .23$; mean difference = 1.17 , $p = .05$). Additionally, Arts and Sciences faculty rated their perceptions significantly lower than faculty in Business ($M = 3.52$, $SD = .76$; mean difference = -0.82 , $p < .001$) and Education ($M = 3.30$, $SD = .21$; mean difference = -0.60 , $p = .003$).

These disciplinary patterns align with findings from previous research suggesting that faculty perceptions of educational technology vary substantially across disciplines, reflecting both the nature of disciplinary knowledge and traditions of pedagogical practice. Disciplines emphasizing applied professional preparation (such as Nursing and Business) appear more receptive to M-Learning, while disciplines emphasizing traditional scholarly engagement (such as Arts and Sciences) demonstrate greater skepticism.



4.4 Research Question 3: Implementation of M-Learning

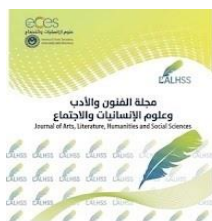
4.4.1 Survey Findings on Implementation

Survey responses regarding M-Learning's role in courses revealed that 67 of 89 participants (75%) reported that M-Learning technologies were not required in their courses. Among those who did require M-Learning technologies, 19 participants (21%) required software or applications, 6 (7%) required smartphones, and 1 (1%) required tablets. Open-ended responses describing M-Learning integration revealed five primary themes: (1) using software as course requirement ($n = 6$), with examples including ProCreate App for iPads in theatre courses and software for flipped course preparation; (2) using Microsoft Office applications such as PowerPoint and Excel ($n = 2$); (3) using learning management systems, particularly Canvas ($n = 8$); (4) using clicker technology such as PointSolutions for in-class engagement ($n = 6$); and (5) using video conferencing tools, particularly Zoom, for synchronous and remote attendance ($n = 3$).

4.4.2 Interview Findings on Implementation

Inductive thematic analysis of interview data identified five primary themes characterizing how graduate faculty implement M-Learning in their courses.

- **Theme 1: Using Mobile Devices for Student Assessment.** Two participants described using mobile devices, particularly tablets, to support student assessment processes. Anna (Anthropology) described using an iPad for grading, leveraging Canvas's mechanism for automatically calculating grade scores. Ayden (Management and Entrepreneurship) described investigating technologies that could evaluate recorded videos for specific key phrases to automate grading processes. These examples illustrate how mobile devices can serve as productivity tools enhancing faculty assessment efficiency.
- **Theme 2: Using Mobile Devices for Accessing the Learning Management System.** Nine participants described using mobile devices primarily to access learning management systems, particularly Canvas. Aaron (Educational Research) described significant use of tablets for teaching with Canvas, including curriculum design supporting student Canvas use. Abby (Supply Chain Management) noted the abundance of education-related apps available on iPads, including Canvas, note-taking applications, and project planners. Ashton (Political Science) described using Canvas in conjunction with student-viewed YouTube videos to support a developed curriculum. These examples illustrate that for many faculty, M-Learning's primary function is providing convenient access to existing institutional learning infrastructure.
- **Theme 3: Using Mobile Devices to Enhance Student Performance.** Two participants described using mobile devices to engage students in active learning experiences. Aria (Theory and Practice in Teacher Education) described using mobile phones for in-class surveys, with students scanning QR codes to access survey links or texting responses. Asher (Supply Chain Management) described using the Mentimeter platform to engage students through interactive questions and reactions to



videos and presentations. These examples demonstrate how mobile devices can be leveraged for active learning beyond passive content consumption.

- **Theme 4: Using M-Learning to Promote Teaching Self-Efficacy.** Four participants discussed how their M-Learning practices reflected and reinforced their teaching self-efficacy. Aaron described maintaining high engagement with the latest developments, particularly regarding factors that might impede student learning. Aria characterized herself as doing "a fairly good job" of staying current with technology developments while remaining open to experimentation. Arthur described regularly testing new vendor-supplied technologies, while Ayden described developing online asynchronous courses over a two-year period. These examples suggest that engagement with M-Learning often reflects and reinforces broader commitments to pedagogical innovation and continuous professional development.

- **Theme 5: Using Mobile Devices to Increase Accessibility for Students.** Three participants described using mobile devices specifically to enhance course accessibility. Aria described using the Owl device to enable students to join classes via Zoom when situations prevented in-person attendance. Alice (Public Health) described efforts to ensure that students could access learning opportunities through multiple modalities, including mobile access. These examples illustrate how M-Learning can be conceptualized as a mechanism for educational equity, expanding access to students whose circumstances might otherwise limit their participation.

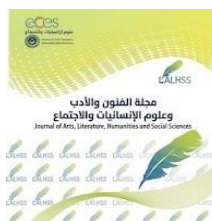
5. Discussion

The findings of this study reveal a complex landscape of graduate faculty perceptions and practices regarding mobile learning, characterized by both genuine recognition of M-Learning's potential and substantial reservations about its pedagogical value and implementation feasibility. Several findings warrant particular attention as they offer insights with implications for theory, practice, and policy.

5.1 The Paradox of Faculty Perceptions

A central finding of this study concerns the paradoxical nature of faculty perceptions regarding M-Learning. Faculty broadly recognize that M-Learning provides flexibility, accessibility, and convenient access to learning resources—benefits aligned with the technology's most frequently cited advantages in the scholarly literature. Simultaneously, however, faculty express skepticism regarding M-Learning's claims to enhance learner engagement, save time and effort for both learners and instructors, or replace established e-learning modalities. This pattern suggests that faculty have developed nuanced rather than enthusiastic perspectives on M-Learning, recognizing specific benefits while remaining cautious about broader claims regarding the technology's transformative potential.

Interview data illuminate the experiential basis for this nuanced perspective. Faculty describe finding it difficult to remain current with M-Learning technology due to time constraints, with several participants noting that incorporating M-Learning often requires more preparation time than traditional lecturing—a finding consistent with broader research on the time costs of interactive teaching with technology (Brownell



& Tanner, 2012). The perception that M-Learning does not save effort or time thus reflects practical experience with the substantial preparation requirements associated with effective M-Learning integration, not merely abstract skepticism about technological claims.

5.2 Disciplinary Variation in M-Learning Receptivity

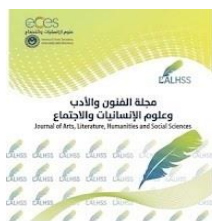
The significant differences in M-Learning perceptions across academic disciplines represent one of the study's most theoretically consequential findings. The pattern observed—with applied professional fields such as Nursing and Business demonstrating substantially more favorable perceptions than traditional academic disciplines such as Arts and Sciences—suggests that M-Learning's pedagogical fit varies systematically across disciplinary contexts. Several factors may contribute to this variation. Applied professional fields often involve content readily delivered through mobile-friendly formats (clinical reference materials, business case studies, practical demonstrations) and may emphasize pedagogical approaches (just-in-time learning, simulation, performance assessment) particularly amenable to mobile delivery. Traditional academic disciplines, in contrast, often emphasize sustained engagement with complex texts, extended scholarly argumentation, and pedagogical practices (close reading, seminar discussion, archival research) less obviously enhanced by mobile delivery.

These disciplinary patterns have important implications for institutional approaches to M-Learning integration. Rather than pursuing universal M-Learning initiatives, institutions might benefit from disciplinarily-differentiated approaches that recognize the varying pedagogical fit of mobile technologies across academic fields. Resources for M-Learning development might be most productively concentrated in disciplines where faculty perceive natural pedagogical fit, while alternative pedagogical innovations might be more appropriate for disciplines where M-Learning's pedagogical value is more contested.

5.3 Age-Based Differences and Generational Hypotheses

The finding that mid-career faculty (ages 45-64) hold more favorable M-Learning perceptions than either earlier-career or later-career faculty is theoretically intriguing and contradicts simple generational hypotheses suggesting that younger faculty would necessarily hold more favorable views of digital technologies. Several explanations may account for this pattern. Mid-career faculty may have accumulated sufficient pedagogical experience to recognize M-Learning's potential applications while retaining sufficient career energy and motivation to invest in pedagogical innovation. Earlier-career faculty may be more focused on establishing core teaching competencies and meeting institutional expectations, while later-career faculty may have developed pedagogical approaches that they are reluctant to substantially modify.

This finding also contradicts Al-Hunaiyyan et al. (2017), who reported no age-based differences in instructor M-Learning perceptions, suggesting that age effects may be context-dependent or may have evolved over time. The contrast underscores the importance of contextualizing findings within specific institutional and temporal



contexts, recognizing that perceptions of educational technology continue to evolve as both the technologies themselves and the experiences of educators with those technologies develop.

5.4 Implementation as Default Rather Than Strategic Integration

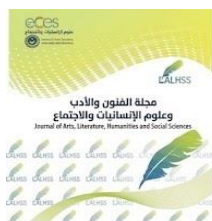
Perhaps the most significant finding regarding M-Learning implementation is the predominant pattern of treating mobile learning as a default mode of access to existing institutional infrastructure rather than as a strategic pedagogical innovation. Both survey and interview data reveal that faculty primarily conceptualize M-Learning in terms of accessing learning management systems, video conferencing tools, and Microsoft Office applications—activities that students would conduct regardless of formal M-Learning policies. Few faculty described strategically designing learning experiences to leverage mobile devices' distinctive capabilities for contextualized learning, real-time data collection, location-based engagement, or other affordances unique to mobile platforms.

This pattern suggests that M-Learning has not yet been substantially integrated into graduate pedagogy as a deliberate pedagogical strategy but has instead emerged as a passive consequence of broader trends in digital education delivery. The implications are substantial: institutions seeking to realize M-Learning's transformative potential must move beyond merely facilitating mobile access to existing platforms toward supporting faculty in designing pedagogically distinctive M-Learning experiences. Without such strategic engagement, M-Learning's pedagogical value will remain limited to incremental conveniences rather than fundamental enhancements to graduate education.

5.5 The Communication Paradox

An interesting tension emerged between survey and interview findings regarding M-Learning's role in communication. Survey data suggested that faculty did not strongly perceive M-Learning as enhancing learner-instructor communication, with many participants selecting neutral responses. However, interview data revealed that several faculty members—including Alice (Public Health)—use mobile devices daily for student communication and find them valuable for facilitating teaching-related interaction. This apparent contradiction may reflect the difference between abstract evaluations of M-Learning's communication potential and concrete experiences of using mobile devices for routine communication. Faculty may not consciously categorize daily mobile communication as "M-Learning" while nonetheless engaging extensively in mobile-mediated educational communication.

This finding aligns with previous research documenting M-Learning's communication benefits (Darko-Adjei, 2019; Miglani & Awadhiya, 2017; Oliveira et al., 2021) while highlighting the importance of how M-Learning is conceptualized and labeled. If M-Learning's communication benefits are to be more fully recognized and intentionally leveraged, professional development efforts may need to help faculty recognize their existing mobile-mediated communication practices as components of M-Learning rather than as separate from it.



6. Implications, Limitations, and Future Research

6.1 Theoretical Implications

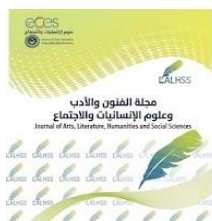
The findings of this study contribute to M-Learning theory in several important ways. First, the study extends existing literature on faculty perceptions of educational technology by focusing specifically on graduate education contexts—a population that has received comparatively little empirical attention. Second, the disciplinary variation observed in M-Learning perceptions challenges universal models of technology adoption and suggests the importance of discipline-specific theoretical frameworks. Third, the implementation patterns documented—particularly the tendency to conceptualize M-Learning as a means of accessing existing infrastructure rather than as a strategic pedagogical innovation—suggest theoretical refinements to models of educational technology integration that recognize multiple modes of integration ranging from passive to strategic.

6.2 Practical Implications

For higher education institutions seeking to enhance M-Learning integration in graduate education, several practical implications emerge from these findings. First, institutions should recognize that faculty hold nuanced rather than uniformly enthusiastic perceptions of M-Learning, and that interventions should address specific concerns about engagement, time investment, and pedagogical value rather than relying on general claims about technological transformation. Second, professional development efforts should be disciplinarily differentiated, recognizing that M-Learning's pedagogical fit varies systematically across academic fields. Third, institutions should provide concrete pedagogical exemplars demonstrating how M-Learning can be strategically integrated into graduate pedagogy beyond merely facilitating access to existing infrastructure. Fourth, faculty interest in M-Learning professional development—documented in interview data—suggests that institutional investment in such programming would likely meet receptive audiences.

6.3 Limitations

This study has several limitations that should inform interpretation of its findings and guide future research. First, the sample was drawn from a single institution, limiting generalizability across institutional contexts. Faculty perceptions and practices at other institutions—particularly those with different resource levels, institutional cultures, or technological infrastructures—may differ from those documented here. Second, the survey response rate was lower than the size of the potential pool of participants would have suggested, raising questions about the representativeness of survey respondents. Third, the interview sample was relatively small ($n = 10$), with five participants reporting limited M-Learning experience. This composition limited the depth of insight available regarding strategic M-Learning implementation. Fourth, the study relied on self-report data for both perceptions and practices, which may be subject to social desirability bias or limited accuracy in describing actual classroom practices.



6.4 Future Research Directions

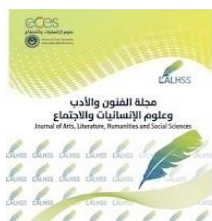
Several productive directions for future research emerge from this study. First, comparative research across multiple institutions would enhance understanding of how institutional context shapes M-Learning perceptions and practices. Second, international comparative research would illuminate cultural and policy contexts shaping M-Learning integration globally. Third, focused investigation of specific disciplines would deepen understanding of disciplinary variation in M-Learning fit. Fourth, longitudinal research tracking faculty perceptions and practices over time would document how M-Learning integration evolves as both technologies and educational contexts develop. Fifth, observational research examining actual classroom M-Learning practices would complement self-report data and provide more accurate portraits of integration practices. Sixth, intervention research evaluating specific professional development approaches for enhancing M-Learning integration would provide actionable guidance for institutional practice.

7. Conclusion

This mixed-methods investigation of graduate faculty perceptions and implementation of mobile learning has produced findings that simultaneously confirm and complicate prevailing narratives about M-Learning in higher education. While faculty broadly recognize M-Learning's flexibility and accessibility benefits, they hold nuanced and often skeptical views regarding its capacity to enhance engagement, save time, or replace established e-learning modalities. Demographic analysis reveals significant variation by age and disciplinary affiliation, suggesting that M-Learning integration cannot proceed effectively through one-size-fits-all approaches. Implementation patterns suggest that M-Learning has been incorporated into graduate education primarily as a means of accessing existing infrastructure rather than as a strategic pedagogical innovation.

These findings have substantial implications for institutional approaches to M-Learning integration. Institutions seeking to realize M-Learning's pedagogical potential must move beyond passive facilitation of mobile access toward strategic support for pedagogical innovation that leverages mobile devices' distinctive capabilities. Such efforts should be disciplinarily differentiated, recognizing that M-Learning's pedagogical fit varies systematically across academic fields. Professional development opportunities—for which faculty expressed substantial interest—represent a particularly promising avenue for institutional investment.

Ultimately, the future of mobile learning in graduate education depends not merely on the continued evolution of mobile technologies but on the development of pedagogical practices that strategically leverage these technologies' capabilities to enhance rather than merely supplement traditional educational approaches. This study contributes to that development by documenting the current state of faculty perceptions and practices, identifying patterns of variation that inform targeted interventions, and suggesting directions for future research that can deepen our understanding of how mobile learning can most effectively serve graduate education.



References

1. Abdalla, W. A. A., & Devi, M. R. (2023). Mobile technologies to improve graduate students' communication abilities. *International Journal of Arts and Humanities Studies*, 3(2), 1-8.
2. Abu-Al-Aish, A., Love, S., Hunaiti, Z., & Al-Masaeed, S. (2013). Toward a sustainable deployment of m-learning in higher education. *International Journal of Mobile Learning and Organisation*, 7(3-4), 253-276.
3. Al-Adwan, A. S., Al-Madadha, A., & Zvirzdinaite, Z. (2018). Modeling students' readiness to adopt mobile learning in higher education: An empirical study. *International Review of Research in Open and Distributed Learning*, 19(1), 221-241.
4. Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior*, 56, 93-102.
5. Al-Hunaiyyan, A., Alhajri, R., & Al-Sharhan, S. (2017). Instructors age and gender differences in the acceptance of mobile learning. *International Journal of Interactive Mobile Technologies*, 11(4), 4-16.
6. Ally, M. (2013). Mobile learning: From research to practice to impact education. *Learning and Teaching in Higher Education: Gulf Perspectives*, 10(2), 1-10.
7. Aresta, M., Pedro, L., & Santos, C. (2015). Mobile learning and higher education: A theoretical overview. *Journal of Mobile Multimedia*, 11(1-2), 147-156.
8. Bose, D., & Lowenthal, P. R. (2016). Integrating mobile devices into the classroom: A qualitative case study of a faculty learning community. *International Journal of Social Media and Interactive Learning Environments*, 4(4), 319-332.
9. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.
10. Brownell, S. E., & Tanner, K. D. (2012). Barriers to faculty pedagogical change: Lack of training, time, incentives, and tensions with professional identity. *CBE—Life Sciences Education*, 11(4), 339-346.
11. Castellanos-Reyes, D., Romero-Hall, E. J., Vasconcelos, L., & Garcia, B. (2022). Mobile learning for emergency situations: Four design cases from Latin America. In *Global Perspectives on Educational Innovations for Emergency Situations*. Springer.
12. Creswell, J. W. (1999). Mixed-method research: Introduction and application. In *Handbook of educational policy* (pp. 455-472). Academic Press.
13. Crompton, H. (2013). A historical overview of m-learning: Toward learner-centered education. In *Handbook of mobile learning* (pp. 3-14). Routledge.
14. Crompton, H., & Burke, D. (2018). The use of mobile learning in higher education: A systematic review. *Computers & Education*, 123, 53-64.
15. DeJonckheere, M., Vaughn, L. M., James, T. G., & Schondelmeyer, A. C. (2024). Qualitative thematic analysis in a mixed methods study: Guidelines and considerations for integration. *Journal of Mixed Methods Research*, 18(3), 258-269.
16. Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, 19, 18-26.



17. Hwang, B. L., Chou, T. C., & Huang, C. H. (2021). Actualizing the affordance of mobile technology for mobile learning. *Educational Technology & Society*, 24(4), 67-80.
18. Jie, Z., & Sunze, Y. (2022). A mobile pedagogical framework for enhancing online teaching and learning in higher education. *Interactive Learning Environments*, 1-14.
19. Kim, T. K. (2017). Understanding one-way ANOVA using conceptual figures. *Korean Journal of Anesthesiology*, 70(1), 22-26.
20. Korucu, A. T., & Bicer, H. (2018). Investigation of post-graduate students' attitudes towards mobile learning and opinions on mobile learning. *International Technology and Education Journal*, 2(1), 21-34.
21. Kuhnel, M., Seiler, L., Honal, A., & Ifenthaler, D. (2018). Mobile learning analytics in higher education: Usability testing and evaluation of an app prototype. *Interactive Technology and Smart Education*, 15(4), 332-347.
22. Miglani, A., & Awadhiya, A. K. (2017). Mobile learning: Readiness and perceptions of teachers of Open Universities of Commonwealth Asia. *Journal of Learning for Development*, 4(1), 58-71.
23. Mohammadi, M., Sarvestani, M. S., & Nouroozi, S. (2020). Mobile phone use in education and learning by faculty members of technical-engineering groups. *Frontiers in Education*, 5, 1-9.
24. Morris, P. L., & Sarapin, S. (2020). Mobile phones in the classroom: Policies and potential pedagogy. *Journal of Media Literacy Education*, 12(1), 57-69.
25. Pimmer, C., Mateescu, M., & Gröhbriel, U. (2016). Mobile and ubiquitous learning in higher education settings: A systematic review of empirical studies. *Computers in Human Behavior*, 63, 490-501.
26. Pollara, P. C. (2011). Mobile learning in higher education: A glimpse and a comparison of student and faculty readiness, attitudes, and perceptions [Doctoral dissertation, Louisiana State University].
27. Qazi, A., Qazi, J., Naseer, K., Hasan, N., Hadaker, G., & Bao, D. (2024). M-Learning in education during COVID-19: A systematic review of sentiment, challenges, and opportunities. *Heliyon*, 10, 1-15.
28. Romero-Rodríguez, J. M., Aznar-Díaz, I., Hinojo-Lucena, F. J., & Gómez-García, G. (2020). Mobile learning in higher education: Structural equation model for good teaching practices. *IEEE Access*, 8, 91761-91769.
29. Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, 94, 252-275.
30. Vazquez-Cano, E. (2014). Mobile distance learning with smartphones and apps in higher education. *Educational Sciences: Theory and Practice*, 14(4), 1505-1520.
31. Williams, M., & Moser, T. (2019). The art of coding and thematic exploration in qualitative research. *International Management Review*, 15(1), 45-55.