International Journal of Information Science and Management
Vol. 24, No. 1, 2026, 155- 179
DOI: https://doi.org/10.22034/ijism.2026.2025375.1438 / DOR: https://dor.isc.ac/dor/20.1001.1.20088302.2026.24.1.8.9

Original Research

Influence of Mobile Learning on Students' Performance in Higher Education Institutions: A Systematic Literature Review

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Received: 24 March 2024
Reviewed: 20 May 2024
Accepted: 25 August 2025

Abstract

The integration of mobile learning represents a significant advance in online learning. The present study aims to highlight the positive effects of mobile learning on students' performance in higher education. It underscores how mobile learning encourages interactive learning experiences, promotes collaboration, and enables students to share information through social media platforms. A systematic literature review was conducted encompassing 319 papers published from 2015 to 2023. Of these, 51 papers from 33 distinct journals were identified as pertinent to the subject matter. Database searches were conducted across platforms, including SpringerLink, Elsevier, ProQuest, Taylor & Francis Online, Web of Science, and Google Scholar. In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement, a well-known framework for systematic reviews, the study aims to ensure transparency and accuracy in the literature search. The findings of this review show positive effects on students' performance in higher education when mobile devices are used as a learning tool. The study concludes by recommending ways for future research, centered on maximizing the use of mobile technology in higher education. It suggests investigating how students utilize mobile devices, particularly social media, for self-directed learning outside of traditional educational settings.

Keywords: Mobile Learning, Distance Education, Online Learning, Higher Education Students, Collaborative Learning.

Introduction

Higher education institutions (HEIs) have a dynamic e-learning environment that improves technology-enabled platforms, integrating technology with traditional educational methods as an innovative key for education (Kim et al., 2017). In the current digital era, online educational resources prove invaluable for e-learning and distance education, facilitating student-teacher

communication through new technologies. This is described in three key areas: access, e-learning, and lifelong learning. The demand for access to education is substantial and developing among all countries (Zarei & Mohammadi, 2022). Students' willingness to embrace smartphones as educational tools highlights their readiness for a mobile technology-focused approach to learning in higher education. Their positive perception and eagerness to utilize smartphones underscore their readiness for such educational innovations (Lazaro & Duart, 2023; Reddy et al., 2023; Lin et al., 2016). The acceptance and utilization of technology and mobile learning by individuals are significant subjects in information systems (Rondan-Cataluña et al., 2015; Turan et al., 2022). Users' decisions regarding the timing and use of mobile learning are influenced by various variables, including the use of mobile technology, collaborative learning, mobile learning acceptance, mobile learning readiness, students' performance, students' perceptions, teaching and learning, behavioral intention, mobile phone addiction, student engagement, and self-efficacy.

The way students approach and examine challenges, consider a variety of perspectives, and use various tools will be affected by the growth of mobile learning. This will improve collaboration and make it easier for students to use social media platforms for knowledge sharing. In what ways can educational organizations, educators, and students support the acceptance and advancement of mobile-driven technologies? To address these concerns, a comprehensive review of how studies are utilizing modern mobile technologies and achieving collaborative learning goals is essential. Prior research has identified variables that affect mobile learning effectiveness, but has not investigated their effects on learners (Kashive & Phanshikar, 2023; Samadbeik et al., 2023). This systematic review examined research on collaborative learning aided by ICT strategies to close this knowledge gap and advance understanding of how mobile learning has been applied to collaborative learning. Furthermore, the findings from this study can help bridge existing gaps in the literature. To this end, this systematic review assessed studies on the utilization of inventive technologies in online education. The following are the research questions that were addressed:

Research Question 1: What are the impacts of mobile learning that influence students' performance in higher education?

Research Question 2: What are the main elements influencing the usability of mobile devices for the growth of e-learning?

The first section of this study presents the introduction and literature review, followed by the methods used to conduct a systematic literature review on the influence of mobile learning on students' performance in higher education. Secondly, the study presents the results and discussion of this review. Lastly, the paper highlights the conclusion and the study's limitations and suggests potential recommendations for future research on the implications of mobile learning among students in higher education.

Literature Review

The usage of mobile technologies increases the educational experience in higher education, particularly in the area of emotion, where collaboration and student engagement play critical roles (Consoli et al., 2023). In a comparison of various learning environments, online learning was found to enhance students' perceptions of flexibility and self-efficacy (Le et al., 2022). In

academic psychology, the motivation for learning is a pivotal study, establishing a direct relationship between motivation and learning outcomes. E-learning facilitates wide access to lifelong learning, allowing the growth and sharing of online learning resources globally. Therefore, highlighting its pivotal role in promoting interactive opportunities, mobile learning significantly impacts higher education learners.

Mobile devices, including phones and tablets, are crucial in facilitating learning across diverse contexts, individuals, and subjects. Mobile learning reduces both temporal and spatial barriers, enabling learners to take part in unconventional forms of education (Diacopoulos & Crompton, 2020). Acceptance of mobile learning is directly correlated with intentional behavior, with factors such as attitude, expected utility, and clarity of use influencing this relationship (Mutambara & Bayaga, 2021). The willingness of students to embrace smartphones as educational tools highlights a mobile technology-obsessed attitude to learning in higher education. Their positive perception and eagerness to utilize smartphones underscore their readiness for such educational innovations (Chen & Tsai, 2021). Today's students are exposed to a wide array of advanced technologies, offering them distinct chances for learning, self-exploration, and cross-cultural interactions. Social media and emerging technologies are increasingly recognized as powerful tools for fostering collaborative learning and supporting education in fields such as creative thinking, resource sharing, and virtual networking for skill development (Sarwar et al., 2019). Information and communication technology, including internet-based apps and social networking sites, boosts cooperation and expertise creation by facilitating connections with external experts (García Botero et al., 2018). Students' utilization of diverse social networking tools correlates positively and significantly with their interactions, experiences, and overall quality of educational experiences (Chew et al., 2023). This study utilized a systematic review of how students utilize mobile technologies, particularly social media, for self-directed learning outside traditional educational settings.

The educational system has undergone a digital transition through the use of ICT tools and social networking sites (Neier & Zayer, 2015). It is essential to understand how students perceive and use technology in higher education, including their motivations and the effects on educational outcomes, such as assessment and student engagement. Social media is recognized as a driver of educational change and of social collaboration and openness. Social networking tools are appreciated for their capacity to facilitate distributed and networked knowledge construction through connections and social interactions. Acceptance of mobile learning among parents has a relevant effect on positive attitudes, usefulness, clarity of usage, and behavioral intention (Mutambara & Bayaga, 2021; Mufuliat Olayode et al., 2023). Mobile learning presents opportunities for student-centered learning, as indicated by teachers' conceptions (Chen & Tsai, 2021). Challenges such as the necessity for students to complete self-learning before scheduled class time or difficulties in understanding pre-class materials can impede the effectiveness of online education (Y. N. Lin et al., 2021). Tracking mobile phone addiction and enhancing sleep conditions offer promising avenues to promptly reduce indicators of depression (Ding et al., 2023).

In e-learning, granting students flexibility and control over their educational activities is vital. This empowers them to decide on content depth, media usage, and study time, enhancing their learning experience (Yavuzalp & Bahcivan, 2021). Perceptions and individual standards have a significant impact on how learners intend to use these technologies (Lai et al., 2022). E-learning uses computers and web-based education, employing digital and virtual classrooms to

offer flexible learning via electronic channels (Cranfield et al., 2021). E-learning is considered a variant of distance education, and its essential appeal to learners lies in its flexibility. It also allows communication with educators from anywhere, at any time, via mobile or laptop with an internet connection. Many universities recognize the importance of helping students transition from traditional to independent online education to enhance their skills and abilities (Gupta & Chopra, 2022).

Prior research has provided extensive insights into the factors that may affect students who use mobile devices not only for social media but also for educational purposes. Higher education institutions face profound social, economic, and technological transformations that will reshape students' academic experience in the 21st century. Researchers must remain vigilant in monitoring emerging technologies and their potential applications in future classrooms (Neier & Zayer, 2015). E-learning materials address students' current challenges in retrieving specific information from data storage, and versatile recommendation systems that employ individualized techniques are proposed to address these difficulties (Khanal et al., 2020). The awareness of environmental issues is on the rise, paralleled by the emergence of sharing economy platforms that facilitate information dissemination. These platforms enable consumers to understand the link between their consumption habits and sustainability, fostering a more informed approach to decision-making regarding resource utilization (Horng et al., 2022). Research has shown that integrating multimedia elements into higher education enhances realism, interactivity, and satisfaction levels compared to text-based mobile tests. Consequently, we anticipate its incorporation into future curricula to enhance student performance (Jang & Suh, 2022; Lynn & Emanuel, 2022).

Materials and Methods

In this systematic literature review, the influence of mobile learning on students' performance in higher education was investigated. The widely acknowledged Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement informed our approach, particularly in the literature search methodology (Rethlefsen et al., 2021; Abuhassna & Alnawajha, 2023). The database used for this research was followed by a collection of high-impact journals. The literature search in this study was limited to the largest and most widely used databases, including Elsevier, SpringerLink, ProQuest, Taylor & Francis Online, Web of Science, and Google Scholar, from 2015 to 2023. We applied a search term specific to each scientific source to find these papers with keywords including "mobile learning," "online learning," "distance education," "higher education students," and "collaborative learning." The search string that was used to search as: "Mobile learning" OR "online learning" AND "distance education" OR "online learning" OR "higher education students" AND "mobile learning" OR "collaborative learning."

Papers were selected for analysis using a three-step method, as shown in Table 1. First, the repositories were examined, and 319 papers were identified. After obtaining the results, exclusion criteria were applied, including the removal of duplicate articles and those not relevant to the topic of the influence of mobile learning on students' performance in higher education. After reviewing the abstract and results, all irrelevant publications were deleted. The final selection comprised 51 articles (studies) published in reputable journals, which served as the basis of our review. A representation in visual form of the selection process for articles is provided in Figure 1.

Table 1
Studies examined in the review

Articles	Elsevier	Springer Link	ProQuest Central	Taylor & Francis Online	Web of Science	Total
Total downloaded articles	83	72	67	39	58	319
Articles selected	56	49	38	22	29	194
Included articles	23	20	4	2	2	51

One researcher examined the studies, while other researchers double-checked the analysis for accuracy. The data analysis method used was content analysis. The database source, title, publication, publication year, journal details, sampling technique, participants' education level, country, advantages, and variables of mobile learning addressed in the review have all been specified and covered in the research questions. Each study was thoroughly examined before the data were categorized and analyzed using Microsoft Excel and Word. The data collected from the content analysis undertaken in this systematic review were presented using descriptive figures and tables. Table 2 shows the inclusion and exclusion criteria used in the approach.

Table 2
Criteria of inclusion and exclusion

Inclusion criteria	Exclusion criteria
Articles published in reputable scholarly databases, including Elsevier, Springer Link, ProQuest, Taylor & Francis Online, Web of Science, and the search engine Google Scholar.	Articles have not been published in respectable databases, such as predatory publications or sources that lack academic standards.
The studies were conducted from 2015 to 2023.	Studies were conducted outside the specified timeframe, i.e., from 2015 - 2023.
Studies involving students of higher education institutions are prioritized.	Studies do not involve students within higher education institutions.
Variables analyzed in research investigating the influence of mobile learning on student engagement, perceptions, and academic performance.	Variables were not analyzed in research investigating the influence of mobile learning on student engagement, perceptions, and academic performance.
Studies that focused on the incorporation of mobile learning into educational practices and their effects.	Studies do not directly address the integration of mobile learning in educational practices and its effects.

Selection of articles

Articles for this systematic review were chosen as full-text articles from reputable journals. The article references were based on the expectation that electronic material will be more relevant and broadly accessible than print information. This systematic review's study selection procedure consists of three steps:

Identification: In this step, articles were identified across different databases, and a total

of 319 full-text articles were downloaded using keywords related to the study, such as mobile learning, distance education, online learning, higher education students, and collaborative learning. 97 articles were removed because their full texts were unavailable.

Screening: In this step, out of a total of 222 articles, 28 were removed due to duplication, and 194 full-text articles were reviewed. Again, by reading the abstracts and findings, a total of 143 articles were removed because they were not related to the main research topic.

Inclusion: After the removal of 143 articles, a total of 51 full-text papers were included in the process of this systematic literature review for the final investigation (Figure 1).

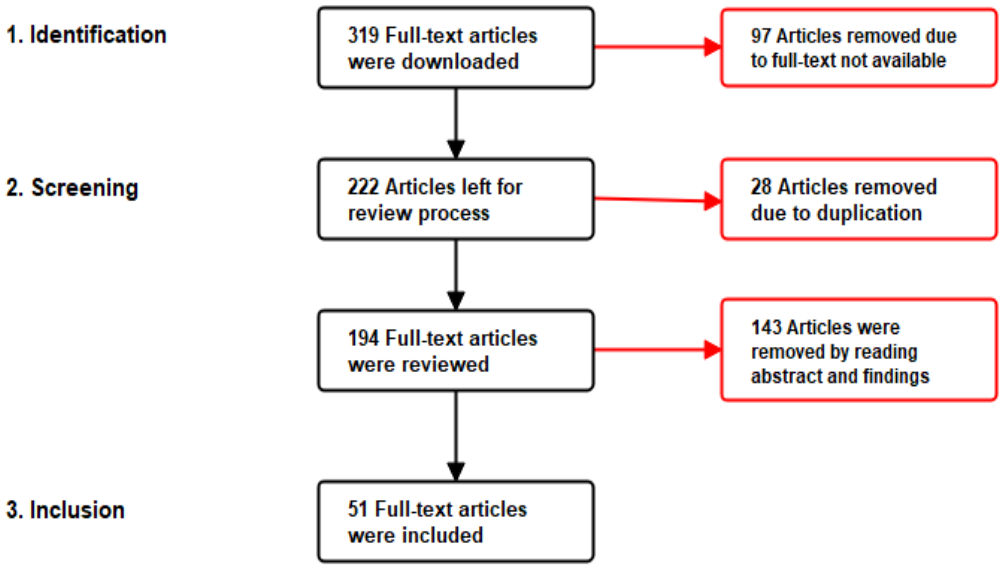

Figure 1: A diagrammatic flowchart of the systematic literature review process

Results

A comprehensive examination of articles retrieved from diverse databases, including Elsevier, SpringerLink, ProQuest, Taylor & Francis Online, Web of Science, and Google Scholar, spanning 2015 to 2023, was undertaken to examine the positive effects of mobile learning on students' performance in higher education institutions. This systematic literature review meticulously selected 51 studies to examine the influence of mobile learning on students' performance and its integration in higher education. The significance was determined by analyzing the positive effects of mobile learning among both learners and instructors, seeking insights into their interactions and collaborative practices in the context of e-learning adoption.

Impact of mobile learning on students' performance in higher education

Table 3 illustrates significant consistency among the 51 reviewed articles in terms of the countries represented, methodologies utilized, and findings observed. Specifically, six studies were shown in the USA, five in Taiwan, four in China, and the remaining thirty-six studies were distributed across other countries. The majority of participants in these studies were university students from various disciplines. Methodologically, quantitative approaches, such

as surveys, were predominant, with 33 studies employing them, while 16 studies used qualitative methods, including interviews and reviews, and 2 studies used mixed methods, i.e., quantitative and qualitative, including both surveys and interviews. Most of the findings of this review show a positive impact on student satisfaction and performance, and also encourage interactive learning experiences that promote collaboration and facilitate social media platforms to share information among students.

The prevalence of mobile phones in higher education could explain their extensive utilization in research. However, the data also indicates the diverse range of devices used in studies on mobile learning (Crompton & Burke, 2018). When both learners and educators dedicated considerable awareness to establishing goals, the subsequent process of meeting and documenting these objectives became more manageable for students (Pospíšilová & Rohlíková, 2023). The effects of comparative advantage, complexity, and persistence were found to have a major impact on students' resistance to mobile learning, with persistence being the least important factor. Furthermore, comparative benefits, creativity, and perceived barriers to mobile learning were identified as significant determinants of learners' desire to adopt mobile learning, with relative advantages exerting a significant influence (Kim et al., 2017).

Yalcinkaya & Cinar Yucel (2023) described students' positive attitudes towards mobile learning and their readiness to embrace it for educational benefits. The study conducted by Camilleri & Camilleri (2023) found that factors such as resource availability, ongoing training, and technical support significantly influenced respondents' engagement with mobile earning programs. Moreover, students demonstrated familiarity with mobile phones and their applications.

Table 3
Details of articles reviewed and findings

Author	Country	Methodology	Findings
Diteeyont & Heng-Yu, 2023	Thailand	Quantitative (Survey)	Provide educators with insightful guidance on creating instructional materials, engaging activities, and effective teaching that promote student achievement in the context of mobile learning.
Kashive & Phanshikar, 2023	India	Quantitative (Survey)	Assist in comprehending strategies for enhancing the creation of mobile learning content and environments to maximize effectiveness.
Paganin et al., 2023	Italy	Quantitative (Survey)	Explore students' receptiveness to smartphone-based interventions aimed at stress management and well-being promotion.
Nikolopoulou et al., 2023	Greece	Quantitative (Survey)	Acknowledge that students view their attitudes, confidence, and digital skill competency as minor, if not non-existent, barriers to the adoption and use of mobile technology.
Yalcinkaya & Cinar Yucel, 2023	Turkey	Quantitative Survey	Students exhibit positive attitudes toward mobile learning and are enthusiastic about its implementation.

Author	Country	Methodology	Findings
Samadbeik et al., 2023	Iran	Quantitative (Survey)	The significance of diverse elements in effectively employing mobile learning.
Reddy et al., 2023	Fiji	Quantitative (Survey)	Students' eagerness and favorable outlook on utilizing mobile phones for learning in higher education indicate their preparedness for education driven by mobile technology.
Ding et al., 2023	China	Quantitative (Survey)	Depression symptoms may be avoided, either directly or indirectly, by addressing mobile phone addiction through therapies and improving sleep quality.
Lv et al., 2023 Peramunugamage et al., 2023	China Sri Lanka	Quantitative (Survey) Qualitative (Review)	There exists a correlation between depression, stress, and the classification of mobile phone addiction. Mobile-based classroom collaboration is gaining popularity, with most courses being innovative and student-focused.
Lazaro & Duart, 2023	India	Quantitative (Survey)	Higher education students' readiness for and acceptance of mobile learning, especially those enrolled in Open and Distance Learning (ODL) programs.
Salhab & Daher, 2023	Israel	Qualitative (Students enrolled in an Educational Technology course)	When students use mobile learning, instructors should support and encourage them, as this will help them stay interested and boost their confidence.
Camilleri & Camilleri, 2023	Malta	Quantitative (Survey)	Respondents were found to be influenced by factors that promote participation in mobile learning programs, including the availability of materials, opportunities for ongoing training, and technical assistance.
Qazi et al., 2023	Brunei Darussalam	Quantitative (Survey)	Developing nations are making informed choices regarding the utilization of mobile learning applications alongside emerging technologies.
Lai et al., 2022	Netherlands	Quantitative (Survey)	Learners' self-regulation abilities and goals strongly predict how they actually make use of mobile devices.
Lan, 2022	Taiwan	Qualitative (pre- and post-test)	Learners who participated in mobile-assisted pronunciation training not only had a more positive attitude toward the training course and mobile application, but also showed significant improvements in pronunciation.
Al-Rahmi et al. 2022	Malaysia	Quantitative (Survey)	Insights on how educational institutions can increase students' willingness to use mobile learning, fostering positive attitudes and behavioral intentions to use it in educational settings.

Author	Country	Methodology	Findings
Peng et al., 2022	China	Quantitative (Survey)	The importance of meditation and responsibility in clarifying probable processes behind the link between perceived pressure and dependence on mobile phones, offering insights for developing interventions to mitigate problematic behaviors among students.
Jang & Suh, 2022	South Korea	Qualitative (Group interviews)	A Proficiency Assessment platform that uses multimedia elements is seen as more feasible, interactive, and satisfactory than written smartphone evaluations.
Goundar & Kumar, 2022; Okai-Ugbaje et al., 2022	Fiji Australia	Qualitative (Review) Quantitative & qualitative (Survey and interview)	Growing scholarly curiosity in the topic and the use of various applications for mobile learning. The mobile learning paradigm takes into account the social and economic realities of low-income nations.
L. Zhang et al., 2022	China	Qualitative (Human-interaction machine-based intelligent retrieved (HIM-IR) method)	Core aspects and attributes of mobile learning amidst advancements in technological trends, where the Hybrid Instructional Model with Interactive Resources (HIM-IR) proves beneficial for individuals involved in mobile learning design, preparation, and implementation.
Saidani Neffati et al., 2021	Saudi Arabia	Qualitative (Augmented Reality (AR) platform)	The use of smartphones and tablets (SD) to incorporate visual modelling into electronic learning is demonstrated through the creation of an Augmented Reality (AR) platform that enables e-learners to supplement course materials with graphical and digital multimedia apps.
Y. N. Lin et al., 2021	Taiwan	Quantitative (quasi-experiment)	Mobile flipped learning significantly improved learners' self-efficacy and academic interest.
Oliveira et al., 2021	Portugal	Quantitative (Survey)	During theoretical sessions, students make extensive use of applications, notably social media platforms such as Instagram and Facebook.
Antee, 2021	USA	Qualitative (The participants attended an online university in South Korea)	Respondents in the study may have had favorable experiences with mobile devices, had digital literacy abilities, or were more comfortable with it.
Chang et al., 2021	Taiwan	Quantitative (an experimental group to use the app and a	Compared with the non-experimental group, the experimental group using the mobile application showed significantly higher knowledge scores, lower intrinsic

Author	Country	Methodology	Findings
		control group to use a traditional simulation-based paper learning method)	and external cognitive loads, greater competence achievement, and higher satisfaction.
X. Zhang et al., 2021	Hong Kong	Quantitative (Survey)	Clinical Science students at the University of Hong Kong exhibited more diverse information needs and engaged more extensively with their mobile devices for learning-related activities than their peers in other medical majors, despite only modest overall differences in usage levels.
Qashou, 2021 Criollo-C et al., 2021 Ocran et al., 2020 Jiang & Zhang, 2020 Diacopoulos & Crompton, 2020 Hoi, 2020; Lau et al., 2020	Israel Ecuador Ghana Australia USA Australia Hong Kong	Quantitative (Survey) Qualitative (Review) Qualitative (Interview) Quantitative (Survey) Qualitative (Review) Quantitative (Survey) Quantitative (Survey)	All variables, including acceptability and implementation of mobile learning, showed strong positive connections. Mobile devices encompass a comprehensive array of applications, support, and resources for educational institutions. Favorable perceptions regarding mobile-friendly library facilities were noted. Recommendations from the study included educating students about the advantages of using mobile devices to access library services and ensuring adequate training for library personnel. In mobile-assisted educational settings, introducing socialization activities for new learners increased social engagement and supported the development of sophisticated analytical abilities. Mobile learning amplifies educational experiences in social studies, particularly by fostering student engagement and collaboration in the affective domain. Enhancements in technical and organizational support are essential, alongside the necessity for further empirical studies on instructional approaches. Student groups demonstrated comparable levels of engagement in various learning, research, social networking, leisure, and recreational

Author	Country	Methodology	Findings
			activities using their smartphones.
Grant, 2019	USA	Qualitative (Review)	Explicitly recognizing the unique functions and affordances of mobile learning within educational technology can effectively guide future educational research toward aligning with learners' objectives.
Bai, 2019	USA	Qualitative (Review)	Mobile learning enriches students' educational experiences, promotes learning beyond traditional classroom settings, and supports personalized learning.
Green, 2019	USA	Quantitative & Qualitative (Survey and interview)	Mobile digital technologies affirm the integral role of social and communicative relationships in writing classrooms, challenging instructors to integrate them effectively.
Hamidi & Jahanshaheefard, 2019	Iran	Quantitative (Survey)	Enhanced student satisfaction and reinforced adoption of mobile learning within universities contribute to increased overall student satisfaction.
Kumar & Bervell, 2019	Malaysia	Quantitative (Survey)	Students' positive intentions to embrace mobile learning hinge on motivation and performance expectations.
Verma et al., 2019	Hungary	Quantitative (Survey)	Anticipated awareness of the educational benefits of mobile learning is projected to be high or moderate in the future.
García Botero et al., 2018	Belgium	Quantitative (Survey)	Attitude toward mobile learning is predominantly influenced by students' beliefs about its ability to help them achieve their learning objectives.
Crompton & Burke, 2018	USA	Qualitative (Review)	Higher education faculty are encouraged to explore opportunities to extend learning beyond the classroom through mobile learning.
Al-Mashhadani & Al-Rawe, 2018	Iraq	Quantitative (Survey)	Optimal utilization of smartphone applications and computers can improve performance in colleges and universities.
Gan & Balakrishnan, 2018	Malaysia	Quantitative (Survey)	Students express intentions to utilize mobile devices for academic communications with their instructors.
Kim et al., 2017	South Korea	Quantitative (Survey)	Resistance to mobile learning significantly impacts students' intentions to adopt it, relative to perceived advantages.

Author	Country	Methodology	Findings
Viberg & Grönlund, 2017	Sweden	Qualitative (Interview)	Students frequently use their personal mobile devices for self-initiated learning tasks, suggesting that course designers should accommodate such practices.
Briz-Ponce et al., 2017	Spain	Quantitative (Survey)	Students exhibit a strong positive attitude toward perceived mobile learning and the utilization of apps.
Sung et al., 2016	Taiwan	Qualitative (Review)	The integration of mobile devices in teaching and learning processes yields discernible effects.
Lin et al., 2016	Taiwan	Quantitative (Survey)	The development and validation of three dimensions, self-directed learning, optimism, and mobile learning self-efficacy, are highlighted.
Khan et al., 2015	Oman	Qualitative (Review)	Promoting awareness of mobile learning and fostering partnerships between public and private entities are crucial endeavors.

Advantages of mobile learning

Table 4 shows the advantages of mobile learning examined in studies, such as the positive attitude of students toward mobile learning, increased mobile-assisted collaborative learning environments, support and help to update technological developments in higher educational organizations (n = 7), implementing positive effects on students' intention (n = 6), improving self-efficacy, and self-directed learning (n = 5), etc**.**

Table 4
Advantages of mobile learning have been examined in studies

Advantages of mobile learning	F
Positive attitude of students toward mobile learning	7
Increased mobile-assisted collaborative learning environments	7
Support and help to update technological developments in higher educational organizations	7
Implementing positive effects on students' intention	6
Enriches students' learning experience for mobile technology adoption	5
Improves students' competencies	3
Increases awareness level for the educational benefits	2
Understanding ways to develop mobile learning	2
Improves students' performance	2
Increases self-confidence, motivation, and engagement	2
Increased use of social networks like Facebook and Instagram	2

In addition to showing a more optimistic attitude toward mobile applications, students also showed significant improvement in their academic performance (Goundar & Kumar, 2022; Lan, 2022). Students' personality traits towards mobile learning are primarily influenced by their beliefs about its usefulness in achieving their educational goals. This perspective is further

shaped by factors such as the social environment and the technical infrastructure available for mobile learning (García Botero et al., 2018). There are significant improvements in the educational landscape, particularly in higher education, with a pronounced impact on the affective domain, fostering student engagement and collaboration through mobile learning (Diacopoulos & Crompton, 2020). Supportive environments for mobile-assisted collaborative learning enhance social presence and facilitate the acquisition of complex cognitive skills during the learning process (Cavus Ezin & Yilmaz, 2023; Jiang & Zhang, 2020).

Studies according to the research location

Table 5 presents the studies examined in this literature review by research location, along with the countries where the research was conducted. In Table 5 it was found that studies related to the topic of mobile learning influence on the students of higher education were mostly conducted in the United States of America (n = 6), and the rest of the researches were conducted in Taiwan (n = 5), China (n = 4), Australia, and Malaysia (n = 3), Fiji, Hong Kong and other four countries (n = 2), and Belgium and other seventeen countries conducted (n = 1) studies respectively.

Table 5
Studies according to the research location

Country Name	F
USA	6
Taiwan	5
China	4
Australia	3
Malaysia	3
Fiji	2
Hong Kong	2
India	2
Iran	2
Israel	2
South Korea	2
Belgium	1
Brunei Darussalam	1
Ecuador	1
Ghana	1
Greece	1
Hungary	1
Iraq	1
Italy	1
Malta	1
Netherlands	1
Oman	1
Portugal	1
Saudi Arabia	1

Spain	1
Sri Lanka	1
Sweden	1
Thailand	1
Turkey	1
Total	51

In this context, industrialized nations have organized and adapted their technological infrastructures to facilitate the shift from traditional, in-person education to digital platforms. Developing nations were not fully prepared for this transformation and faced challenges due to insufficient technological and practical foundations, affecting students, instructors, and other stakeholders (Zareie & Navimipour, 2016; Zarei & Mohammadi, 2022). Many worldwide colleges and universities are embracing technological and communication systems to modernize the higher education industry and stimulate investment in its rebuilding (Al-Mashhadani & Al-Rawe, 2018). Studies suggest a growing tendency toward collaborative learning, notably in higher education, where the emphasis is mostly on innovation and focused on learner activities based on mobile learning (Peramunugamage et al., 2023). Students have a moderate but evident preference for mobile learning and app use in education.

Their sentiments are overwhelmingly positive, and they exhibit a high readiness to support such technology (Briz-Ponce et al., 2017; Khan et al., 2015). Furthermore, developing countries strategically leverage mobile learning alongside advances in technology, demonstrating cautious decision-making in integrating educational resources (Qazi et al., 2023; Okai-Ugbaje et al., 2022).

Elements influencing the usability of mobile devices for the growth of e-learning

Studies distributed according to publication years

Figure 2 shows the studies published over the years on the positive effects of mobile learning on students' performance in higher education. In Figure 2, it is evident that these studies were conducted in 2015, and the number of studies increased in recent years, specifically 2021, 2022, and 2023.

There has been a notable increase in the utilization of mobile learning among students of higher education institutions in recent years. Concurrently, rapid technological advancements are altering civilization, creating dynamic and evolving environments. It is critical for HEIs to embrace these innovations to enhance and enrich the educational process (Oliveira et al., 2021; Diteeyont & Heng-Yu, 2023). New and innovative technologies can organize and deliver information to higher education students related to distance learning (Kampa, 2023; Viberg & Grönlund, 2017). Students' self-regulation abilities and objectives strongly predicted their real-world use of smartphones and other mobile devices (Lai et al., 2022; Peng et al., 2022). Students' performance, self-efficacy, and motivation were significantly improved by the use of mobile learning (Y. N. Lin et al., 2021; Qashou, 2021; Hafezad Abdullah, 2024.

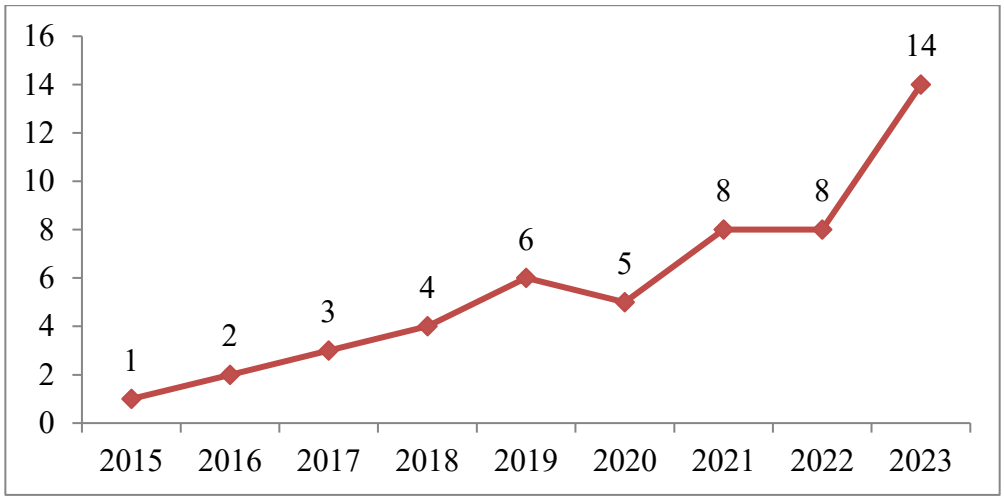

Figure 2: Studies distributed according to years

Variables examined in studies

Table 6 shows the variables found in these articles. In Table 6, it was found that the most used variables were the use of mobile technology (n = 9), collaborative learning, mobile learning acceptance, and mobile learning readiness (n = 7), students' performance (n = 5), students' perception and teaching and learning (n = 4), behavioral intention and mobile phone addiction (n = 3). The lowest examined variables were student engagement and self-efficacy (n = 1), respectively.

Table 6
Variables examined in studies

Variables	F
Use of mobile technology	9
Collaborative learning	7
Mobile learning acceptance	7
Mobile learning readiness	7
Students' performance	5
Students' perception	4
Teaching and learning	4
Behavioral intention	3
Mobile phone addiction	3
Student engagement	1
Self-efficacy	1

Reddy et al. (2023) highlight students' eagerness and positive perceptions of the use of Mobile phones for higher education instruction and demonstrate their preparedness for mobile-based education. Gan and Balakrishnan (2018) provide insights into the factors that influence students' intent to use mobile learning to communicate with their instructors about educational issues. Academic interest in mobile learning is growing, with various apps used by both students and instructors, including learning management systems, broadcasts, podcasts, educational games, interactive tools, and language apps. Integrating mobile learning enhances student

satisfaction and academic performance in higher education settings (Hamidi & Jahanshaheefard, 2019).

Smartphones have transformed into versatile platforms offering a wide array of apps, support, and resources for educational institutions. By assessing learners' current mobile device usage patterns, tailored educational applications can be developed. Despite numerous initiatives to integrate mobile learning into higher education, several challenges remain to be addressed (Criollo-C et al., 2021; X. Zhang et al., 2021). Ding et al. (2023) found that using mobile phones and improving sleep quality could be helpful strategies for directly or indirectly reducing depressive symptoms (Lau et al., 2020; Bai, 2019). In the context of mobile phone dependency, depression, and anxiousness were associated with hidden group membership in males, but females had a strong correlation with challenges recognizing emotions, stress, and anxiety (Lv et al., 2023; Green, 2019).

Positive evaluations are given to the mobile services libraries offer, suggesting that students should be informed about the benefits of using mobile devices to access library resources, and that staff should receive proper training to support these services. Furthermore, management should provide additional resources to effectively manage these resources (Gan & Balakrishnan, 2018). Mobile learning enhances educational experiences, extends learning beyond the classroom, and promotes personalized instruction. Using mobile learning enables learners to easily access knowledge, participate with students and educators, coordinate educational activities, and generate and distribute items while on the move (Lau et al., 2020). Practitioners and researchers should define and consider design requirements for learning contexts, as well as the successful factors of mobile learning. By specifically outlining the objectives and opportunities of this rapidly evolving field of learning technology, we can design ongoing educational research to focus on learners' goals (Grant, 2019).

Discussion

This investigation reviewed studies that examined the influence of mobile learning on students' performance in higher education, identifying studies distributed by publication year, advantages of mobile learning, research location, research methodology, findings, and variables examined. The findings of this review show that using mobile phones as an educational tool has positive effects on students' performance in higher education. The relevance of the information provided has been established as a great achievement for society's institutions of higher education, as well as for individuals, in accessing the information and resources available online using mobile devices. However, in the present digital era, information providers must develop advanced, innovative strategies to deliver online services to users worldwide. After the COVID-19 pandemic, it has become clear that there is a significant change in our society, so there will be a new impetus for information professionals and the recent education system to adopt e-learning at large scale. Nowadays, digital libraries allow users to access available resources online through multiple remote access methods, such as mobile learning, which they can use from anywhere, anytime. This is more useful than conventional libraries because they can contribute limited sources due to price and scope. Digital libraries can help bridge the gap between e-learners and libraries and increase demand for e-learning (Allen & Taylor, 2017). Another reason to choose an e-learning facility is the availability of various electronic tools. By using these tools on mobile or other devices, users can easily search for text, images, or videos, with access provided by the institutions or online via remote access to fulfill their academic

needs.

This systematic review aimed to assess how students utilize mobile devices, particularly social media, for self-directed learning outside traditional educational settings. The review encompassed 51 studies investigating the application of mobile learning across various educational domains. Notably, the use of mobile learning in conjunction with online learning innovations for students' performance in higher education institutions was observed primarily in recent years, specifically in 2021, 2022, and 2023. A significant portion of these studies originated in the United States of America. The outcomes of this systematic literature review underscore that mobile learning was predominantly favoured among university students. With the acceptance of mobile phones as the most commonly used devices among students of higher education institutions. A beneficial effect of mobile technology was visible in enhanced student engagement and collaboration. The review highlighted several advantages of mobile learning, such as the positive attitude of students toward mobile learning, an increase in mobile-assisted collaborative learning environments, support and help to update technological developments in higher educational organizations, positive effects on students' intention, self-efficacy, and self-directed learning, etc. (Ocran et al., 2020).

Continued acceptance and utilization of mobile learning offer insights into optimizing content and contextual frameworks for heightened effectiveness (Jang & Suh, 2022). Understanding fundamental aspects and emerging features in mobile learning contributes significantly to its design, composition, and execution (L. Zhang & Yu, 2022; Saidani Neffati et al., 2021). A study conducted by Al-Rahmi et al. (2022) provides invaluable insights for higher education institutions seeking to strengthen students' acceptance of mobile learning, thereby fostering positive attitudes and behavioral intentions toward its incorporation into educational processes. Understanding mobile adoption dynamics helps universities tailor services to increase student adoption rates, accounting for the variables that influence these choices (Paganin et al., 2023; Rožanec et al., 2022; Kumar & Kumar, 2023). Improving technical and organizational support structures, alongside conducting more empirical research on instructional methodologies conducive to mobile learning, particularly in developing nations, emerges as imperative (Hoi, 2020).

Exploration of dependency on mobile devices among students in higher education, prompted by public health occurrences, as well as efforts to enhance attitudes, confidence, and skills of mobile learning usage among students, serves as vital reference points (Jang & Suh, 2022; Verma et al., 2019; Nikolopoulou et al., 2023). Students' digital literacy and expertise with mobile learning, as well as prior favorable experiences, may have influenced the study's results (Antee, 2021). Encouraging intentions to use platforms such as Google Classroom for educational purposes were discovered to be influenced by practice, inspiration, and achievement expectancies (Kumar & Bervell, 2019). Instructors are encouraged to provide guidance, support, and motivation to students engaging with mobile learning, as this can bolster their confidence and sustain their interest, thereby enhancing affective engagement (Salhab & Daher, 2023). Research groups using mobile applications reported significantly greater information outcomes, lower inherent and external cognitive demands, greater skill achievement, and greater pleasure than control groups (Chang et al., 2021).

Conclusion

In conclusion, the systematic review suggests that mobile learning, particularly when integrated with social media, positively influences teaching and learning in higher education institutions. The research outcomes of the 51 specific studies analyzed indicated positive results, encompassing various variables such as the use of mobile technology, collaborative learning, mobile learning acceptance, mobile learning readiness, students' performance, students' perception, teaching and learning, behavioral intention, mobile phone addiction, student engagement, and self-efficacy, respectively. These studies showcased diverse ways in which mobile devices can support educational practices, with research conducted in countries such as the USA, Taiwan, China, Australia, and others. Notably, the majority of mobile users were university students, with mobile phones the most frequently used devices, possibly due to their widespread availability in higher education settings. The main disturbance students face individually is poor internet connectivity, which causes problems due to the lack of technical staff (Almalki, 2022; Sung et al., 2016).

This systematic literature review found a positive influence of mobile learning on students' performance in higher education, offering a broad perspective on the reasons, methods, and applications observed in studies on e-learning and ICT. Nonetheless, it is crucial to interpret the review results in light of certain limitations. Firstly, the selection process for articles limited the literature review to papers published in 33 journals and focused solely on mobile learning. This systematic review is an important tool for researchers seeking to consider holistically research on mobile learning among higher education students and to identify gaps in the existing literature.

Recommendations

Recommendations for future research include expanding the sources, incorporating a wider range of literature, and exploring different technologies, particularly social networking sites, to discover how learners can use them for independent learning beyond traditional classroom settings. In conclusion, we summarize the implications for research practices and future studies based on the review findings. First, researchers must investigate intervening variables to comprehend the mechanisms behind positive outcomes. Second, the data from this systematic review highlight the advantages of employing mobile learning in informal education contexts. Future research should focus on the usability of mobile devices in social environments to better understand educational dynamics in these contexts. Third, the use of mobile learning has not been thoroughly investigated across all subject domains, suggesting a potential avenue for further research. Lastly, while this review predominantly focused on university and undergraduate students, further studies on higher secondary school students and faculty members using mobile learning in classrooms would be pertinent.

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