

Mobile Learning (M-Learning) for Higher Education: Delivering Education through Smartphones Rather than Computers

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Abstract

The rapid advancement of information and communication technologies (ICTs) has transformed teaching and learning practices in higher education worldwide. Universities are increasingly adopting digital technologies to improve access to education, enhance student engagement, and support flexible learning environments (UNESCO, 2023). However, in many developing countries, including Zambia, access to personal computers remains limited due to economic constraints and inadequate technological infrastructure.

In Zambia, mobile technologies have become the primary means of accessing digital services and the Internet. The 2022 National Survey on Access and Usage of Information and Communication Technologies by Households and Individuals reported that 63.3% of the adult population had access to mobile phones, while only 36.8% of mobile phone users owned smartphones (ZICTA, 2023). Furthermore, the survey indicated that smartphones are the dominant devices used to access the Internet, whereas the use of portable and fixed computers remains considerably low. These statistics demonstrate the growing importance of smartphones in facilitating access to digital information and online services in Zambia. ([ZICTA][1])

In recent years, smartphones have become the most widely used digital devices among university students because of their affordability, portability, and multifunctionality (Naveed et al., 2023; Gupta et al., 2021). These devices enable learners to access e-learning platforms, participate in virtual classes, communicate with lecturers and peers, and retrieve educational materials from anywhere and at any time (Sophonhiranrak, 2021). Consequently, higher education institutions are increasingly recognizing the potential of mobile learning (m-learning) as an alternative and complementary approach to traditional computer-based e-learning (Crompton & Burke, 2021).

Mobile learning refers to the use of portable digital devices, particularly smartphones and tablets, to facilitate teaching and learning beyond the limitations of fixed locations and conventional classrooms (Naveed et al., 2023). The flexibility and accessibility offered by smartphones make them particularly suitable for developing countries, where mobile phone ownership is significantly higher than computer ownership. In Zambia, evidence from national surveys suggests that smartphones are increasingly becoming the principal digital tools through which individuals access the Internet and digital services. ([NADA ZamStats][2])

Despite the growing adoption of smartphones in education, the implementation of mobile learning in higher education faces several challenges, including inadequate digital infrastructure, limited institutional readiness, insufficient lecturer training, and the absence of clear policies guiding smartphone integration

in academic environments (Al-Emran & Shaalan, 2022; Naveed et al., 2023). Furthermore, empirical evidence on the effectiveness of smartphone-based mobile learning in the context of Zambian higher education remains limited. Therefore, there is a need to investigate how smartphones can be effectively utilized to deliver education and improve learning outcomes in higher education institutions.

This study, therefore, seeks to explore mobile learning in higher education by examining the use of smartphones as primary learning devices rather than relying solely on computers. The findings are expected to contribute to the growing body of knowledge on m-learning and provide recommendations for enhancing digital inclusion and educational accessibility in Zambian higher education institution

1. Introduction and Background of the Study

(Naveed et al., 2023; Crompton & Burke, 2018; Sophonhiranrak, 2021) Mobile learning (m-learning) refers to the use of portable digital devices such as smartphones, tablets, and other wireless technologies to support teaching and learning processes anytime and anywhere. Unlike traditional computer-based e-learning, mobile learning emphasizes mobility, flexibility, and continuous access to educational content beyond fixed locations such as computer laboratories or lecture halls. This approach enables learners to engage with educational resources, communicate with instructors and peers, and participate in learning activities regardless of time and geographical constraints (Alrasheedi et al., 2015; Gupta et al., 2021).

This shift has been largely driven by the rapid expansion of mobile technologies, improved internet connectivity, and the increasing affordability of smartphones, particularly in higher education settings across both developed and developing countries (Naveed et al., 2023; Sophonhiranrak, 2021).

Because of its portability, versatility, and affordability in comparison to laptops and desktop computers, cellphones have emerged as the most popular digital device among college students in recent years (Naveed et al., 2023; Al-Emran et al., 2022). Accessing e-learning platforms, participating in online forums, attending virtual lectures, and collecting academic resources from digital libraries are just a few of the educational activities that these gadgets facilitate (Sophonhiranrak, 2021; Gupta et al., 2021). In order to promote flexibility, accessibility, and student involvement, higher education institutions have progressively incorporated mobile technologies into teaching and learning processes (Crompton & Burke, 2021; Yilmaz et al., 2022).

Studies indicate that mobile learning promotes learner-centered education by allowing students to control the pace, timing, and location of their learning activities (Naveed et al., 2023; Sophonhiranrak, 2021).

The global adoption of mobile learning was significantly accelerated by the outbreak of the COVID-19 pandemic, which forced educational institutions worldwide to transition from traditional face-to-face instruction to remote and online learning systems. During this period, smartphones became essential tools for ensuring continuity in education, enabling students to attend virtual classes, submit assignments, and access learning materials without physical presence on campus. Research evidence shows that the pandemic triggered a substantial increase in academic interest and publications on mobile learning between 2020 and 2022, highlighting its growing importance in modern education systems (Thirty years of mobile learning in higher education: A historical review and bibliometric analysis, 2026).

In developing countries such as Zambia, the role of mobile learning is even more critical due to limited access to personal computers and inadequate ICT infrastructure in many higher education institutions. A large proportion of university students rely primarily on smartphones for academic purposes because laptops and desktop computers are often unaffordable or unavailable. Consequently, mobile learning has emerged as a practical and cost-effective alternative for supporting access to higher education, particularly

among students from rural and low-income backgrounds. Research shows that mobile learning enhances self-directed learning, collaboration, and academic accessibility by enabling students to learn independently regardless of time and geographical location (Sophonhiranrak, 2021).

Despite the increasing adoption of smartphones in higher education, several challenges continue to affect the effective implementation of mobile learning systems. These challenges include poor internet connectivity, high mobile data costs, limited digital literacy among students and lecturers, device distractions caused by non-academic applications, cybersecurity risks, and unequal access to advanced smartphones. Additionally, inadequate institutional support and the lack of mobile-optimized learning platforms further limit the effectiveness of smartphone-based education. Empirical studies also indicate that students' acceptance of mobile learning is influenced by factors such as perceived usefulness, ease of use, facilitating conditions, and social influence, which significantly determine the level of adoption in higher education environments (Yılmaz et al., 2022; Gupta et al., 2021).

Therefore, this study seeks to investigate the effectiveness of mobile learning through smartphones in higher education institutions and assess its potential as a viable alternative or complement to traditional computer-based learning systems. The study will further explore the opportunities, challenges, and factors influencing the adoption of smartphone-based learning in order to contribute to improved digital education practices in higher education institutions.

2. Problem Statement

(UNESCO, 2023; Crompton & Burke, 2023; Bond et al., 2021) As part of a larger educational reform and digitalization, higher education institutions around the world are progressively using digital technologies into their teaching and learning processes. Despite these advancements, traditional computer-based e-learning systems are still widely used by many universities in underdeveloped nations. These systems frequently assume that students have regular access to desktop or laptop computers. However, due to financial limitations, digital inequality, and infrastructure difficulties, access to personal computers is still restricted in many poor nations.

(World Bank, 2022; UNESCO, 2023; Naveed et al., 2023) A large percentage of university students in nations like Zambia cannot afford laptops or desktop computers, which makes it challenging for them to fully engage in computer-based online learning systems. Because of this, a lot of students rely on smartphones as their primary digital devices to access learning materials, interact with instructors, and do assignments. The growing use of smartphones emphasizes the promise of mobile learning, or m-learning, as a different strategy for enhancing educational accessibility, especially in poor nations where limited access to personal computers and digital inequality continue to be significant obstacles. Smartphones have therefore become the most widely available and frequently used technology among university students, particularly in low- and middle-income settings (Naveed et al., 2023).

Due to its portability, versatility, and affordability in comparison to laptops and desktop computers, cellphones have emerged as the most popular digital device among college students in recent years (Naveed et al., 2023; Al-Emran et al., 2022). Accessing e-learning platforms, participating in online forums, attending virtual lectures, and collecting academic resources from digital libraries are just a few of the many educational activities that these devices facilitate (Sophonhiranrak, 2021; Gupta et al., 2021). In order to promote flexibility, accessibility, and student involvement, higher education institutions have progressively incorporated mobile technology into their teaching and learning processes (Crompton & Burke, 2021; Yılmaz et al., 2022).

This lack of mobile optimization creates usability challenges for students who rely on smartphones, including difficulties in navigating platforms, viewing course materials, submitting assignments, and participating effectively in online learning activities (Almaiah et al., 2022) (Naveed et al., 2023; Sophonhiranrak, 2021; Yilmaz et al., 2022) As a result, learning efficiency, user experience, and academic achievement may be adversely affected by the mismatch between students' preferred devices and institutional learning systems. Accessibility, usability, and engagement issues may arise when mobile learning platforms are not built to support frequently used student devices like smartphones.

This gap in knowledge limits the ability of policymakers and educational institutions to make informed decisions regarding the integration of mobile learning strategies into higher education systems (Sánchez-Prieto et al., 2021).

(Naveed et al., 2023; Al-Emran & Shaalan, 2022; Sophonhiranrak, 2021) Inadequate institutional preparedness, poor digital infrastructure, inadequate lecturer training, and unclear policies governing smartphone use in academic settings are additional factors that frequently impede the successful implementation of mobile learning. These difficulties lower the overall efficacy of mobile learning and lead to disparities in how it is implemented across institutions. Supportive institutional initiatives, investments in digital infrastructure, professional development for instructors, and regulations that encourage the meaningful integration of cellphones into teaching and learning processes are all necessary for the successful adoption of mobile learning. Both instructors and students may find it difficult to fully benefit from mobile learning technology in the absence of adequate support mechanisms (Dhawan, 2022). Therefore, this study seeks to investigate the effectiveness of mobile learning through smartphones in higher education institutions. It also aims to identify the key factors influencing its adoption, examine existing challenges, and explore how smartphone-based learning can be optimized to improve teaching and learning outcomes in higher education institutions, particularly in developing contexts such as Zambia.

3. Specific Objectives

The study will be guided by the following objectives:

1. To identify the benefits of mobile learning in higher education.
2. To investigate the challenges affecting the implementation of smartphone-based learning.
3. To assess factors influencing students' acceptance and use of mobile learning.
4. To propose strategies for improving mobile learning implementation in higher education institutions.
5. To examine the use of smartphones for mobile learning among higher education students.

4. Research Questions

1. What are the benefits of mobile learning through smartphones?
2. What challenges affect the implementation of m-learning in higher education?
3. What factors influence students' acceptance of mobile learning?
4. What strategies can improve smartphone-based learning in universities?
5. How are smartphones being used for mobile learning in higher education?

5. Scope of the Study

The scope of this study is limited to the use of smartphones for mobile learning in higher education institutions, with a particular focus on understanding how mobile technologies are being integrated into teaching and learning processes. Mobile learning in this context refers to the use of smartphones and

related mobile applications to access educational content, participate in learning activities, communicate with lecturers, and engage in collaborative academic work beyond the traditional classroom environment (Traxler, 2018).

The study will specifically focus on students' and lecturers' experiences with smartphone-based learning systems. Students' experiences will include how frequently they use smartphones for academic purposes, how they access learning materials, and how mobile learning influences their academic engagement and performance. Lecturers' experiences will focus on how they deliver content, communicate with students, and manage instructional activities using mobile learning platforms. Understanding both perspectives is essential because effective mobile learning implementation depends on the interaction between learners and instructors within digital environments (Almaiah et al., 2022).

In addition, the study will examine the benefits associated with smartphone-based learning in higher education. These benefits include flexibility in accessing learning materials, improved communication between students and lecturers, enhanced collaboration among peers, and increased access to digital educational resources. Previous studies have shown that mobile learning contributes to learner autonomy, engagement, and academic motivation by allowing students to learn anytime and anywhere using portable devices (Sánchez-Prieto et al., 2021).

The study will also investigate the challenges affecting the effective use of mobile learning in higher education institutions. These challenges include poor internet connectivity, high data costs, limited device capabilities, digital distractions, cybersecurity risks, and unequal access to smartphones among students. Research indicates that such barriers can significantly hinder the successful adoption and sustainability of mobile learning initiatives, especially in developing countries where digital infrastructure may still be limited (UNESCO, 2021).

Furthermore, the study will explore the factors influencing the adoption of smartphone-based learning systems among students and lecturers. These factors will be examined using relevant theoretical perspectives such as the Unified Theory of Acceptance and Use of Technology (UTAUT), which highlights constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions as key determinants of technology adoption behavior (Venkatesh et al., 2003; Almaiah et al., 2022).

Geographically, the study will be limited to selected higher education institutions in Zambia. The findings may therefore not fully represent all universities in other countries; however, they will provide valuable insights into the general trends, challenges, and opportunities associated with smartphone-based mobile learning in similar educational contexts.

Overall, the scope of this study is confined to understanding how smartphones are used as learning tools in higher education, focusing on user experiences, perceived benefits, implementation challenges, and adoption factors influencing mobile learning practices in university settings.

6. Aim of the Study

The aim of this study is to investigate the effectiveness of mobile learning (m-learning) through smartphones in higher education and to assess its potential as an alternative or complementary approach to traditional computer-based learning systems. Mobile learning has gained significant attention in educational research due to the rapid increase in smartphone ownership and the growing demand for flexible, accessible, and student-centered learning environments. In higher education, smartphones are increasingly being used to access learning materials, participate in online discussions, and engage in

academic activities beyond the physical classroom, making them a central tool in modern digital education (Traxler, 2018).

This study aims to critically examine how effectively smartphones support teaching and learning processes in universities, particularly in terms of improving student engagement, accessibility of learning resources, and academic performance. Previous research indicates that mobile learning enhances learning outcomes by enabling continuous access to educational content and supporting self-paced and personalized learning experiences (Sánchez-Prieto et al., 2021). By focusing on effectiveness, the study seeks to determine whether smartphone-based learning can deliver comparable or improved educational outcomes when compared to traditional computer-based systems.

In addition, the study aims to assess the extent to which mobile learning can serve as a viable alternative or supplement to conventional computer-based learning environments. While computer-based learning has traditionally dominated higher education, it often requires fixed infrastructure such as computer laboratories and stable desktop systems. In contrast, smartphones offer portability and affordability, allowing learners to access educational content anytime and anywhere. This shift has been widely recognized as part of the broader digital transformation in education, where mobile technologies are increasingly used to expand access and improve learning flexibility (UNESCO, 2021).

Furthermore, the study aims to explore the key factors influencing the adoption and use of smartphone-based learning in higher education institutions. Using theoretical perspectives such as the Unified Theory of Acceptance and Use of Technology (UTAUT), the study will examine how performance expectancy, effort expectancy, social influence, and facilitating conditions shape students' and lecturers' acceptance of mobile learning systems (Venkatesh et al., 2003; Almaiah et al., 2022). Understanding these factors is essential in determining whether mobile learning can be sustainably integrated into higher education practices.

Ultimately, the study aims to generate empirical evidence that can guide policymakers, university administrators, and educators in improving the design and implementation of mobile learning systems. This is particularly important in developing contexts such as Zambia, where challenges related to infrastructure, digital literacy, and access to technology may influence the success of mobile learning initiatives. The findings are expected to contribute to enhancing the effectiveness, inclusivity, and sustainability of smartphone-based learning in higher education institutions.

7. Significance of the Study

This study will be important to many higher education stakeholders (Naveed et al., 2023; Gupta et al., 2021; Yilmaz et al., 2022). Understanding how smartphone-based learning might enhance educational accessibility and digital inclusion would be beneficial to universities and governments. The findings could help schools create mobile learning policies that work and enhance their digital learning infrastructures. Additionally, the results could offer evidence-based suggestions for improving the use of mobile learning and fortifying digital learning infrastructures at universities.

Improved mobile-friendly learning systems that facilitate flexible and accessible education may assist students (Naveed et al., 2023; Yilmaz et al., 2022; Gupta et al., 2021). Additionally, lecturers could acquire useful tactics for using cellphones into instructional activities. The study will also add to the body of literature already available on mobile learning, especially in developing nations like Zambia where there are still few empirical studies on smartphone-based learning in higher education.

8. Literature Review

8.1 Concept of Mobile Learning

Mobile learning is defined as the use of mobile technologies such as smartphones and tablets to support learning activities beyond traditional classroom environments. Unlike conventional e-learning, which often depends on desktop computers and fixed internet access, m-learning emphasizes portability, flexibility, accessibility, and continuous learning opportunities. Recent studies describe mobile learning as a learner-centered educational approach that allows students to access educational materials anytime and anywhere through wireless technologies (Naveed et al., 2023). Mobile learning further promotes independent learning, collaborative engagement, and personalized educational experiences among learners in higher education institutions (Sophonhiranrak, 2021).

The widespread ownership of smartphones among university students has made m-learning increasingly popular in higher education. Research indicates that smartphones support various educational functions, including accessing lecture notes, participating in online discussions, attending virtual classes, watching educational videos, conducting research, downloading digital learning materials, and submitting assignments (Sophonhiranrak, 2021). Additionally, mobile technologies facilitate instant communication between lecturers and students through learning management systems and educational applications, thereby enhancing interaction and collaboration in the learning process (Gupta et al., 2021).

Recent literature also suggests that mobile learning improves flexibility by allowing students to learn at their own pace and according to their personal schedules (Yılmaz et al., 2022). This flexibility is particularly beneficial for distance learners, part-time students, and learners from remote areas who may have limited access to physical classrooms and computer laboratories (Naveed et al., 2023). Furthermore, smartphones are considered more affordable and portable than desktop computers, making them practical tools for expanding educational access in developing countries (Aldowah et al., 2021).

Scholars further argue that mobile learning supports active and interactive learning through multimedia content such as videos, podcasts, animations, virtual simulations, and educational games (Alhumaid, 2021). The integration of mobile applications and cloud-based technologies has also improved students' ability to store, share, and retrieve educational content efficiently (Kumar & Sharma, 2022). In higher education institutions, mobile learning is increasingly viewed as an innovative strategy for promoting digital transformation and improving teaching and learning effectiveness in the post-COVID era (Haleem et al., 2022).

8.2 Benefits of Mobile Learning in Higher Education

Mobile learning offers several advantages in higher education. One major benefit is flexibility, as students can learn regardless of location and time. Smartphones support continuous and self-paced learning, allowing students to revisit educational materials whenever necessary. Research shows that m-learning improves accessibility for students in remote and underserved communities because smartphones are generally more affordable and portable than computers (Naveed et al., 2023). Another significant advantage is increased student engagement and collaboration. Mobile applications such as learning management systems, discussion forums, instant messaging platforms, and educational apps promote communication and collaborative learning among students and lecturers. Additionally, smartphones support multimedia learning through videos, podcasts, animations, and interactive applications, which can improve students' understanding and motivation.

Mobile learning is also cost-effective because institutions may reduce dependence on expensive computer laboratories and physical learning resources. Studies further indicate that mobile learning enhances digital

literacy and independent learning skills among university students (Al-Hunaiyyan et al., 2022). Furthermore, mobile learning encourages personalized learning experiences because students can customize their learning environments according to their preferences and learning pace. Adaptive mobile applications can provide immediate feedback, track learning progress, and recommend learning materials suited to individual needs, thereby improving academic performance and learner satisfaction (Sánchez-Prieto et al., 2021).

Another important benefit of mobile learning is improved communication between lecturers and students. Through mobile devices, lecturers can instantly share announcements, lecture notes, quizzes, and assignment feedback, ensuring timely interaction and continuous academic support. Research indicates that instant communication through mobile platforms strengthens teacher-student relationships and enhances participation in learning activities (Martin & Bolliger, 2021). Mobile learning also supports collaborative knowledge construction through online group discussions, peer reviews, and social learning platforms, which are essential in higher education environments.

In addition, mobile learning promotes lifelong learning by enabling learners to access educational resources beyond formal classroom settings. Students can participate in online courses, webinars, virtual libraries, and educational communities using smartphones, which broadens opportunities for professional development and continuous education (Crompton & Burke, 2023). The portability of smartphones further allows students to integrate learning into their daily routines, increasing productivity and effective time management.

Mobile learning also contributes to inclusivity in education. Students with disabilities may benefit from assistive technologies integrated into smartphones, such as voice recognition, screen readers, subtitles, and text-to-speech applications. These features help create more inclusive learning environments and improve participation among diverse groups of learners (UNESCO, 2021). Moreover, during emergencies such as the COVID-19 pandemic, mobile learning played a crucial role in ensuring continuity of education when universities were closed, demonstrating its importance in supporting resilient and sustainable higher education systems (Dhawan, 2022).

8.3 Challenges of Mobile Learning

Despite its advantages, mobile learning faces several challenges. One of the major challenges is poor internet connectivity and high mobile data costs, particularly in developing countries. Students may struggle to access online educational resources due to unstable network coverage or limited financial resources for purchasing internet bundles. In many rural areas, unreliable electricity supply and weak telecommunication infrastructure further hinder effective participation in mobile learning activities (UNESCO, 2021).

Device distraction is another major concern associated with smartphone-based learning. Smartphones provide access to social media, games, entertainment applications, and non-academic content that may negatively affect students' concentration and academic performance. Studies indicate that frequent notifications and multitasking behaviors reduce learners' attention spans and academic productivity (Amez & Baert, 2020). Community discussions and educational debates have also highlighted concerns about excessive smartphone use and reduced learner engagement during online learning activities.

Another significant challenge is digital inequality among students. Although smartphones are generally more affordable than computers, not all students possess modern devices capable of supporting advanced educational applications and virtual learning platforms. Some learners use low-end smartphones with limited storage capacity, insufficient memory, or outdated operating systems, which restrict access to

certain learning resources and applications (Naveed et al., 2023). This digital divide may increase educational inequalities among students from different socioeconomic backgrounds.

Limited battery life and small screen sizes also affect the effectiveness of mobile learning. Continuous use of smartphones for online lectures, assessments, and multimedia content consumes battery power quickly, especially in areas with unreliable electricity supply. In addition, small screens may make it difficult for students to read lengthy academic texts, participate in detailed discussions, or complete complex assignments comfortably (Sung et al., 2021). These technical limitations can negatively influence students' learning experiences and academic performance.

Cybersecurity and privacy risks represent another important challenge in mobile learning environments. Students who use public Wi-Fi networks or unsecured mobile applications may become vulnerable to cyber threats such as hacking, phishing attacks, malware, and unauthorized access to personal information. Research emphasizes the importance of digital security awareness and institutional data protection measures in supporting safe mobile learning practices (Almaiah et al., 2022).

Inadequate lecturer training and resistance to technological change may also limit successful implementation of mobile learning in higher education institutions. Some lecturers may lack the technical skills required to design mobile-friendly instructional materials, manage virtual classrooms, or integrate educational applications effectively into teaching practices. Studies have shown that insufficient professional development programs and limited institutional support often reduce educators' confidence in adopting mobile learning technologies (Martin et al., 2020).

Another challenge involves the lack of clear institutional policies and infrastructure for mobile learning. Many universities have not fully developed guidelines regarding smartphone use in academic settings, online assessment procedures, digital ethics, and mobile learning standards. Without proper policies and support systems, institutions may experience difficulties in ensuring effective implementation, quality assurance, and academic integrity in mobile learning environments (Dhawan, 2022).

Furthermore, some higher education learning platforms are still designed primarily for desktop computer access rather than mobile optimization. Certain websites, digital libraries, and online assessment systems may not function effectively on smartphones, leading to poor user experiences, slow navigation, and difficulties in accessing academic content. This lack of mobile-friendly educational design can reduce students' participation and satisfaction with m-learning systems (Park & Kim, 2021).

8.4 Theoretical Framework

This study will be guided by the Unified Theory of Acceptance and Use of Technology (UTAUT), which was developed by Viswanath Venkatesh and colleagues to explain factors influencing individuals' acceptance and use of technology. The UTAUT model is one of the most widely used theoretical frameworks in information systems and educational technology research because it integrates elements from several earlier technology acceptance theories. The model explains users' behavioral intentions and actual use of technology based on four major constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Recent studies have shown that UTAUT remains highly relevant in examining mobile learning adoption in higher education environments (Almaiah et al., 2022).

Performance expectancy refers to the degree to which students and lecturers believe that using mobile learning technologies will improve their academic performance and teaching effectiveness. In the context of this study, students may adopt smartphone-based learning if they perceive that it enhances access to educational materials, improves communication with lecturers, increases productivity, and supports better academic achievement. Research indicates that students are more likely to embrace mobile learning

technologies when they recognize clear educational benefits such as convenience, flexibility, and improved learning outcomes (Sánchez-Prieto et al., 2021).

Effort expectancy refers to the ease associated with using mobile learning systems. If smartphone applications, learning management systems, and online learning platforms are easy to operate and user-friendly, students and lecturers are more likely to adopt them for educational purposes. Studies demonstrate that complicated interfaces, poor navigation, and technical difficulties may discourage users from engaging with mobile learning platforms. Therefore, perceived ease of use plays a critical role in influencing attitudes toward smartphone-based education (Naveed et al., 2023).

Social influence refers to the extent to which individuals perceive that important people around them believe they should use a particular technology. In higher education, students may adopt mobile learning because of encouragement from lecturers, peers, university administrators, or societal trends promoting digital education. Lecturers' attitudes toward mobile learning can significantly influence students' willingness to participate in smartphone-based educational activities. Research suggests that institutional culture and peer influence contribute greatly to technology acceptance in universities (Martin et al., 2020). Facilitating conditions refer to the availability of technical infrastructure, institutional support, internet connectivity, training, and resources necessary for effective use of mobile learning technologies. Students and lecturers are more likely to adopt m-learning when universities provide reliable Wi-Fi networks, technical support services, mobile-compatible learning platforms, and digital literacy training. Inadequate infrastructure and limited institutional support may negatively affect technology adoption despite positive attitudes toward mobile learning (Dhawan, 2022).

The UTAUT framework is particularly suitable for this study because it provides a comprehensive understanding of the factors influencing smartphone-based learning adoption in higher education institutions. The model will help examine how students' perceptions, institutional support, technological accessibility, and social factors contribute to the acceptance and effective use of mobile learning systems in Zambian universities. Additionally, the framework will assist in identifying barriers that may hinder successful implementation of smartphone-based education.

9. Research Methodology

9.1 Research Design

The study will use a mixed-methods research design involving both quantitative and qualitative approaches. A mixed-methods approach is appropriate because it enables the researcher to collect both numerical and descriptive data, thereby providing a more comprehensive understanding of the use, benefits, and challenges of mobile learning in higher education (Creswell & Creswell, 2021). Quantitative methods will help measure patterns of smartphone usage and levels of mobile learning adoption, while qualitative methods will provide deeper insights into participants' experiences, perceptions, and attitudes toward smartphone-based learning. The integration of both approaches improves the validity and reliability of the research findings through triangulation of data (Saunders et al., 2022).

9.2 Target Population

The target population will include university students and lecturers from selected higher education institutions in Zambia. Students are important participants because they are the primary users of smartphone-based learning systems, while lecturers are directly involved in the delivery and management of digital learning activities. Including both groups will provide balanced perspectives on the

effectiveness, opportunities, and challenges associated with mobile learning in higher education (Naveed et al., 2023).

9.3 Sample Size and Sampling Techniques

A sample of students and lecturers will be selected using stratified and simple random sampling techniques to ensure fair representation of participants from different academic departments and levels of study. Stratified sampling will help divide the population into relevant subgroups before selection, thereby improving representativeness and reducing sampling bias (Kothari, 2021). Simple random sampling will then be used to select participants within each subgroup, ensuring that every member of the population has an equal chance of being included in the study. These sampling techniques are suitable for educational research because they improve the reliability and generalizability of the findings (Creswell & Creswell, 2021).

9.4 Data Collection Methods

Data will be collected using questionnaires, interviews, and focus group discussions. Questionnaires will be used to collect quantitative data regarding smartphone ownership, patterns of mobile learning usage, perceived usefulness, and challenges experienced by students and lecturers. Questionnaires are effective because they allow researchers to gather data from a large number of participants within a relatively short period of time (Saunders et al., 2022).

Interviews will be conducted to obtain detailed qualitative information concerning participants' experiences, attitudes, and perceptions toward mobile learning. Interviews provide opportunities for participants to explain their views in greater depth and allow the researcher to clarify responses where necessary (Bryman, 2021). Focus group discussions will further encourage interaction among participants and generate diverse perspectives regarding the benefits and limitations of smartphone-based learning in universities. The combination of these methods will strengthen the credibility and richness of the research findings.

9.5 Data Analysis

Data analysis in this study will involve both quantitative and qualitative procedures in line with the mixed-methods research design. The integration of both forms of analysis will enable a comprehensive interpretation of findings regarding mobile learning adoption, usage patterns, benefits, and challenges in higher education institutions (Creswell & Creswell, 2021).

Quantitative data collected through questionnaires will be analyzed using statistical techniques with the aid of software such as IBM SPSS Statistics. The data will first be cleaned, coded, and entered into SPSS to ensure accuracy and consistency. Descriptive statistics such as frequencies, percentages, means, and standard deviations will be used to summarize participants' responses on variables such as smartphone usage, accessibility of mobile learning platforms, perceived usefulness, and ease of use. These descriptive measures will help to present a clear picture of trends and patterns in the data (Field, 2022).

In addition, inferential statistical techniques may be applied to examine relationships between key variables influencing mobile learning adoption. For example, correlation analysis may be used to determine the relationship between perceived ease of use and frequency of mobile learning usage, while regression analysis may be applied to identify the strongest predictors of mobile learning acceptance among students and lecturers. These statistical techniques are important in educational research because they allow researchers to test hypotheses and draw generalizable conclusions from the data (Pallant, 2020). Qualitative data collected through interviews and focus group discussions will be analyzed using thematic analysis. Thematic analysis is a systematic approach used to identify, analyze, and interpret patterns or

themes within qualitative data. The process will involve transcription of recorded interviews, familiarization with the data, coding of responses, identification of themes, reviewing themes, and finally defining and naming themes (Braun & Clarke, 2021).

Through thematic analysis, the study will identify key themes such as students' experiences with smartphone-based learning, challenges related to internet connectivity, levels of digital literacy, and perceptions of institutional support for mobile learning. This method allows for a rich and detailed understanding of participants' perspectives and experiences, which cannot be captured through quantitative methods alone (Nowell et al., 2017).

The integration of both quantitative and qualitative findings will be achieved through triangulation, where results from SPSS analysis and thematic analysis will be compared and interpreted together to provide a more holistic understanding of mobile learning in higher education. This approach enhances the validity and reliability of the study findings and ensures that conclusions are well-supported by multiple sources of evidence (Saunders et al., 2022)

1. Scope of the Study

The study will focus on the use of smartphones for mobile learning in higher education institutions. It will specifically examine students' and lecturers' experiences, benefits, challenges, and factors influencing the adoption of smartphone-based learning. The research will concentrate on educational activities such as accessing online learning materials, participating in virtual classes, submitting assignments, engaging in collaborative learning, and communicating with lecturers through mobile devices (Dhawan, 2022).

The study will be limited to selected higher education institutions in Zambia and may not represent all universities in the country. However, the findings are expected to provide valuable insights into the current state of mobile learning and contribute to improving digital education practices in higher education institutions.

2. Expected Outcomes

The study is expected to provide important insights into smartphone usage in higher education and the growing role of mobile technologies in digital learning environments. The findings are expected to identify the major benefits and limitations of mobile learning, including flexibility, accessibility, learner engagement, internet challenges, and digital inequalities among students (Almaiah et al., 2022).

The study is also expected to determine factors influencing m-learning adoption among students and lecturers using the Unified Theory of Acceptance and Use of Technology (UTAUT) framework. Factors such as perceived usefulness, ease of use, institutional support, and social influence are expected to play significant roles in technology acceptance (Sánchez-Prieto et al., 2021).

Furthermore, the study is expected to recommend strategies for improving smartphone-based learning systems in universities. These recommendations may include improving internet infrastructure, promoting mobile-friendly learning platforms, enhancing digital literacy training, and developing institutional policies that support effective mobile learning implementation in higher education institutions (UNESCO, 2021).

3. Expected Outcomes

The study is expected to generate comprehensive findings on the role of smartphones in supporting mobile learning within higher education institutions. Overall, it is anticipated that the research will contribute to

a deeper understanding of how mobile technologies are shaping teaching and learning practices, particularly in university settings where digital transformation is increasingly becoming central to education delivery (Almaiah et al., 2022).

One of the key expected outcomes is the provision of detailed insights into smartphone usage in higher education. The study is expected to reveal how frequently students and lecturers use smartphones for academic purposes such as accessing learning materials, attending virtual lectures, communicating through learning platforms, and submitting assignments. Previous research indicates that smartphones have become essential educational tools due to their portability, affordability, and ability to support continuous learning beyond the classroom environment (Sánchez-Prieto et al., 2021).

The study is also expected to identify both the benefits and limitations of mobile learning. On the benefits side, findings are likely to confirm that mobile learning enhances flexibility, accessibility, student engagement, and collaboration among learners. It is also expected that mobile learning improves digital literacy and supports self-directed learning among students. However, the study may also highlight limitations such as poor internet connectivity, high data costs, device distractions, limited battery life, and unequal access to smartphones among students, which may negatively affect learning outcomes (UNESCO, 2021).

Another expected outcome is the determination of factors influencing m-learning adoption among students and lecturers. Using the Unified Theory of Acceptance and Use of Technology (UTAUT), the study is expected to confirm that performance expectancy, effort expectancy, social influence, and facilitating conditions play a significant role in determining whether individuals accept and use smartphone-based learning systems. Prior studies have shown that perceived usefulness and ease of use strongly influence learners' willingness to adopt mobile learning technologies in higher education (Venkatesh et al., 2003; Naveed et al., 2023).

Furthermore, the study is expected to recommend practical strategies for improving smartphone-based learning systems in universities. These recommendations may include enhancing internet infrastructure, reducing data costs through institutional partnerships, improving mobile-friendly learning platforms, and strengthening digital literacy training for both students and lecturers. It is also expected that the study will recommend the development of clear institutional policies to guide the effective and ethical use of mobile learning technologies in higher education institutions (Dhawan, 2022).

In addition, the study is expected to provide policy-relevant insights for university administrators and education policymakers in Zambia. These insights may support the development of more inclusive, accessible, and technology-driven education systems that align with global trends in digital learning transformation. Overall, the findings are expected to contribute to both academic literature and practical improvements in mobile learning implementation in higher education.

4. Conclusion

Mobile learning has emerged as a significant educational innovation that is reshaping the delivery of higher education through the use of smartphones and other mobile technologies. Unlike traditional computer-based learning systems that often require fixed locations and infrastructure, mobile learning enables students and lecturers to access educational content, communicate, and engage in learning activities anytime and anywhere. This shift toward mobile-enabled education reflects the broader global trend of digital transformation in higher education, where flexibility, accessibility, and learner-centered approaches are increasingly prioritized (Traxler, 2018).

The increasing ownership and use of smartphones among university students have created new opportunities for improving teaching and learning processes. Smartphones support a wide range of educational activities, including accessing online lecture materials, participating in virtual discussions, submitting assignments, and engaging with interactive learning applications. These capabilities enhance flexibility and promote continuous learning outside the traditional classroom environment. Research has shown that mobile learning contributes to improved student engagement, motivation, and academic performance due to its ability to support personalized and self-paced learning experiences (Sánchez-Prieto et al., 2021).

Furthermore, mobile learning offers cost-effective solutions for expanding access to education, particularly in developing countries where access to computer laboratories and stable infrastructure may be limited. By leveraging smartphones, universities can reduce dependence on expensive physical resources while increasing access to digital learning materials for a larger number of students. This has made mobile learning an important tool for promoting inclusive education and bridging digital divides in higher education systems (UNESCO, 2021).

However, despite these advantages, the successful implementation of mobile learning is still constrained by several challenges. Key issues include poor internet connectivity, high mobile data costs, limited access to advanced smartphones, cybersecurity risks, and inadequate digital literacy among both students and lecturers. In addition, distractions caused by non-academic smartphone applications such as social media and entertainment platforms can negatively affect students' concentration and academic performance. These challenges are particularly evident in developing contexts where digital infrastructure and institutional readiness are still evolving (Almaiah et al., 2022).

Another important factor affecting the success of mobile learning is the level of institutional support provided by universities. Without adequate policies, training programs, and technical support systems, both students and lecturers may struggle to effectively adopt and integrate mobile learning technologies into teaching and learning practices. Studies indicate that successful technology adoption in education depends not only on availability of devices but also on supportive environments that encourage effective and meaningful use of digital tools (Venkatesh et al., 2003).

In conclusion, this study seeks to investigate the effectiveness of smartphone-based learning in higher education institutions and contribute to improving digital education practices. By examining the benefits, challenges, and factors influencing adoption, the research aims to provide evidence-based recommendations that can support the development of more effective mobile learning systems. Ultimately, strengthening mobile learning implementation has the potential to enhance educational quality, increase access to learning opportunities, and support the transformation of higher education into more flexible and technology-driven systems, particularly in contexts such as Zambia (Dhawan, 2022).

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