On-The-Go Learning: Mobile Learning Can Improve
Student Engagement and Learning Outcomes in Higher Education

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LTEC 6000: Philosophy of Computing in Education

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November 30, 2021

Abstract

Mobile device users have risen and are projected to reach 7.33 billion smartphone users by 2023. Mobile learning refers to acquiring knowledge and skills via mobile technologies. Mobile learning, or on-the-go learning, has significantly grown in education. However, several educators are reluctant to use new technology, and others have enthusiastically embraced mobile devices. The literature review will analyze mobile learning studies conducted over the past decade, utilizing a mixed-method methodology and organizing them by thematic categories. The upcoming study will involve individuals who use mobile devices in higher education. It will investigate the potential positive effects of the amount of time spent on mobile devices on student engagement and performance. Key findings include a) mobile devices are widely used across the globe in mLearning; b) mobile learning models may be interconnected with adaptive learning strategies to enhance student performance and engagement c) mobile learning promotes positive attitudes towards mLearning content; d) mobile learning apps have an increasing demand; e) mobile learning could improve student engagement and learning outcomes in higher education than traditional teaching methods.

Keywords: mobile learning, smartphones, tablets, laptops, student engagement, student achievement, student attitudes, teacher's attitudes

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Technology is continuously evolving, and emerging educational trends are following suit. The traditional methods of instructor-led classrooms merge with changing technological advancements in the 21st century. Gen-X, Millennials, and Gen-Z were born into the digital age. Most students in higher education, especially from Gen Z, are used to instant access to digital information. Mobile devices such as laptops, notebooks, cell phones, smartphones, and tablets are a must-have in the current college population (Ortiz and Green, 2019). They have no concept of the Yellow Pages, road atlas, pagers, the big car phone bag, fax machines, and dial-up to access the World Wide Web (www).

Today, mobile devices are here to stay, and over 90% of USA adults have cell phones, with 64% being smartphones (Kaliisa, 2017). Of the 830 million online young people, 320 million (39%) are in China and India (ICT Facts and Figures, 2017). 49% account for mobile device users in Asia due to the rapid internet development (Padmo et al., 2019, p. 148). There are 7 billion mobile device users and over 3 billion internet users worldwide. According to the Statista report by O'Dea, 7.33 billion individuals will own a smartphone by 2023 (O'Dea, 2021). Mobile learning (mLearning) is exploding in most industries, but the more significant benefit could help expand innovative learning and improve higher education student engagement and learning outcomes.

According to previously examined studies, reports, and articles, students in higher education are taking advantage of the mobile learning flexibility of the anytime, anywhere to learn while engaging in on-demand content like audio, video, podcasts, and other multimedia assets (Ortiz & Green, 2019). Higher engagement and retention rates of bite-size content or

information with interactive videos or animations on-demand keep learners interested and engaged on mobile devices (Demir & Akpınar, 2018). Mobile learning also increases learning so peers and instructors can exchange ideas and concepts collaboratively. Mobile devices are less expensive now, more powerful, and accessible, and have become more favorable with college students and the younger generation.

Traditional methods of teaching are declining as more focus is on student-centered learning. Mobile learning does not mean to replace instructional teaching but to be a tool to assist and realign how students learn, retain knowledge, and perceive instructional materials to improve performance (Demir & Akpınar, 2018). The study examines how the emerging technology of mobile learning positively influences the educational area. The research hypothesized that mobile learning could improve higher education student engagement and learning outcomes than traditional teaching methods.

Literature Review

Mobile Learning Definition

What is mobile learning? Mobile learning can be defined as learning through mobile technologies. Using mobile devices as an intervention for learning activities anywhere at any time has emerged as "Mobile Learning" (Demir & Akpınar, 2018). Mobile learning, often called mLearning, brings a positive step toward pedagogy and consistently promotes student-centered constructivist learning in education (Okai-Ugbaje et al., 2020).

Mobile learning in the 21st century is an emerging technology that significantly impacts instruction in and outside the classroom. Mobile learning offers a new educational way for learners to access content on-demand, regardless of any time, anywhere. The learner would only need a connection to the internet and a mobile device (Toperesu & Van Belle, 2018, p. 31). The

type of mobile device can be any handheld or portable electronic device. A handheld device can

be held in hand and runs computer programs called apps or applications ("Definition of

handheld," n.d.). A mobile device can be a cellphone, smartphone, personal digital assistant

(PDA), and their peripherals, tablets, and laptops, but not desktops in any form.

Mobile Learning in Education

Mobile learning encompasses mobile technologies in many forms to construct and

enhance a university student's knowledge anytime, anywhere. It may be the only tool to connect

to university coursework or apps to learn. According to Koomson (2018), mobile learning will

pave the way for educational learning in rural areas in developing countries where the internet is

unstable or even available (Koomson, 2018). Most students in other countries only have cell

phones or mobile devices. Therefore, mobile learning is an alternative option in countries with

rural areas.

Mobile learning is more affordable and less impactful on educational budgets for

individuals with limited financial resources. Students can use mobile devices to access

instructional material, connect with others, develop content, and get instant feedback from an

instructor inside and outside the classroom (Koomson, 2018). There seem to be limitless

opportunities as mobile learning makes its way to connect to a global technology-driven society.

Mobile learning is a constant evolution of smartphones and tablets, increasing as the

demand for apps skyrockets. Students are looking for ways to expand their knowledge and make

the best use of their time using a mobile device. Smartphone or mobile device apps are among

students' most shared tools. According to the study by Zaheer et al. (2018), about 1.43 million

applications (apps) are available on Google Play (Zaheer et al., 2018). Instructors must start to

innovate apps as a source of information and a tool to help create instructional content (Zaheer et al., 2018).

Mobile Learning Models

The learning models such as synchronous, e-learning, learning management system (LMS), flipped classroom, and blended learning in the classroom with mobile devices have changed how educators look at teaching and learning methods (Koomson, 2018; Ortiz & Green, 2019; Siani, 2017). Some educators have found ways to create a composite mobile learning structure versus a learning management system (LMS), developing mobile apps as a learning platform. Mobile devices can create a virtual classroom via an LMS app. The students can access content, communicate with peers via a discussion forum and instructors, take quizzes, upload assignments, and retrieve instructors' feedback. A learning management system typically delivers courseware online (Ortiz & Green, 2019).

The WhatsApp messenger research study by Koomson (2018) is an excellent example of synchronous e-learning, learning management systems (LMS), and blended learning models all wrapped up into one approach. The research study by Koomsman (2018) utilizes WhatsApp as an LMS app to conquer poor infrastructure and unstable internet connectivity in rural areas of sub-Saharan Africa (Koomson, 2018). Blended learning allows a face-to-face hybrid or accessing instructional content through the WhatsApp mobile messaging application. WhatsApp also allows real-time interaction with instructors and students through group chat and free face-to-face video conversation, similar to blended formats that combine traditional face-to-face teaching and learning with online courses and content (Koomson, 2018).

WhatsApp would provide many opportunities to learn inside and outside the classroom via mobile learning (Koomson, 2018), similar to the flipped classroom mobile learning model.

According to Demir & Akpınar's (2018) study, connecting virtual environments across the globe to mobile learning can help educators focus on how learners access new knowledge, skills, collaborations, and experiences all on the go (Demir & Akpınar, 2018). The most common format for distance learning in Ghana is online tutorials. During the research, WhatsApp was simulated as an LMS app tool to access online tutorials, upload documents and media files, provide immediate interaction and feedback, and administration and monitor course work (Koomson, 2018).

Mobile learning models in the classroom, like 1:1 or BYOD, have excellent potential when students bring their devices or 1:1 to differentiate their use for learner growth (Firipis et al., 2020). Whether a laptop, tablet, or smartphone, a mobile device to access or execute coursework is essential for the 1:1 or bring-your-own-device (BYOD) mobile learning models (Siani, 2017; Cardoso, 2019). Typically, in a 1:1 model, the school or instructor will provide a laptop or tablet, whereas the student provides their own mobile device in a BYOD model. While there are many guidelines around regulating the company's BYOD to work depending upon the industry, there are few policies and procedures around mobile devices in the educational sector (Siani, 2017).

Dr. Siani from the University of Portsmouth's research study on the BYOD learning model in higher education addresses its use in teaching, learning, and assessment. The research used a questionnaire to gain qualitative information, such as current knowledge and students' perspectives, and to identify some BYOD model challenges discussed in another section (Siani, 2017). The BYOD model is seamlessly integrated with other mobile learning models, such as e-learning for distance education, blended learning, flipped classroom approaches, and informal learning.

The informal learning model of mobile learning may be the most underrated. Informal learning is when students develop themselves personally to add value to their social and economic standing (Toperesu & Van Belle, 2018, p. 31)—for example, moving to another city, pulling out their mobile device to find out about the city, restaurants nearby, stores, banking locations, highways, and streets to get to the next point, yet learning more about the new city surroundings. Since informal learning is not new, learning more proficiently and productively through engaging course content has become more convenient. Students may become more self-directed in learning if engaged and interest capture their attention in coursework assignments outside of classroom activities (Firipis et al., 2020). Students find ways to improve their performance, like turning non-productive time, such as riding a bus, into a productive study or reading time required for a class assignment.

Asynchronous online learning consumes extensive mobile device usage for its flexible, anytime-where model. It is probably one of the ways educators use mobile devices outside the classroom for learning activities via the web without being restricted to a physical classroom. A research study by Padmo et al. (2019) wanted to understand more about mobile devices improving access to online learning for remote students. Due to Indonesia's rapid increase in mobile devices, they believe the study will show the advantages of mobile learning and how it can connect to the global world (Padmo et al., 2019, p. 148). Other data show how different institutions in Indonesia implemented mobile learning as providers of learning programs and how the students, through their mobile devices, can access learning materials and other instructional content through Open Educational Resources (OER) (Padmo et al., 2019, p. 148).

Mobile Learning Adoption

Mobile learning adoption in higher education has been challenging as educators believe mobile devices could distract students and classrooms. The study by Gezgin et al. (2018) compared undergraduate students' attitudes toward mLearning between the Computer Engineering (CENG), Computer Education, and Instructional Technology (CEIT) departments in a Turkish public university (Gezgin et al., 2018). The study's findings showed that the qualitative stance was a significant factor in understanding what makes students accept or resist mobile learning (Gezgin et al., 2018).

The research approach to the study was to evaluate two groups using a correlational survey method to a sample population of 531 subjects. There were 745 students enrolled, but 531 volunteered to participate. The researchers target three characteristics: gender, area of study, and mobile device ownership. These three variables help discover the instructor's effectiveness in selecting the appropriate mLearning strategies, content, and mobile technologies to build a framework of relevant pedagogies (Gezgin et al., 2018).

Another study research by Toperesu & Van Belle (2018) encompasses the potential benefits and challenges for students and institutions considering mobile learning in higher education. The researchers used a general inductive study. The study found that mobile devices for mobile learning are affordable, scalable, and easy to use. One of the benefits for the institutions was the ability to obtain coursework and ease of updating course material. Instant access can enhance face-to-face teaching, making learning more efficient (Toperesu & Van Belle, 2018). One of the many drawbacks of mobile devices is security and privacy. Another drawback found in the report is that some educators feel that mobile devices cause too much distraction for learners and associate mobile device use during lectures with lousy behavior (Toperesu & Van Belle, 2018).

Mobile Learning Effect on Student Engagement

The effect on student engagement can be challenging, but more research examines mobile learning and how learners stay engaged. Firipis et al. (2020) study aims at the learner's engagement improvement and growth in the engineering unit. They created experimental research with differentiation on 1:1 mobile devices in the classroom. The highlight of the study was differentiating technical skills developed using pre- and post-learning perceptions and comprehending how 1:1 mobile devices can support a learner's growth in their skillset (Firipis et al., 2020). The experiment will produce artifacts of mobile learning used to support a learner's growth. However, the instructor must apply the self-directed learning theory to this learning model. According to Carol A. Tomilson (2017; as cited in Firipis et al., 2020), the study reveals that students comprehend what they learn and how they process and demonstrate what they know.

Another study by Ortiz & Green (2019) showcased the benefits of mobile devices in creating more significant student engagement. The research demonstrated how mobile devices access a Blackboard learning management system and used two groups - undergraduates and graduates (Ortiz & Green, 2019, p. 163). The graduates enrolled in courses denoted with a B. The study used a quantitative approach by gathering mobile device access patterns and frequency counts of logins during LMS usage. The study Ortiz & Green (2019) report captures the type of mobile device operating systems but collected data for a whole year and failed to capture mobile access from student laptops. The Ortiz & Green (2019) findings through the mobile device patterns and frequency counts in accessing the learning management system proved beneficial to the student. The students could access their coursework anytime, anywhere, and excel in their

coursework. However, there was a gap in collecting their perspectives or attitudes toward the mobile devices utilized with the learning management system (Ortiz & Green, 2019, p. 163).

Mobile Learning Effect on Student Achievement

The multiple case study by Zaheer et al. (2018) demonstrated that mobile learning apps could help build more educational resources within the classroom. The experimental study will serve two purposes: to build knowledge and skill sets for the instructor and student. Building educational apps for mLearning provides opportunities to unite individuals in real or virtual worlds by creating learning communities among teachers and students (Zaheer et al., 2018, p. 189; Demir & Akpınar, 2018). In contrast, the Zaheer et al. (2018) study revealed that educators and students would have more opportunities for innovative teaching and learning if learning strategies integrated more apps into educational learning domains (Zaheer et al., 2018, p. 189).

Another research by Klimova (2019) from the international country Czech Republic studied whether applied linguistics students would see improved learning performance. The pilot study involved foreign language learning through a smartphone app (Klimova, 2019, p.1). The students would continuously assess the foreign language they were learning. This study's results were significant as they knew the second language, English. Through the app study, the learner revised English vocabulary and phrases, and the instructor ensured it was constructed to the student's personalized needs (Klimova, 2019, p.1). However, in the study, students lack attention and concentration with the app and switch to something else on a mobile device.

The study by Talan (2020), "*The Effect of Mobile Learning on Learning Performance: A Meta-Analysis Study,"* aimed at how mobile learning impacts student performance. Using a random sample method, the researcher used the meta-analysis approach from 104 studies with

about 7,568 participants. During the study, the researcher found that mobile learning should utilize new learning approaches for connectivity, navigation, and location-based learning. While the virtual learning environment is a classroom, it provides a low-cost, flexible way for learners to reach the school, teacher, and curriculum (Talan, 2020).

Medical education has struggled with adopting mobile learning in its sector. Cardoso's descriptive and exploratory research study (2019) used mobile devices as a mediation tool in a Portuguese medical health school for teaching and learning analysis. The experimenter, Cardoso (2019), implemented a Bring Your Own Device BYOD strategy as most students own their own devices. There were 634 students as subjects responding to a survey describing their use or experience of the mobile device in a learning context. The researchers used consent forms and had to reiterate that they were strictly confidential and on a volunteer basis. 98% of the mobile devices used in the study were smartphones (Cardoso, 2019). The experiment went well, but 72% of the students showed indifference to mobile apps outside of classroom activities. Most students did not use mobile devices in the biomedical laboratory, internship seminars, or practicum sessions. On the positive, most students own their devices and use them daily for over two hours on their course assignments (Cardoso, 2019).

Discussion

Mobile technologies are emerging, and the shift from teacher-centered to student-centered is evolving. The various studies in this literature review reveal that mobile devices used for educational purposes in and outside the classroom help students promote positive attitudes toward mobile learning instructional content Ozdamar Keskin (2011, as cited in Ortiz & Green, 2019). Another study revealed that mobile learning enhanced students' interest and motivation in coursework, Ozan (2013, as cited in Ortiz & Green, 2019). Many studies during the research

have demonstrated that learning environments that utilize mobile devices through various learning models encourage students to engage in learning activities. Mobile learning has given educators a new perspective on teaching and learning methods utilizing learning models (Koomson, 2018; Ortiz & Green, 2019; Siani, 2017). Therefore, Yilmaz & Akpinar's (2011, as cited in Ortiz & Green, 2019) research concludes that mobile devices may be necessary for educators and students to engage. Design principles for specific student interaction are based on the mobile learning content produced by Celik (2012, as cited in Ortiz & Green, 2019).

Another benefit of mobile learning is applying learning strategies and pedagogies to enhance student engagement and performance by utilizing 1:1 differentiated variables and BYOD strategies (Zaheer et al., 2018; Firipis et al., 2020; Cardoso, 2019). When learners gain access to instructional content outside the classroom, it keeps them student interested. Personalization learning evolves in the differentiation of a learner's growth. However, students can become disengaged when interest is lost and face other challenges in use and technical issues seen as problems that need remediation in mobile learning Gikas & Grant (2013, as cited in Ortiz & Green, 2019).

One constant finding throughout the studies is that most students own a mobile device, even in rural areas like Ghana (Koomson, 2018) and the rapid market of Asia, including Indonesia, where high utilization of internet and mobile devices are used (Padmo et al., 2019). In the Padmo et al. (2019) study, 72% of the students used their mobile devices to access the distance education coursework and material during nighttime and 33% during the day. The instructional coursework engaged students on mobile devices. Most studies showed that students appreciated mobile learning and increased their motivation, which positively impacted student performance and increased motivation (Demir & Akpınar, 2018; Firipis et al., 2020; Klimova,

2019; Talan, 2020). Future research studies should incorporate the learning design thinking process to frame mobile learning challenges, gaps, and adoption issues. The learning design thinking process will help educators implement viable mobile learning strategies, models, and pedagogies through iterative refinement.

Conclusion

One of the educators' many challenges with mobile learning is measuring effective learning and student engagement. Now, we are bringing mobile devices into the classroom, prompting more questions about the disruption of learning. How do we assess it? Are we effective in our instruction? Is the content interactive to keep the learner engaged or interested? What learning measurements do we apply to know our students are engaged? Mobile learning can be a supplementary tool to the instructional curriculum design for a great learning experience and keeping students engaged.

When educators frame the problem and understand how to address it, learning strategies and remediation efforts are implemented for the course curriculum's successful mobile learning component. The mobile learning models are flexible and utilized with teaching and learning strategies constructed for the student-centered course. Several iterations of mobile learning models introduce novelty and unconventional approaches to attain optimal student involvement and enhanced learning results. Prior studies have demonstrated that mobile learning can augment student involvement and

 improve learning achievements in higher education compared to conventional teaching methods.

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