

The Integration of M-Learning in Learning Management System

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Abstract

Mobile technology, with its ability to operate wirelessly, is an efficient and effective tool that offers several benefits in enhancing students' skills such as knowledge sharing, collaborative learning, learning outside the classroom, improved networking skills, and e-learning. The technological advancements in the 21st century play a crucial role in meeting the rising needs of educational organizations by transferring to m-learning. In this paper, we discuss the important results of integrating mobile technology into teaching to improve the learning outcomes of education. The main objective of the study is to create awareness of accessing multimodal techniques like mobile to enhance teaching-learning outcomes and analyze students' perceptions of integrating mobile technology in educational systems. The results reveal an increase in students' awareness, focus, interest, and excitement in learning lessons with the inclusion of m-technology into teaching. One of the major implications of M-learning is that it keeps students engaging and it supports continuous learning. The research results can be used to manage information, build knowledge, and support the learner's learning needs at any time and location.

Keywords—M-learning, learning outcomes, teaching tools, education.

Introduction

Conventional learning methods provide an environment where students are required to attend to the subjects taught in the classrooms. In distance learning, the medium of learning is the internet. With the advancement of wireless technology such as smartphones and laptops, education can be a) synchronized, where learners interact with the teacher simultaneously, and receive instant responses, or b) asynchronous, where learners can use e-books, videos, etc. Web-based teaching and learning resources are integrated and presented using computers [1]. In the current decade, ICT plays a crucial role in empowering learners and educators by transferring a teacher-centered approach to a student-centered paradigm. Studies have revealed that this transformation positively affects students' academic and social development, leads to increased student gains in learning efficiency, and promotes effective methods to manage classroom time [2].

In the 1980s, E-learning technology evolved as a new way of education for distance learning. Distance education has transitioned from e-learning to a new learning paradigm 'm-learning'. This approach makes education possible anywhere and at any time with the help of modern technologies.

M-learning is an approach that students and educators of the modern era use for accessing educational materials using wireless devices such as mobile phones, tablets, etc. The applications in these devices use a Wi-Fi network and provide many services to facilitate the education process by allowing students to use learning resources and activities regardless of where they are, or the time it is accessed [3]. Learners can capitalize on the facilities provided by social network sites to support their learning experience, like collaborative learning, and get peer support through social media, email, WhatsApp, blogs, and other social networking sites [4, 5]. M-learning approaches are flexible and efficient to be implemented on students at any level or with various study skill abilities [6].

The main significance of this study is to check the effectiveness of m-learning in teaching and learning as there is confusion about whether the use of technological learning stimulates the learning process or not. This paper aims to examine and analyze the perceptions of students integrating mobile technology features for educational as well as in their social life and assess students' levels of technological literacy skills [7].

In this paper, section 2 presents a literature review, section 3 projects learning strategies, section 4 describes M-learning resources in technological literacy, section 5 demonstrates research methodology, section 6 outlines the results of the research, section 7 concludes the work and section 8 describes discussion and future work.

Literature Review

Many educational institutions worldwide have used m-learning to deliver learning activities anytime, anywhere. Apple devices are popularly used as part of mobile learning. Students use mobile devices in classrooms for translation purposes and for checking grammar/vocabulary. M-learning can exist anywhere and has more potential to adapt and facilitate varied innovative educational methods. As part of active learning, many approaches are proposed by scholars to enhance the engagement and interaction between student-teacher using the M-learning paradigm. It is found that implementing successful technology in education such as M-learning proved more effective than traditional learning through effective applications.

M-learning in decision-making at the university level during time-pressed situations is prominent. The benefits of mobile learning are not just limited to educational subjects [12]. Mobile tools aid students to make investment decisions, and provide financial advice, registrations, instant messaging, and other emergency services. The determination of success or failure of mobile learning is due to factors such as technological skill, network availability, student knowledge, etc. Studies reveal that even though m-learning is a subset of e-learning as both incorporate the same learning delivery methods, they vary on many levels. With its advancements in software-hardware technology, the world has a crucial role in making m-learning successful in terms of time management and developing multimedia tools used for teaching and learning [17]. Studies reveal [8] that in universities students use mobile devices as part of self-directed informal learning and campus interactivity. As students are of multiple intelligence, their way of solving problems and mastering skills may vary. It is found that at the university level, wireless technology and mobile devices promote both virtual and in-class learning. Studies propose that the SRS approach helps build students' learning skills at all levels. Studies by Deemah [9,15] share that using mobile phones

in classrooms may also have negative effects. In many fields of study, mobile learning tools such as Kahoot and Socrative have encouraged students in learning. As a result of such study tools, the attendance rates went high in classrooms. Suggestions are given in research work to develop technological content for physical education as well [16]. Research studies by Chung et al., 2018 found that M-learning applications are noteworthy as they deliver instant assessment results and are useful for analyzing at-risk students. Though M-learning tools provide an environment to help students actively participate in class, the process of training teachers to adopt M-Learning tools and develop teaching materials is time-consuming [17]. Proper teacher training is mandatory to achieve digital competence and produce a positive impact on students [18]. Studies also reveal that increase in the satisfaction rate of students can be achieved by following a structured workflow and timely communication [19].

M-Learning plays a crucial role in improving students' knowledge acquisition at different levels. Tools like Kahoot can be used to strengthen student knowledge as well as to measure the weak areas in learning [20]. Scholars also noted M-learning applications' drawback as it demands uninterrupted WiFi signal and Internet data consumption [21].

Mostafa Al-Emran analysed the publications of 87 scholarly works on the acceptance of technology in learning and reported the review in the form of six research questions [30] Results of the studies by Qashou indicate that the significance of M-learning depends on the attitude of its intention to adopt, while ease of use and self-efficacy depends significantly on the attitude to use M-learning tools which also leads to satisfaction of using M-learning tools and its usefulness [31]. Mostafa Al-Emra's studies on the continued use of m-learning developed an integrated model by incorporating the technology acceptance model (TAM), theory of planned behavior (TPB), and expectation-confirmation model (ECM). The results of his study revealed that the continued use of m-learning depends on factors such as ease of use as well as attitude. His studies prove that usefulness and satisfaction are not significantly dependent on continuous m-learning [32].

E-learning and M-learning Interaction

In electronic learning, education delivery uses wireless devices to enable students to learn through video conferences through the internet. Mobile learning is an innovation where learning content can be accessed using mobile devices along with features of e-learning [10,20]. The main benefit is that the learning is not confined to a particular location or classroom or a set schedule and offers flexible learning. Learning aids can be accessed at all times and any place by the students. Teachers can upload teaching materials or edit the settings of assessments at their convenience using personal devices. The different m-learning approaches are given in Figure 1.

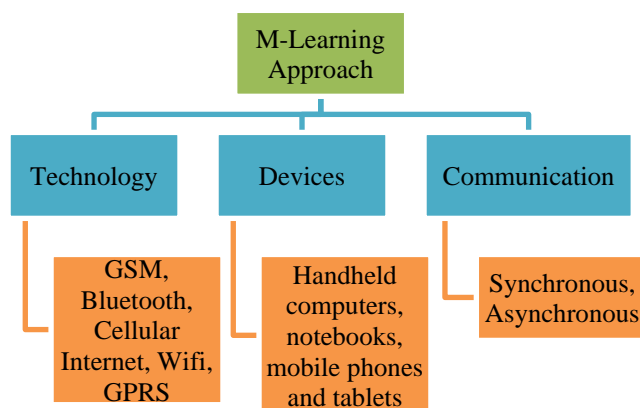


Fig. 1. M-learning Approach

M-learning is all about providing learners with bigger choices and convenience. This system is also flexible to teachers as it helps to reach out to absent students, post course content online, and prepare audio-video materials. This method offers freedom of learning, using technology, generating a quiz, blogs, forums, surveys, or feedback forms. The three fundamental perceptions of M-learning are mobility of:

1. Technology – Use portable computing devices with wireless technology having WiFi or cellular network connections to deliver educational materials to learners using services such as Email, SMS, apps, etc.
2. Learning – Transfer educational resources via. mobile phones.
3. Learner – Ability to collaborate with peers or self-learn using a delivery channel.

The features common to Electronic and mobile learning approaches are given in Figure 2:

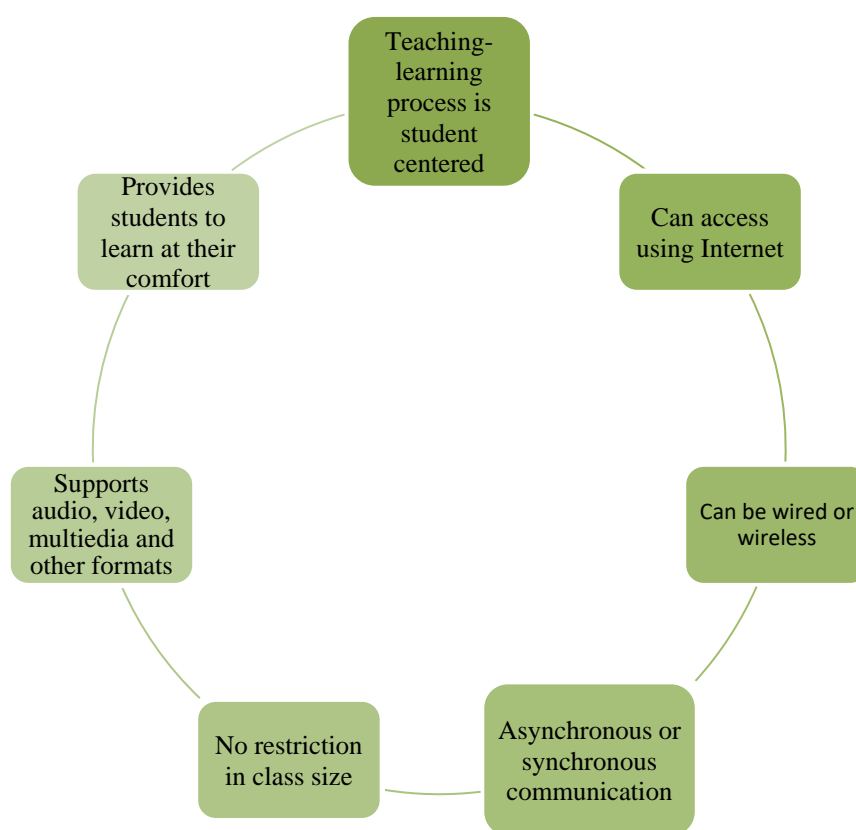


Fig. 2. Common features of electronic and mobile learning approaches

The differences between E-learning and M-learning approaches in terms of devices, network, protocol, service, and safety are listed in Table 1 [10,22]:

Table 1. Differences between E-learning and M-learning approaches

	E-Learning	M-Learning
Devices	Desktop/Laptop	Mobile/Smart Phone, Tab computers
Network	Mostly wired	Wireless, Bluetooth, 4G
Protocol	Web-based	Wireless App based
Service	Intranet/Internet	Cellular Networks, GSM, GPRS, CDMA
Safety	Low level	Safer

M-learning Educational Resources

With the rapid spread of mobile technology and the continuous need for development in student-centered learning, the impact of m-learning on academic performances has obtained the main focus. Educational institutions are focusing on producing a new modern approach to implementing m-learning applications using web services and the internet of things [23]. M-learning services are categorized as services for learning resource access and tools that aid administrative side academic staff [11,24].

Learning resource access

Learning resource access services are based on the course material content, which is uploaded for student learning by educators. Services like access to course handouts, online/recorded presentations, assessments, assignments, and other announcements are uploaded.

Academic staff/Administrative side services

Provide registration support, course admission, email services, announcements, and events; provide petitions, downloads, FAQs, alumni, bookstore, library, and Moodle services; generate teacher evaluation and student grades for various assessments; create forums, discussion groups, research resources; support educators to develop advanced teaching aids which are web and IoT based [13,25]; allows educators to implement diverse perspectives into teaching. It also provides an efficient cognitive distant learning platform where students can connect with their teacher, course material, and learning materials.

Table 2. *Benefits of different M-learning teaching tools*

Platform	Tools	Benefits
Mobile	Apple phones/mobile phones, pads	Anytime anywhere learning is possible, collaboration, student-centered, portable, and accessible, motivate learners, increased knowledge retention, makes faster learning, time efficient, and flexibility
Social Network	Facebook, Linked-in, blogs	Better communication as students can be linked to access teaching materials and stay informed about exams, events, and announcements, promotes self-directed learning, helps researchers, acquire digital literacy skills, and connect to the global community.
Web-based	Moodle	Able to link resources of various formats, provides an efficient way to deliver course content and teaching resources, flexible, distributed, engaging, interactive, and efficient instruction. Enhance productivity, easy accessibility, and integration, security, convenience, offers better access to learning materials and better communication, allows teachers to measure the learning progress of students in real-time, provides smarter and more efficient use of the resource, self-paced learning,
IoT	Smart class, attendance system	audiovisual interactive content delivery, can connect to a lot of devices on a global basis, smarter security systems, smart learning software.

Social networking tools foster and enhance student engagement in acquiring learning skills by providing them with interaction opportunities with teachers and peers [14]. Social networking tools and web-based platforms such as Moodle help to deliver attractive courses for teaching [26].

IoT is the interconnection of things consisting of modern web-enabled smart devices like laptops, smartphones, or smartwatches. The built-in devices such as processing devices, sensing devices, and hardware involved in communications gather, forward, analyze, and share data. IoT uses AI algorithms to analyze enormous volumes of linked data sensing devices in the cloud, which can be used to closely monitor students, allowing teachers to use the technology to create smart lesson plans and improve education objectives [27-29]. The different M-learning platforms, tools, and their benefits are shown in Table 2.

Methodology

Delivery of teaching using m-learning technology is a daunting task. M-learning teaching is easy but at the same time challenging as each student's expectation is different. Class control is another challenging factor as students may divert their attention to other apps or social networks during class. Preparing synchronous and asynchronous activities to meet curriculum and student expectations is challenging for educators. The learning materials and assignments are designed to develop students' research skills, which can be accessed using m-tools.

Design of the Study

In this paper, an analytical descriptive approach is used in collecting students' feedback related to the different stages of this study. A literature review on M-learning features, merits, and demerits in classrooms is carried out.

The proposed mobile learning teaching approach encourages and challenges students to do their best in learning using m-technology.

Phases of the Study

As part of the m-learning strategy, firstly, students are advised to read the e-materials uploaded for each lesson to ensure complete engagement of students. These e-handouts can be accessed on any m-devices. Secondly, their level of understanding is assessed using a set of review questions uploaded in the course link. Lessons are demonstrated in class to cover up the at-risk portions and e-assignments are given to strengthen their conceptual knowledge. These assignments are group activities to promote social interaction where small or friendly groups are formed. After completing the assignment, the software generates the grades. More attempts are given to motivate students to improve their performance percentage.

M-learning benefits students as it permits learning at any time and in their comfort time. M-learning teaching materials and activities help to complement classroom teaching. M-learning presentations included online questions in the slides to evaluate student understanding of the subject. Completed practical assignments are submitted for evaluation. For examinations, timers are set, several attempts are set and feedback is provided. Questions are shuffled and displayed one question per screen. Special logins and passwords are set for examinations. Downloading-uploading assignment files, e-interaction, e-announcements, discussion forums, etc., help students to get proficient at using m-learning tools and technology. Demonstrations are given to students to use the web for various class activities.

Implementation of M-Learning at the Organizational Level

At the organization level, implementation of M-learning is successfully done by ensuring that:

- Learning content is mobile-friendly.
- Learning content efficiently works on different types of m-tools like tablets.
- Learning content works on different platforms such as iPhones, Samsung, etc.
- Educators are trained and have access to m-tools.

Implementation of M-Learning at the Educational Level

M-learning at the university level enables students to use learning materials at any time from anywhere. This led to the boom of online learning as it motivated the self-learning skills of a student. M-learning can be implemented by including:

- Recorded audio/video lessons.
 - An environment like BBB or Zoom enables the communication between students and educators to promote collaborative learning.
 - Assessments and exams are conducted online to check the level of understanding of students.
 - Uploading all text materials and handouts on the website.
 - Interactive gamification links make learning more efficient.
- The next step of the M-learning process was to:
- Train educators to prepare audio/video/interactive elements in their teaching content.
 - Upload the content timely on the website so that it can be accessed from anywhere and at any time using m-technology.
 - Ensure proper communication between educators and students or between peers.
 - Conduct periodic assessments and group work activities.
 - Generate feedback.

As students are of multiple intelligence, the level of learning depends on the student's satisfaction with the diverse learning environment. Feedback measures of quality learning are incorporated in the study to reflect student perception of the acceptance of m-technology in their learning habits. The feedback reflects each student's impression of the quality of learning through apps, tablets, iPhones, etc. The measurements adopted were based on:

- Measuring the learning outcomes which are based on technological use.
- Measuring the quality of learning using m-technological tools.
- Checking the level of acceptance of using apps/tablets etc.
- Checking the level of acceptance towards the teacher's teaching.
- Checking the level of acceptance towards the course.
- Checking the level of acceptance towards the organization.
- Checking the level of acceptance towards peers as part of collaborative learning.
- Checking the level of acceptance towards using apps/tablets etc. for m-learning.
- Checking the level of interest in class activities.
- Checking the level of interest in course activities.

Activities are designed using mobile devices or otherwise are designed to be mobile friendly promoting ease of use and accuracy of the subject. Preparing effective teaching aids aligned to m-technology is a challenging factor for educators due to the physical limitation (limited hardware and software features) in mobile devices compared to desktop computers. The teacher has to be vigilant and monitor the actual learning of students to avoid distractions due to the various activities on mobile. The success of m-learning depends on the teaching materials developed.

The two main objectives of this research are to evaluate students' satisfaction with using mobile as a learning tool and assess students' technological skills.

Results

Student feedback from 30 undergraduate students from a GCC university consisting of 19 females and 11 males from a semester is gathered.

Quantitative research is carried out, and a questionnaire is used to collect facts to understand the research outcomes better. Questionnaires were distributed through WhatsApp and Email. Constant use of m-learning enhanced students' technological skills. Students' interest and overall class participation improved with the aid of technology. Students found earlier teaching methods as monotonous and caused boredom. Data analysis is carried out in two phases. In the first phase preference for using m-learning tools for learning is collected. The second phase deals with the verification that supports acceptance of the m-learning approach. A questionnaire was prepared to gather data to analyze the preference for using m-learning technology/tools for learning by learners in their learning process. Various m-devices and their choice of preference were recorded as shown in Table 3.

Table 3. *M-learning technology/tool used by learners*

M-learning Technologies						
Students	Handheld Computers	MP3 Players	Notebooks	Mobile Phones	Tablets	Charts
Male	0	0	1	8	2	
Female	0	0	2	12	5	

The analysis report shows that most of the learners preferred using mobile phones as part of their m-learning process. The feedback points to the following as benefits of mobile learning:

- Accessible everywhere and at any time.
- Synchronized communication.
- Enhanced social interaction.
- Easily available compared to laptops, tab, and other devices.
- Apps are mobile-friendly.
- Develops a sense of ownership and builds the learner's ability to take control of education.
- Convenient to use and assist well even during an emergency.

The objective of the second questionnaire is to gather feedback to measure the satisfaction/acceptance level of m-learning at the organizational and educational levels as shown in Table 4.

A 5-point Likert scale is used to indicate students' attitudes and opinions. The study is conducted by analyzing data collected from participants using a survey questionnaire comprising 13 questions.

In this experiment, the maximum value of the mean score is shown for "Easy to

access feedback and results of assessments” (M=5). “Interesting to use mobile phones for learning”, “Learn/review lessons any time anywhere”, “Easy to submit assignments”, and “Apps in M-learning encourages active” showed (M \geq 4.50). However, a certain group of students preferred the traditional learning system and indicated a minimum mean score value for “Watch the virtual demonstrations of lessons before class and it enhances self-learning” (M=1.98). This is due to the small screen size of mobile devices which causes discomfort to read, limited computational power, battery support, and distraction while using mobile. At the same time, a certain group of students felt watching the virtual demonstrations of lessons before class enhances self-learning. The result also shows that the success of m-technology quality of learning is predominantly due to ease of access to m-tools. The results also show the contribution of m-tools towards active learning/course participation and promoting learning to different learner satisfaction.

Table 4. *M-learning acceptance rate*

M-learning Questions		Mean		Average Mean
		Male	Female	
1	Interesting to use mobile phones for learning	4.4	4.62	4.51
2	M-device expertise (using apps, social media, emails, video conferencing, etc.)	3.9	4.55	4.23
3	Flexibility to access course materials	4.01	4.37	4.19
4	Watch the virtual demonstrations of lessons before class and it enhances self-learning	1.48	2.48	1.98
5	Learning courses using M-learning attracts me more than others	3.5	4.25	3.88
6	Learn/review lessons any time anywhere	4.75	5	4.88
7	Easy to access feedback and results of assessments	5	5	5.00
8	Interactive and convenient use	4.1	4.78	4.44
9	Easy course registration steps	4.05	4.25	4.15
10	Easy to submit assignments	4.78	4.98	4.88
11	Promotes collaborative learning and research environment	4.1	4.25	4.18
12	Apps in M-learning encourages active course participation	4.5	4.7	4.60
13	Access to the helpdesk, library, and announcements and social platforms	4.5	4.3	4.40

Conclusion

As technologies evolve, accepting, adopting, and integrating new techniques is one of the constant challenges faced by the education system. Proper training for educators to expand their horizons to use and integrate modern technologies of mobile learning into the curriculum is vital.

This study aims to evaluate the acceptance of mobile learning among students to enhance academic performance and meet the objectives of educational institutions. The results of this research support the shifting of the traditional learning methods to M-learning at the graduate or undergraduate level where handheld-mobile devices play a central role in teaching and learning. It is found that M-learning has improved content delivery effectively. It enhances student engagement in and out of the classroom. The new learning style has helped in improving students' technological skills. It is also found that m-learning teaching involves linking students with teachers

and universities through m-tools. M-technology plays a crucial role in gaining students' satisfaction in the learning process as it provides ease of use as well as it enables students to learn at their own pace.

The study finds m-learning benefitting students who are at risk, as they can learn at their own pace, any number of times, and wherever they want. Designing and incorporating appropriate apps in the curriculum will further lead teachers and raise students' level of satisfaction.

However, it is found that students exhibit lesser practical and technical effort, and a low tolerance for error and instructional media.

Discussions and Future Work

In This Paper, An Investigative Study Is Conducted About Learners' M-Learning Benefits. The Results Deliver Significant Backing For The M-Learning Approach. The Study Reveals The Impact Of M-Technology Enhance Students' Quality Of Learning And Active Participation. The Use Of Apps On Mobile And Tablets As A Medium For Learning Helped Students Gain Confidence To Improve Their Technological Knowledge As Well.

The Results Show Enhancement In Student Interaction With Peers, Self-Exploration, Self-Learning, And Social Interaction Abilities Compared To Traditional Learning. Students' Nature To Question And Find Out The Answer On Their Own Became Easier With The Help Of Technology.

The Results Show An Increased Level Of Satisfaction Rate Of Students' Perception Of Mobile Learning And Facilitating Their Learning Process. M-Learning Increased The Dimension Of Achieving Knowledge And Learning Outcomes. The Results Indicate The Student's Satisfaction With Teachers Who Are Using M-Learning Tools In Their Classrooms. M-Learning Tools Have Developed Students' Interest In Subject Learning With Or Without Teachers. The Study Also Shows Teachers' Importance In The Learning Environment. The Results Support M-Learning As It Facilitates Learners' Subjective Insights And Provides A Different Dimension To Learning At Universities.

In this paper an investigative study is conducted about learners' m-learning benefits several research studies are focusing on m-learning and its contribution to the education system. The adoption of m-learning at the university level needs more clarity as m-learning learners and their learning outcomes satisfaction rate at different levels of education need further study.

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