# Learners and Educators Attitudes Towards Mobile Learning in Higher Education: State of the Art

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***Abstract*— In the last few years, the way we learn has been significantly changed from traditional classrooms that depend on printed papers into e-learning relying on electronic teaching material. Contemporary educational technologies attempt to facilitate the delivery of learning from instructors to students in a more flexible and comfortable way. Mobile learning (M-learning) is one of such pervasive technologies that has been evolved rapidly to deliver e-learning using personal electronic devices without posing any restrictions on time and location. Literature that sheds light on using M-learning in various institutions of learning is beginning to emerge. The work in this paper demonstrates the state of the art of the M-learning. It discusses learners' and educators' attitudes towards the use and adoption of M-learning. Advantages and disadvantages of M-learning were also presented. The integration and implementation of M-learning with other technological resources has been described. Factors affecting the students' and faculty members' attitudes towards the use of M-learning have been demonstrated. Moreover, the new trends and challenges, which are evolved while conducting this survey, are explained.**

***Keywords—M-learning; Attitudes; Higher Education; Educational Technology.***

## I. INTRODUCTION

Mobile learning (M-learning) recently has been shifted from being a theory to a real valuable improvement supporting the learning environment. M-learning may simply be considered as the natural evolution of e-learning with more effective communication and powerful personalized mechanisms ([1], [2]) or a new platform of distance learning ([3], [4]). M-learning makes it easy for all students at different ages to study and access the learning material anytime anywhere. Modern technologies, such as M-learning, give students a convenient opportunity to learn more within shorter time frame. These features make M-learning an excellent technology for supporting learning in various universities worldwide.

In general, before embarking on developing any technology, it is important to examine the end-user attitude towards the use of such technology. Attitudes toward technology help in determining strengths and weaknesses and facilitate the development of the required infrastructure. The end-users of M-learning technology are students and educators.

In this study, we review the state-of-the-art of M-learning research and examine students' and educators' attitudes within the universities that have applied M-learning and identify various challenges and opportunities to M-learning. In addition, we have reviewed the students' and faculty members' attitudes towards the use of M-learning in their higher education environments, i.e. environments that have not yet implemented M-learning.

This survey is structured as follows: Section 2 provides a background on M-learning technology. Section 3 demonstrates students and educators attitudes towards the adoption of M-learning in the universities where it has been applied. Section 4 presents students and educators attitudes towards the use of M-learning in the universities where it has not yet been applied. Section 5 presents some concluding remarks.

## II. BACKGROUND

### *A. Educational Technologies in higher educational institutions*

Educational technologies aim at facilitating the learning process and enhancing its performance through the management of appropriate technological resources. Recently, there are various technologies that have been employed in higher educational institutions in order to facilitate the learning process, such as tablets, Learning Management Systems (LMS), Intelligent Tutoring Systems (ITSs), smart boards, social media, forums, and blogs, among others. As stated in [5], education should be adapted to the emergent importance of such technologies and educational platforms need to be designed and intended for enhancing learners' educational

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literacy. Using technologies in the educational environment helps in delivering more teaching and learning capabilities to students in timely fashion [6]; hence, making teaching and learning a successful way. Educational technologies not only facilitate the learning process but also prepare students for today's demands and tomorrow's work challenges [7]. Shifting to any of these technologies requires significant development efforts, material preparation and availing financial resources.

### *B. Mobile Learning*

Nowadays, Mobile technology has been successfully employed in various sectors, including the educational sector. Mobile learning is a new research trend in the educational field that addresses mobility in different dimensions: mobility of technology, mobility of learners, mobility of educators, and mobility of learning. Researchers have defined M-learning in different ways [8]. In [9], M-learning is defined as an emerging form of distance learning; while in [10] it is defined as he next generation of E-learning through the use of mobile technology. Many other authors, such as [11], [12] and [45], have defined M-learning as the learning performed with the utilization of small portable devices, such as smart phones, tablets, PDAs and any other similar devices. In [13], M-learning is described as the learning that occurs when the learner uses mobile technology to learn in anytime anywhere. Whereas in [14], M-learning has been defined as the learning that is performed in a non-programmed environment by facilitating the learners' attendance. Hence, M-learning can bring learners from everywhere in order to learn, collaborate, and share ideas instantaneously through their personal computing devices that are accessible anywhere while on the move.

M-learning has been employed in almost all stages of the education sector, such as KG, primary and secondary schools, and higher education institutions. M-learning in higher education is our main concern in this study.

### *C. Mobile Learning in higher education*

M-learning as one of the recent technologies in the education sector has brought many prospects for both learners and educators in order to facilitate the learning process. Higher education, particularly as an important venue, has employed M-learning in various universities around the world in order to deliver the learning regardless of place and time. Queen's University Belfast used tablet PCs and PDAs for facilitating feedback from tutors to their students [15]. Canada College has applied the Interactive Learning Network (ILN) that utilized both tablet PCs and wireless technology in order to offer an active participation among students [16]. DePauw University has applied tablet PCs by incorporating the DyKnow system (a classroom interaction and management system) which in turn allows students to work collaboratively to solve problems received by their instructor [17]. Abilene Christian University has applied the Mobile Learning Initiative (MLI) through the use of iPhone and iPod touch by both students and educators [18]. Princess Nora University has used mobile phones in order to teach grammar and vocabulary of the French language for undergraduate students [19]. King Saud University has employed mobile devices to gain the benefits of its applications in order to serve the education programs [45]. Hence, the introduction of M-learning has proved its efficiency when employed effectively in the context of higher education. So, we agree with [20] on that the near future will reveal that M-learning is going to facilitate a wide range of educational methods in order to support learning.

### *D. Advantages and Disadvantages of M-learning*

With the introduction of any new technology, there is always a debate about its advantages and disadvantages. M-learning is not an exception. In the literature, there is a list of advantages. In ([21], [22], [23], [26], [24], [25], and [19]), there is a consensus that M-learning enables the interaction and communication among learners and educators in an easiest way in anytime anywhere. It is mentioned in [26] that Mobile devices in all their types are lighter than using traditional books. More important, learners have the ability to share their knowledge [27], obtain an immediate assessment feedback ([15], [13]), and overcome physical restrictions by getting access to the end-users and digital learning resources, regardless of place and time, through the use of their mobile devices ([13], [28], [25], [12], [29]). A significant advantage is that M-learning makes it easy for students with disabilities to effectively participate in the learning process [30]. The technologies associated with mobile devices lend themselves to social media communication among students and educators, most probably through the use of video conferencing technology ([31], [25] and [27]).

In contrast, in the literature, some researchers indicated that mobile learning has brought some disadvantages. Current mobile devices have small screens, limited memory and limited battery life ([32], [33] and [29]). However, these hardware limitations should disappear over time with the rapid improvement of quality of these components and the new technologies that support them. In [25], concerns are raised about whether mobile devices could be a distraction device within the class; especially with the presence of what so-called "Anti-technology" instructors who find it difficult to deal with. However, those instructors are not witness to the personal nature of mobile devices, which gives opportunities for integrating learning with everyday lifestyles, encouraging continuous learning opportunities regardless of time sensitivity and location.

## III. Students' and Educators' Attitudes towards the Adoption of M-learning

M-learning has been applied in various universities worldwide. Students' and educators' attitudes toward using this technology are important success factors that should be taken into account. In this section, we discuss and try to answer the following questions. How M-learning is applied in the context of higher education? What are the students' and educators' attitudes towards adopting M-learning? How M-learning is evaluated? The following subsections try to answer these questions from different perspectives.

### *A. Tablet PCs*

In [34], studies are conducted about the impacts of the Interactive Learning Network (ILN) model, which involves both tablet PCs and wireless technology on students' performance, on students' perceptions towards ILN versus the traditional learning model. Two studies were piloted for evaluating the proposed model. The first study was a comparison between two groups from Canada College: 41 students (using the ILN model) and 28 students (using the traditional learning model). Similar exams and homework were given to both groups of students. The second study was a comparison between Canada College (using the ILN model) and San Francisco State University (SFSU) (using the traditional learning). Pre- and post-tests were given to both groups in order to determine whether the knowledge level is the same. A survey was conducted to measure the students' attitudes towards using the tablet PC. Independent student *t-tests* were performed in order to evaluate the students' performance within the two studies. Results revealed positive perceptions from the students towards the adoption of tablet PCs. The first study results indicated a significant difference between the two groups where ($p < 0.001$) in quizzes and ($p < 0.01$) in homework to those who used the ILN model, but no statistical difference has been observed in the final exam. Moreover, the second study results have revealed a statistical difference between the two groups where ($p < 0.05$) in quizzes and ($p < 0.05$) in the final exam to those who used the ILN model, but no statistical difference was noticed in the homework. Furthermore, post-tests have indicated that Canada College students in the second study have achieved higher scores than SFSU students.

In [35], the study addresses the educators' perceptions toward the impacts of the iPad initiative within the Higher Colleges of Technology (HCT), UAE. The iPad initiative has been applied to foundation program students. iPad 3 has been provided to all the students and educators at the foundation program with 22 apps downloaded as a bulk by the college. Data were collected via interviews and surveys. Results have been interpreted within the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis framework. Findings from interviews and surveys revealed positive results where the observed strengths outperform the observed threats. Moreover, results indicated that the faculty members are positively supporting the adoption of the new technology. Nevertheless, results have shown that using a couple of apps allow the faculty members to prepare their materials easily. Although the study has presented significant results, it has shown some limitations. The study has focused only on students enrolled in the foundation program. Moreover, it only examines the faculty members' perceptions towards the adoption of the iPad without studying its impact on students' perceptions.

### *B. Social Media*

The integration of M-learning with Geographic Information System (GIS) module in a pilot course within a Turkish university is studied in [31]. Each student has been provided with a tablet device. Google+ and Hangout have been used as a social media in order to facilitate the communication. Surveys were conducted in order to evaluate the students' attitudes towards M-learning and social media. Results revealed that most of the students have interacted effectively with Google+. Moreover, all the students have used Hangout to conduct video conferencing among them, and with their instructors; particularly, in their office hour for discussing course assignments and projects.

In [25], a study was conducted for addressing the impacts of mobile technologies on learning and teaching and how these technologies have been integrated with social media for providing better learning. Social media technology, in the form of Skype, twitter, and blogs, are used for sharing ideas and discussions. Data were collected via focus group interviews in order to hear the experiences and perceptions towards the use of mobile technology within three universities in USA. Three instructors, and between two to four students from each university participated in Skype interviews. Results revealed that mobile technology has brought significant benefits to the universities' classrooms. These benefits include: Accessing information quickly and enhancing communication among students and educators.

### *C. E-podium*

At King Saud University, Saudi Arabia, a study [36] was conducted on the effects of M-learning on students and instructors when utilizing and accessing the E-podium technology (an electronic device that records a lecture while it is being delivered within the class and uploads it to the LMS). Two surveys were conducted. The first survey examines the effectiveness of E-podium technology. The second survey verifies the effectiveness of M-learning on students and instructors. The data analyses using *t-test* revealed that 80-90% of students were significantly positive towards using E-

podium. Results also indicated that 80% of the students have agreed on receiving an updated material through their mobile devices. Furthermore, more than 80% of students and instructors were positive towards the adoption of M-learning.

In [27], a new model that combines four technological resources is proposed: M-learning, E-podium, website and video conferencing. The model enables knowledge management mechanisms of lectures materials and makes it easy for students to access these materials. The model offers convenient means for communicating with instructors via video-conferencing. Moreover, the proposed model facilitates knowledge creation and transformation via the integration of M-learning and E-podium.

### *D. eBooks*

In [37], the authors attempted to address the effects of mobile devices and eBooks on student learning. Three questions were involved within the study. The questions are: Will the utilization of mobile devices affect students' access to eResources? What are the benefits and drawbacks behind using mobile devices? How mobile devices will affect the student learning? Data were collected through pre- and post-surveys and focus groups within two universities. The study has targeted the graduate students of social work and both the under- and postgraduate students of nursing. *Pre-survey* was conducted to examine the students' familiarity with mobile devices and eBooks while *post-survey* (including all the *pre-survey* questions with some additional questions) was conducted to determine the impacts of eBooks-based mobile devices on students. Results revealed that 68% of the students were using their mobile devices to access the eBooks within the *pre-survey* while this percentage has been increased to 82% in the *post-survey*. Results indicated that only 72% of the students have access to two mobile devices or more supported with Internet access. Independent *t-test* results revealed that using two or more mobile devices will significantly increase the students' frequency of accessing eBooks. Students indicated that mobile devices make it easy for them to access eBooks anywhere and at their convenience without referring to the library. Moreover, 81% of the students stated that using mobile devices and eBooks have increased their ability to access the materials easily.

### *E. Language Learning*

In [38], a study was conducted on the Iranian EFL (English as a Foreign Language) students' attitudes towards the adoption of Mobile Assisted Language Learning (MALL) on listening. Two research questions were concerned within the study. The first question tries to compare the impact of cell-phone based audio-books versus the traditional audio-books that uses either CD-ROM or audio-cassette. The second question is concerned with the EFL students' attitudes towards the mobile technology. Seventy students were participated within the study and divided into two equal groups. Both groups were enrolled for the Oxford Placement Test (OPT), as a pre-test. Post-tests were also given to both groups in order to examine the students listening comprehension improvements. The pre- and post-tests were concerned with the first research question. MALL survey and interviews were conducted to address the second research question. Results revealed that there was no significant difference between the two groups in the OPT test while the post-tests results indicated that the *mean* score of the experimental group was higher than the *mean* score of the comparison group. Moreover, almost all of the learners indicated that the MALL is more useful due to its ease of use in listening to topics of interest using their cell-phones.

In [19], a study was conducted on the students' attitudes towards the effectiveness of mobile devices as an educational tool for French language at Princess Nora University, Saudi Arabia. All the university students are females. The study attempts to answer two research questions. The first question is: What is the applicable method for achieving better students' interaction and understanding? While the second question is: Is there any difference before and after using mobile devices with regard to students' performance? Qualitative and quantitative methodologies were used to collect the data. Pre- and post-tests were conducted through an experiment. A questionnaire was distributed among 36 female students who were interesting in using M-learning. The same students have applied for pre- and post-tests to examine the effectiveness of M-learning. Qualitative data has been collected via interviews with 10 random students from the participant group. The results indicated that all the students have smart phones: iPhone and Blackberry brands. Results revealed that only 76% of students were interested in learning French language via their mobile phones while the rest preferred to keep using the traditional way of learning. Moreover, paired sample *t*-test between pre and posttests' results ($p < 0.05$) indicated that students' performance have achieved a significant score after using the mobile devices. Although the stud y has used two methodologies to collect the data, but the results were not conclusive due to the restrictions on the number of participants and gender category.

### *F. Business learning*

In [23], the study addressed the impacts of the iPad initiative program on a graduate management education. Three factors have been taken into account within this study: evaluating the effects of iPad on the learning outcomes, identifying the iPad usage towards students' flexibility and convenience, and assessing the efficiency of the iPad on the environmental sustainability and energy. The iPad initiative was launched on fall, 2010. Two groups of students (iPad

group with 17 members and non-iPad group with 23 members) were randomly involved within the study for evaluation. A *Hotel Tycoon* (an operation management simulation that can be played either in a single player or a multiplayer mode) App has been utilized by the iPad group. Results revealed that there is no significant difference in the learning outcomes between the two groups. 80% of the learners mentioned that the iPad was a convenient tool for reading assignments. Moreover, iPad initiative has contributed to both environmental sustainability and energy by minimizing students' transportation and eliminating the usage of hard-copy books. Nevertheless, students reported that the limitation of iPad has prevented them from running Java applets and flash player.

A study by [29] attempts to investigate the effectiveness of M-learning on university students who were taking accounting courses. The study tries to examine whether there any significant difference among the students' perceptions on M-learning regarding three different factors. The first factor is concerned with the use of mobile devices in the learning process. The second one is involved with the usage of mobile devices in conducting research in accounting lessons. The third one is concerned with the time it takes mobile devices in learning. Data were collected via face-to-face interviews and surveys with the 4$^{th}$ class students who are taking accounting lessons in the Akdeniz University, Turkey. Results indicated that 77.3% of the students were using their mobile devices for the learning process. Only 20.4% of the students have used their cell phone for making research in accounting lessons. Results regarding spending time on mobile devices revealed that only 46.6% of the students have spent less than an hour a day for using their mobile devices for the learning process. Collectively, the usage of mobile devices was not effectively performed with accounting lessons but students were interested to use their mobile devices in terms of technological support. As a limitation of this study, perceptions of the faculty members of the accounting course were not investigated.

## IV. Students' and Educators' Attitudes Towards the Use of M-learning in the Institutions of Higher Education

It is important to investigate M-learning technology before applying it to the learning process in higher education. This requires investigating and examining the users' attitudes towards the M-learning technology. As shown, in the literature, M-learning has been recently applied to various universities; however, many universities worldwide still have not yet applied this technology. The following sub-sections review the factors that need to be taken into account when investigating the students' and educators' attitudes (the users of the mobile technology) towards the use of M-learning technology. Students' and educators' attitudes will add a significant value to the recommendations of using M-learning in higher education.

### *A. Gender Difference*

The study by [39] stated that through the use of independent *t*-test there was no significant difference among the students' attitudes in terms of gender category towards the integration of M-learning and LMS. Likewise, [40], [41], [22] and [42] have found that there was no significant difference in genders towards the use of M-learning. In contrast, [43] and [44] have indicated that female students were more positive towards the use of mobile phones rather than male students.

In [45], the study used independent *t*-test that shows that female instructors' attitudes were more positive towards M-learning rather than male instructors, however this observation contradicts with the study by [46] as male instructors' attitudes were more positive towards M-learning than female instructors.

### *B. Students' Majors Difference*

In [43], the authors have indicated in their study that there was no significant difference among the students' attitudes in terms of academic majors towards the use of M-learning.

### *C. Academic Rank Difference*

In [45], the study has investigated the difference in academic rank (Instructor, Assistant Professor, Associative Professor, Full Professor) among 365 faculty members' attitudes towards M-learning in King Saud University, Saudi Arabia. Results indicated that instructors' attitudes, i.e. young teaching assistants were more positive towards M-learning than the academic staff of higher ranks.

### *D. Academic Experience Difference*

The authors of [45] have attempted to examine whether there are differences in the faculty members' attitudes towards M-learning with regard to academic experience. Results revealed that faculty members' attitudes with 21 years or more of experience were more positive towards M-learning.

### *E. Country Difference*

In [44], they have attempted to investigate whether there is any significant difference among students' attitudes towards the use of M-learning within two different regions, USA representing a western country and UAE representing a Middle Eastern country. Findings indicated that USA students were more positive towards the use of M-learning technology ($p < 0.05$) rather than the UAE students. It is worth noting that this study has only focused on students' attitudes without considering the faculty members' attitudes.

### F. Smartphone ownership Difference

The study by [44] tries to examine whether if there is any significant difference among learners' attitudes towards the use of M-learning technology with regard to their smartphone ownership. Results indicated that students who own smartphones (114 students) were more positive towards M-learning than those who do not own them (12 students) with ($p < 0.03$).

## V. Conclusion

Advanced mobile devices are very popular among students and academic staff. The implication of these devices on the modern teaching and learning environment is an active field of research. The emergence of revolutionary M-learning technologies has had a significant impact on educational technology. The new technology has been applied in various universities worldwide, such as: Queen's University Belfast, Canada College, DePauw University, Abilene Christian University, King Saud University, among others. In this review, we have presented the state-of-the-art in M-learning regarding students and educators attitudes towards the adoption of M-learning and highlighted how M-learning has been integrated with different technological resources. Nevertheless, our study includes a review of attitudes of students and educators towards the prospective M-learning in higher education.

In order to figure out the students and faculty members' attitudes towards applying M-learning, significant factors have been examined in our survey. Our study indicated that these factors could be classified along three dimensions: factors specific to students, factors specific to faculty members, and factors related to both end-users. The first dimension includes differences in biographical data such as gender and age, and factors related to enrollment such as student major. For faculty members, it includes also the differences in biographical data as well as factors related to the academic career such as academic rank and academic experience. The second dimension includes differences in the ownership and the use of mobile technology in learning. For faculty members, it includes also differences in the ownership as well as the use of mobile technology in teaching. The third dimension includes differences in students' attitudes towards the use of mobile technology in learning. For faculty members, it includes differences in educators' attitudes towards the use of mobile technology in teaching. Examining those factors lead to provide recommendations on the needs to apply M-learning technology. In the literature, those factors were not sufficiently covered, which influence the conclusion about the recommendations on the need of applying M-learning within higher education environments. As a future direction, we recommend that any survey regarding students' and educators' attitudes towards the use and adoption of M-learning technology should at least consider the indicated factors.

As an extension to this work, we are working to conduct a questionnaire survey within two neighboring countries within the Arab Gulf region (Oman & UAE) as less attention has been paid in these developing countries. Our target is to examine both students and faculty members' attitudes towards the use of M-learning in the higher educational environments. In order to obtain a full picture regarding the students and educators' attitudes towards applying M-learning within the Arab Gulf region countries, we will consider various factors.

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