

# Trends and Challenges for Mobile Learning in Jordan

A. Y. Al-Zoubi<sup>1</sup>, Akram Alkouz<sup>1</sup> and Mohammed Otair<sup>2</sup>

<sup>1</sup>Princess Sumaya University for Technology, Jordan

<sup>2</sup>Arab Academy for Banking and Financial Sciences, Jordan

**Abstract**—The present state of mobile learning in Jordan is investigated in order to provide a meaningful direction for the future development of university eEducation in Jordan. The strengths of mobile learning are elaborated and its current status including challenging issues from the perspective of cognitive learning is addressed. An online survey was conducted to investigate the expectations and perceptions of mobile learning amongst university students and professors in Jordan and a number of countries in the Middle East. Various factors that may contribute to the establishment of mobile learning in educational institutions were investigated and expectations concerning the impact of mobile technologies on teaching and learning were explored. The results reflect on the fundamental needs for effective implementation of mobile learning from the view of cognitive science, instead of technological evolution.

**Index Terms**—Mobile Learning, Mobile Devices and Technology, Education Innovation, University eEducation

## I. INTRODUCTION

There has been a considerable investment in higher education in the Middle East, as indicated by the high admission rates to universities, being the highest in the world, and as motivated by large-scale changes within the global economic system. The present trend, thrive and expansion in education actually coincides with the persisting need to improve the quality of programmes in offer and is coupled with the rapid growth of the emerging ICT technologies. The region has recently witnessed a constant growing rate on the implementation of technology-enhanced learning tools and internet online access. This may set the stage for eLearning deployment on a large scale and to increase its market share at an expected average growth rate of 32% by the year 2008 [1]. Jordan, in particular, has made a good progress in international ICT infrastructure ranking in both the networked readiness index, to stand 44 among 104 nations, and the digital access index with a position of 78 amongst 181 economies [2]. This has enabled many universities to adopt small-scale eLearning solutions, and some are moving towards the implementation of projects based on mobile technologies in order to explore possibilities of engaging its staff and students in mobile learning solutions as this new learning paradigm enables students to interact with professors and access relevant materials when working on a subject, anytime, anywhere using handheld devices.

In this paper, the development of mobile learning into the rapidly changing teaching and learning environment in Jordan is examined. The benefits of mobile learning will also be explored along with the challenges Jordan could

face with the implementation of mobile learning [3]. Various factors that may contribute to the establishment of mobile learning in educational institutions were therefore investigated. These factors include, amongst other, expectations concerning the impact of mobile technologies on teaching and learning, and perceptions concerning mobile learning applications and activities. The limits and possibilities of mobile devices are addressed and common practices for mobile learning found in universities are investigated. Conditions for successful mobile learning implementation are also proposed in terms of attitudes toward learning strategies with mobile devices, and infrastructure and contents. Finally, the educational implications of mobile learning are discussed, as they relate to ubiquitous environments, life-long education, and edutainment [4].

## II. TECHNOLOGY-ENHANCED MOBILE LEARNING

In recent years, a significant number of people have transformed mobile communication devices into personal assistance tools with the ability to access e-mail, search the World Wide Web, read the news, access documents, and organize calendars [4]. The new features and functionalities of handheld devices such as streaming video, colour-display screens, Internet browsers, compatibility with desktop applications, and the improved connectivity capabilities have paved the way for mobile devices to support learning activities and to open the doors to be the most suitable choice as a learning environment. As such, the talking function of handheld devices is no longer its dominant function and textual and visual communications as well as uses of web resources and applications are fast becoming central functions of modern mobile communication [4].

Mobile learning is thus defined as the delivery of online electronic content by means of emerging technologies [5-7]. It has indeed become an innovative means to deliver content and to embed technology into university education because it allows educators to interact with students and to provide input into the design of mobile technology which itself becoming affordable [3R]. However, mobile learning is not intended to replace traditional classroom instruction and lectures or to convert all PC-based learning content into a mobile format, but rather to consider how mobile devices can be used to enhance the learning process and to strengthen and harmonize its overall strategy. Consequently, universities worldwide are utilizing such mechanism to improve their curriculum design in such a way as to integrate more flexible, accessible and personalized learning activities. The

productivity and effectiveness of learners may therefore be enhanced as they will be kept engaged in ongoing learning activities 24 hours a day, 7 days a week.

In Jordan, the rate of wireless Internet is increasing constantly and is likely to be a decisive factor in the development and promotion of mobile learning. In addition, new types of wireless communication services will be widely available soon, such as WiMax, which combines broadcasting with digital communication. Furthermore, technological development in mobile semiconductors such as flash memory will make mobile devices smaller, more capacious, and highly powered. Mobile content will also be easily available and plentiful as wireless Internet services are becoming popular.

### III. MOBILE LEARNING IMPLEMENTATION

Examples from two universities in Jordan are given in order to study the implementation of content, models and environments of mobile learning and ubiquitous computing technology in education. The first example is given at Princess Sumaya University for Technology, where a content of an electromagnetic engineering course was developed for delivery based on the standard ADDIE instruction design methodology. A prototype e-content module was deployed and delivered through mobile learning environments as shown in Fig. (1a). A cycle of Adobe Flash action-script code optimization was conducted to come out with two versions; web and mobile. The goal of the project was to investigate the possibility of providing individual faculty members with technology-enhanced learning tools to assist them in their educational mission [8]. The second example was the design of a mobile quiz system at the Arab Academy for Banking and Financial Sciences. The system was deployed on a PDA to enable instructors to create interactive Web-based quizzes which can be delivered to an Internet-connected computer equipped with a browser [9]. Students can access and perform quizzes anywhere anytime using the PDAs as shown in Fig. (1b). The objective of this examination system was to offer students the benefits provided by mobile learning based on its natural characteristics: mobility, portability, and individualization. Additional benefits include interactivity of the learning process, integration of instructional content and urgency of learning needs.

The third example is a mobile virtual laboratory developed, at Princess Sumaya University for Technology, to help students perform virtual experiments using mobile devices as shown in Fig. (1c). The project was carried out in order to share resources and equipment which can be integrated in an environment created using mobile devices via the Internet and the GPRS telecommunication networks. Java wireless communication technologies were used in the design and a similar design is being implemented using Labview software as shown in Fig. (1d). In all these examples, the mobile content was designed and developed in small bytes of format which can be delivered through wireless communication networks.

The mobile virtual laboratory provides appropriate evidence that mobile learning can be successfully utilized with the integration of learning resources, wireless networking capability and real time data acquisition and control system. Such a challenge is being overcome through a combination of mobile communication

networks, handheld devices, interfacing technology for program download and remote control, and real time development module for learners to verify their experimental program codes. In this combination, the wireless local area network (WLAN) which provides access to the Internet, and PDA which replaces the computer for interaction between learner and learning material, are adopted. Furthermore, the web camera technology is proposed to simultaneously monitor the execution of experiment in the remote laboratory [3].

### IV. RESULTS AND DISCUSSION

The perception of students and professors of mobile learning was investigated through an online questionnaire conducted in the first quarter of 2007. The questionnaire consisted of 24 questions aimed to cover a wide range of subjects and then posted into the Princess Sumaya University for Technology website.

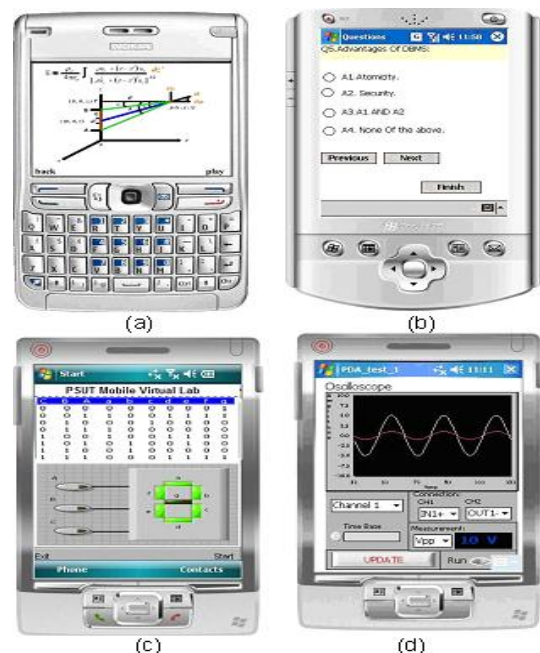


Figure 1. Examples of Mobile Learning in University Education in Jordan.

An email list containing over 2700 emails for professors in the 22 universities, public and private, and a students' list of 415 emails were also prepared and 41.61% were student and 51.83% were lecturers and researchers as shown in Fig. (3), having academic qualification distribution as shown in Fig. (4), and with scientific background as shown in Fig. (5). A high percentage of the respondents of 96.35% possessed a mobile phone while only 15.33% possessed a handheld computer or a PDA, with a distribution shown in Fig. (6), and 91.52% use their mobile devices for SMS exchange while other applications are shown Fig. (7).

Almost 84% of the respondents thought that mobile learning could enrich their learning experience and 16% thought otherwise. These latter respondents find it very expensive to purchase high quality devices to apply for mobile learning purposes.

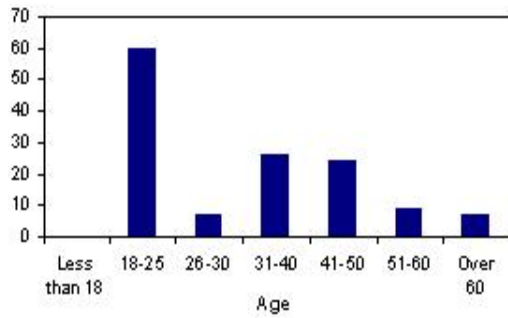


Figure 2. Age Groups of Questionnaire Respondents.

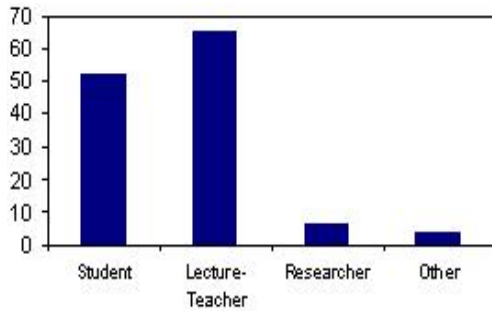


Figure 3. Distribution of Respondents Professions.

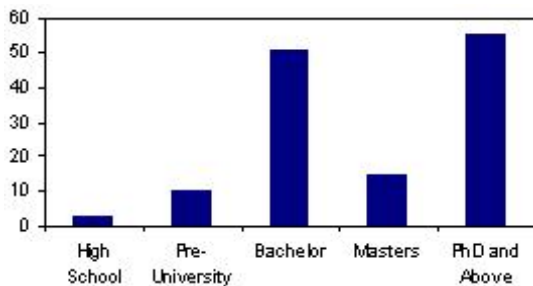


Figure 4. Distribution of Respondents Academic Qualifications.

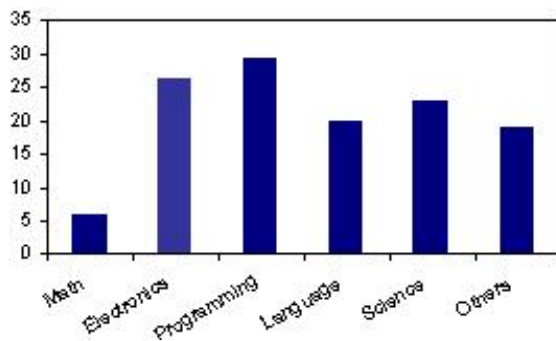


Figure 5. Distribution of Respondents According to Scientific Background.

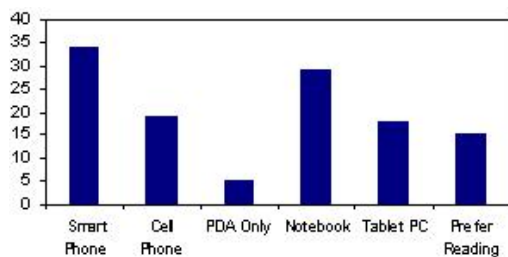


Figure 6. Distribution of Possession of Mobile Devices Types Amongst Respondents.

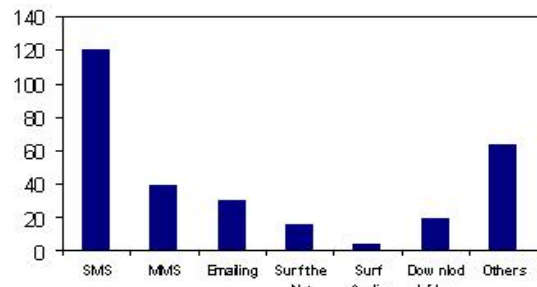


Figure 7. Usage of Mobile Devices amongst Respondents

Some also find it difficult to study with mobile devices, and have actually tried it using PDAs, for example, but was difficult to use in terms of size, functionality and other limited features such as small screens, short battery life, while they can use laptops anywhere that can be "intended" for study. Hence, they still preferred face to face learning and interaction at a person to person level and group work in the classroom, which is the "place to learn". It was however suggested that mobile learning is useful to keep students updated with news about the course. Moreover, a number of respondents suggested that mobile learning sounds perfect but it takes a great amount of time to adapt to this new culture. Consequently, the degree of importance of the factors that influence the choice of a mobile device for use in a mobile learning environment, the mobile learning platform and the expected services it offers was the focus of the questionnaire in order to arrive at the best solution that suites learners and facilitators when a mobile learning system is developed. It was found that screen size and resolution and battery life were the most important factors that influence the choice of a mobile device used in a mobile learning environment as indicated in the results of the questionnaire shown in table (1). The processing power and wireless capabilities of the mobile devices such as GSM, WIFI and Bluetooth were also important to users while input methods such as a keyboard and the weight of the unit were less important to users.

Results also reveal that the speed and cost of downloading new content were the most important features of the mobile learning platform while its userfriendliness and graphics capabilities such as videos, audios and illustrations in the course content were less important. Most respondents did not find the entertainment component in course content and the variety it offers important with only about quarter of the responses being positive in this respect, as shown in table (2). Half of the sample considered accessing notes and course content on an anytime, anywhere basis and receiving live information and notification of events such as exams, cancellation of classes, change of lecture rooms as the most important of the function and services expected from the use of mobile learning technology. However, the interaction and asking questions in the classroom via the mobile device to the teacher by typing in questions, which are then send to the lecturer's PC for him/her to answer, communication with and feedback from the lecturers and tutors, the ability to communicate with other peers and friends as well as being able to add or drop courses seamlessly during course registration time were found to be less important, while participation in mini quizzes inside the classroom was not important as shown in the results of table (3).

TABLE I

Degree of Importance	Screen Size	Weight	Wireless Capabilities	Input Methods	Processing Power	Battery Life
<b>1 (not important)</b>	2.19	2.92	3.65	2.19	1.46	1.46
<b>2</b>	4.38	5.84	2.92	2.19	1.46	0.73
<b>3</b>	10.22	21.90	6.57	24.82	16.06	10.95
<b>4</b>	18.25	23.36	26.28	27.01	27.74	21.17
<b>5 (very important)</b>	59.12	37.96	53.28	35.77	45.26	58.39

The Percentage Degree of Importance of the Factors that Influence the Choice of a Mobile Device for Use in a Mobile Learning Environment.

These findings were strikingly similar to those obtained from a number of respondents from countries in the Middle East such as Iraq, Palestine, Sudan, UAE, Morocco Iran, and beyond such as Malaysia, India, Bangladesh, Brazilian, Uganda, Mozambique, the

Netherlands, UK, Canada and USA. These results agree well with results obtained from an international survey recently conducted to explore current expectations of mobile learning for distance education [14-15].

TABLE II

Degree of Importance	User Friendliness	Speed of Content Download	Cost of Downloading	Graphics and Illustrations	Variety of Courses
<b>1 (not important)</b>	2.92	0.73	0.00	0.73	0.73
<b>2</b>	5.11	2.92	2.19	3.65	5.11
<b>3</b>	11.68	8.03	10.95	16.06	18.25
<b>4</b>	29.93	23.36	19.71	29.93	36.50
<b>5 (very important)</b>	41.61	56.20	58.39	40.15	30.66

The Percentage Degree of Importance of the Mobile Learning Platform.

The respondents were asked to give their suggestions for adding more capabilities to mobile learning systems and the following is a summary of the feedback received:

1- A new mobile device should be invented with very powerful capabilities to reach the goal of using mobiles for learning purposes like what is happened with m-commerce despite the fact that making changes may result

in loss of attraction in device looks. In other words, if we have to increase the size to have a bigger screen, or change the battery, then we will lose the main advantages of any mobile device such as easy portability (size) and weight (because of battery). The system would therefore be more suitable to introduce to those areas with limited access to the tertiary institution.

TABLE III

Degree of Importance	Accessing Notes	Receiving Notification of Events	Interaction in the Classroom	Participate in Quizzes	Communicate with Lecturers	Communicate with Peers
<b>1 (not important)</b>	2.92	0.00	3.65	1.46	2.19	0.73
<b>2</b>	2.19	4.38	7.30	8.76	3.65	8.03
<b>3</b>	13.87	11.68	21.90	21.17	20.44	19.71
<b>4</b>	23.36	29.20	30.66	38.69	28.47	31.39
<b>5 (very important)</b>	48.18	45.26	27.01	19.71	35.04	29.20

The Percentage Degree of Importance of the Services Offered Through the Use of Mobile Learning.

Mobile learning needs to break the barriers in learning, perhaps for individuals who were previously not able to access education due to disabilities, or economic circumstances, as we have many of them in the Arab world. Only then, will mobile learning become a significant technology in today's technologically-added world. It is therefore suggested that the course content, illustrations and design should be tailor-made, and enriched with multimedia capabilities, to suit the mobile device used;

2- Studying with mobile devices should only be just for short-period courses, and one should start with simple knowledge courses that everyone needs to know like English language and computing basics. In addition, a free learning program for testing whether this new way of learning is worthwhile pursuing and made applicable. And, a back-up and maintenance systems should be reliable and efficient;

3- Mobile learning should have network accessibility like WiMax and be categorized into at least 2 segments, first via paid cellular service, and second through 'free' internet. We also need to upgrade and develop the infrastructure and facilities before mobile learning can be fully implemented;

4- Privacy and security measures, grades for example, must be taken into account, just in case not to be altered by a third party;

5- A campaign is needed to promote mobile learning.

It is evident that the results reflect the fact that mobile learning still faces several challenges for its future development in eEducation despite its application in various fields. Issues related to the convergence of wireless infrastructure with handheld devices, the smoother delivery of learning content, and the innovations in content creation are the main challenges that need to be addressed and resolved. In addition, theoretical and practical guideline should be devised to enable professors, instructional designers, programmers, and education administrators to develop proper mobile learning content and curriculum. This will contribute to constructing a better environment for learning and a more educated society in the near future.

The findings of this survey thus reveal some discouraging facts for the future of mobile learning as little educational content for the wireless Internet is available, and as the overall user satisfaction rate is very low, the speed is very slow and service charges are very high. There were few requirements that must be fully met before a promising teaching and learning environments can be added by mobile devices. Such requirements include the need to establish a learning strategy of mobile learning with a focus on the adaptive and flexible nature of the learning process, standardization of contents and the necessity to reach a consensus among educators on the validity and potential of this new method of knowledge acquisition and construction. Only then can mobile learning become popular and accepted mode for the young generation [4].

## V. CONCLUSIONS

Mobile learning environments in Jordan were investigated through the implementation of a number of projects in two universities. An online survey was conducted to investigate the expectations and perceptions of mobile learning amongst university students and professors and various factors that may contribute to the establishment of mobile learning platforms in educational institutions were studied.

The results reflect on the fundamental needs for effective implementation of mobile learning from the view of cognitive science, instead of technological evolution. The findings also reveal some discouraging facts for the future of mobile learning because of the scarcity of content that can be utilized. In addition, the slow internet speed and its high service charges are two other major

factors that hinder the progress of mobile learning in Jordan. However, universities are expected to develop proper mobile learning content and curriculum which will eventually contribute to creating a learning environment that will help develop further the country's educated society in the near future.

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## AUTHORS

**A. Y. Al-Zoubi** is with the Princess Sumaya University for Technology, Jordan. (e-mail: zoubi@psut.edu.jo).

**Akram Alkouz** is with the Princess Sumaya University for Technology, Jordan. (e-mail: akram@psut.edu.jo).

**Mohammed Otair** is with the Arab Academy for Banking and Financial Sciences, Jordan. (e-mail: motair@aabfs.org).

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