A Framework for Mobile Learning for Enhancing Learning in Higher Education

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ABSTRACT

As mobile learning becomes increasingly pervasive, many higher education institutions have initiated a number of mobile learning initiatives to support their traditional learning modes. This study proposes a framework for mobile learning for enhancing learning in higher education. This framework for mobile learning is based on research conducted on the course titled "Internet Technology," taught to second year students in the Department of Mathematics and Computer Science at the University of Djibouti. While the entire gamut of mobile technologies and academic applications needs to be considered, special emphasis and focus is provided to Short Message Services (SMS) and popular social network sites such as Facebook, which is widely used for recreation. This paper highlights how mobile learning using SMS and Facebook can be designed to enhance student learning and help achieve learning outcomes.

Keywords: *Framework for mobile learning, SMS, Facebook, Higher Education*

INTRODUCTION

Mobile learning strategies such as the integration of SMS and Facebook applications have the potential to help higher education institutions cope with rapid technology change, competition, and globalization. This article highlights how mobile learning using SMS and Facebook could be used together with classroom learning in order to support student learning in higher education. SMS and Facebook applications were chosen because these are what most students in higher education use. This aligns with one of the main purposes of mobile learning, namely to reach as many learners as possible. In addition, SMS and Facebook are not only popular but also perceived to be useful in supporting students' needs. However, in order to gain maximum benefit from this technology in education in general and in higher education in particular, an appropriate design and proper implementation are required.

RELATED WORKS

Mobile learning has captured the imagination of many educators in higher education as they have capitalized on the features and tools embedded within powerful mobile devices (Hung & Zhang, 2011). Osaka Jogakuin College in Japan became the first educational institution to provide mobile learning devices (i.e. iPods) to their students to assist in English learning (McCarty, 2005). This success was soon followed by the initiative of Duke University in the United States to provide all first year students with iPods (Belanger, 2005). Furthermore, extant literature indicated that Columbia University in the United States has started to introduce mobile phone learning to explore how instructors and students can utilize the mobile phones for learning (Ahmad & Mentor, 2011). Oxford University in the United Kingdom also has explored the integration of iPad as effective technology for taking online programs (Scott & Breana, 2011). According to Lim, Fadzil and Mansor (2011), there have also been numerous successful attempts by higher education institutions worldwide in using text messages to support distance learners such as Kingston University and the University

of Ulster in the United Kingdom, the Sheffield Hallam University branch in India, the Srinakharinwirot University of Thailand, the Chinese University of Hong Kong, and University of Victoria in Australia. Further research is also being conducted to determine the potential of mobile learning in traditional forms of higher education.

However, mobile learning in higher education settings has not become widespread and is still in the testing stage. Moreover, the research into mobile learning mainly has been based on the challenges and opportunities of this technology in education in general and in online distance learning in particular. In addition, many new research topics have been emerging in various areas, including technological, pedagogical, and methodological issues, and problems related to content and user interface adaptation. Both university administrators and educators have been working to find the best way to use mobile devices in education.

WHAT IS MOBILE LEARNING?

In this context, numerous research studies on the use of mobile and wireless communication technologies in education have been conducted. Researchers have denoted these technology-supported learning approaches as "mobile learning" (Shih, Chuang, & Hwang, 2010). During its development, mobile learning was defined differently by various researchers. A review of the literature of the different definitions reveals four approaches for defining mobile learning: mobile devices, learners and learning process, learning and combination of different components, and a combination of these three approaches.

Table 1 Approaches to Defining Mobile Learning

Approaches	Definitions
Mobile Devices	The use of mobile and handheld IT devices, such as Personal Digital Assistants (PDAs), mobile telephones, laptops, and tablet PC technologies in teaching and learning (Alsaadat, 2009).
	The use of handheld devices such as PDAs, mobile phones, laptops, and any other handheld information technology devices that may be used in teaching and learning (Harriman, 2007).
	Learning delivered, enhanced, or supported mainly or solely by wireless and mobile devices and their technologies (Kukulska-Hulme et al. ,2005)
	Any educational provision where the sole or dominant technologies are handheld or palmtop devices (Taxler, 2005).
Learners and Learning Experience	Where a learner can be physically mobile while at the same time remaining connected to non-proximate sources of information, instruction, and data communications technology (Woodill, 2012).
	When the learning experience that you're trying to design happens to be out and about in the world (Dikkers, 2012).
	Learning process, in which learners collaborate with their peers and teachers, construct the meaning of knowledge (Sharples, 2005).
	Learning arising in the course of person-to-person mobile communication (Nyiri, 2002).
Learning	The processes (both personal and public) of coming to know through exploration and conversation across multiple contexts among people and interactive technologies (Sharples 2009, p. 5).
	The acquisition of any knowledge and skill through using mobile technology, anywhere anytime that results in an alteration in behavior (Geddes, 2004).
	Any form of learning when mediated through mobile devices, and a form of learning that established the legitimacy of "nomadic" learners (Alexander, 2004).
	Part of a new learning landscape created by the availability of online and personal technologies supporting flexible, accessible, learner-focused education (Kukulska-Hulme, 2010).

Combination of Components	The combination of mobile technology and its affordances that create a unique learning environment and opportunities that can span across time and place (Stanton & Ophoff, 2013). Combination of e-learning and mobile technology (Ketterl, Heinrich, Mertens, & Morisse, 2007; Parsons & Ryu, 2006). Partly about learning and partly about the breakthroughs of mobile computing and global marketing of mobile devices (Kukulska-Hulme & Traxler (2005).\ The combination of e-learning and mobile computing that promises the access to applications that support learning at anytime and anywhere (Holzinger, Nischelwitzer & Meisenberger, 2005).

The four approaches shown in Table 1 emphasize the uniqueness of mobile learning and distinguish mobile learning from other forms of education and training such as online learning , distance education, and e-learning. In addition, by providing an understanding of mobile learning in general, these four approaches also can help designers understand the position and significance of mobile learning in the context of higher education.

In this study, mobile learning was defined as learning using mobile devices with wireless connectivity such as mobile phones, smartphones, tablets or any other handheld devices that offers learners the opportunity to enhance their learning experience anywhere and at anytime. This definition was based on the first and second approaches shown in Table 1.

DESIGN OF MOBILE LEARNING

The design of mobile learning constitutes a fundamental stage for the development of a framework or model of mobile learning needed to successfully build mobile learning applications. Mobile learning requires a change in the lecturer's philosophical approach to teaching, and it is not simply the application of e-learning design requirements to the mobile learning environment (Parsons & Ryu, 2006). This means that mobile learning initiatives must establish their own design as a framework or model in order to support learning in education in general and in higher education in particular.

According to Sharples, Taylor, and Vavuola (2005), a first step in postulating a design for mobile learning is to distinguish what is special about mobile learning compared to other types of learning activities. Second, this design must embrace the considerable learning that occurs outside classrooms and lecture halls as people initiate and structure their activities to enable educational processes and outcomes. Third, mobile learning should be based on contemporary accounts of practices that enable successful learning in which learning is an active process of building knowledge and skills through practice within a supportive group or community. Lastly, a design of mobile learning must take account of the ubiquitous use of personal and shared technology. Following those criteria, some of the most well-received and acknowledged proposals of a framework or model for mobile learning are described next. In other words, many researchers have emphasized the importance of having a good design when implementing technology to enhance student learning (Herrington, Herrington & Mantei, 2009; Koole, 2009; Litchfield, Dyson, Lawrence, & Zmijewska, 2007). Alexander (1999) stressed the need for appropriate learning design in order to use technology to improve or enhance students' learning experiences. If the focus is to enhance student learning, priority must be set to design mobile learning in such a way that it will succeed (Leigh, 2004).

Since mobile learning is in its early years, much work is still needed before it can be used widely as added value in higher education. This study contributed to filling this gap by proposing a framework for mobile learning for enhancing learning in higher education in order to engage and motivate students in the learning process and help to achieve learning outcomes.

FRAMEWORK FOR MOBLE LEARNING

The framework for mobile learning is based on a course titled "Internet Technology," taught to second year students in the Department of Mathematics and Computer Science at the University of Djibouti. Using student feedback, the elements of the proposed mobile learning framework are identified, and the factors

concerning these elements are presented in this section. Figure 1 shows the mobile learning framework for the enhancement of learning in higher education as was applied at the University of Djibouti.
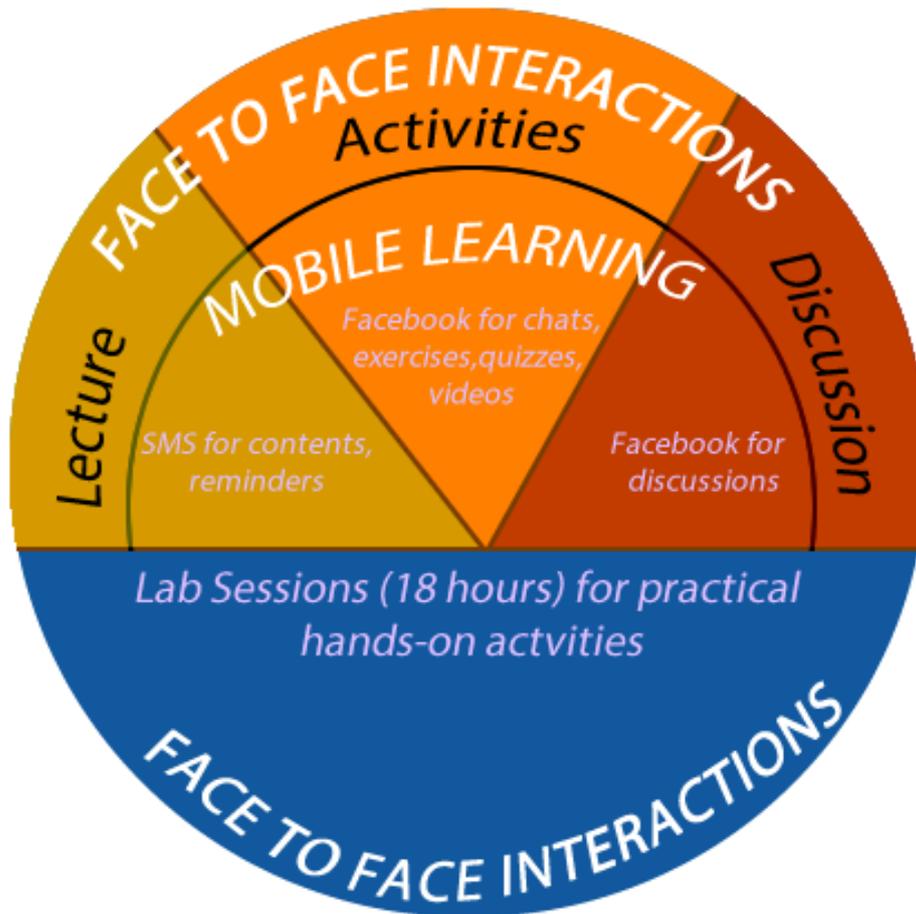

Figure 1. Framework for Mobile Learning.

This framework highlights how mobile learning can be used to support face-to-face interaction through a course titled "Internet Technology." Mobile learning activities were designed and developed to complement the three primary learning modes of face-to-face interaction, which were, lecture, activities, and discussion. Mobile learning has become an emerging tool that offers significant learning experience to enhance student learning in higher education institutions. Many studies have revealed that mobile learning can support and enhance learning in higher education if properly designed. However, although m-learning has been used to support a wide range of learning activities, there has been little research done to investigate the students' requirements or to understand what types of mobile applications students need to use, or to examine how mobile educational software can be designed to effectively support learning (Devinder & Zaitun, 2006). In response to this gap in the literature, this framework shows how mobile learning can be used to enhance the overall learning experience of students and teachers in higher education.

Face to face interactions

Face-to face-interactions constitute one of the main modes of learning in higher education through activities such as lectures, discussion, activities, and lab sessions. This mode of interaction refers to when communication between teachers and students take place in the traditional classroom. The course Internet Technology used these four activities as part of face-to-face interaction. Mobile learning activities were used to supplement the face-to-face interactions activities of the course. Some of the mobile learning activities employed included the use of SMS for content delivery and reminders, and the use of Facebook for discussions, chats, exercises, videos, and quizzes. The course was designed to deliver 42 hours of face-to-face interactions: 24 hours of lecture, activities and discussion and 18 hours devoted to lab sessions.

Lab sessions for hands-on experiences

Lab sessions were compulsory and composed of a weekly meeting of 1 hour and 30 minutes during the 12 weeks of each semester. Lab sessions were intended to enable students to undertake the practical aspect of Internet technology. Lab sessions involved instructor led practical demonstrations regarding the various aspects covered in the course during face-to-face sessions. Students also were required to undertake programming practical sessions aimed at reinforcing the theoretical concepts learned in class. Specifically, lab sessions were mainly undertaken in areas related to creating web pages with HTML and for building dynamic websites using PHP language with MySQL databases. Evaluation of students on lab sessions was based on the workability of the practical projects they completed. Lab sessions were therefore an important part of the course learning activities.

Lectures

Face-to-face lecture is still the main means of disseminating knowledge in higher education, but university faculty and administrators have been examining other tools and methods to support and engage students (Sweeney, O'Donoghue, & Whitehead, 2004). For this study, lectures were undertaken through instructor led oral presentations to students in class. Specifically, lectures were used to deliver theoretical Internet technology concepts to students. The lecture method involved the instructor providing concepts orally to students who also participated in the lecture by asking questions. In addition, the lecture of this course mainly used multimedia presentation software such as Microsoft PowerPoint to engage students in the learning process. Additionally, public lectures organized by the department of mathematics and computer science were also used to expose students to more complex Internet technology applications.

However, educational research has revealed that face-to-face lecture sessions alone are not highly effective in helping students accomplish learning outcomes. Therefore, other strategies, such as activities and discussion were used to help the instructor gauge the students' progress and require students to actively engage with the content, each other, and the instructor.

Activities

Face-to-face activities are designed to encourage student engagement during class. Additionally, activities in learning Internet technology were developed for both the classroom environment and out-of-class environment. Within the classroom, theoretical aspects of the course were deeply developed through several exercises before the practical lab session. In the out-of-class environment, students were required to conduct case studies and present their findings in class. Specifically, students were grouped into various categories and given a specific case study to evaluate based on topics covered during the course. Finally, face-to-face activities involved brainstorming activities to enable students to review the concepts learned from the face-to-face lecture.

DISCUSSION

Another learning tenet within face-to-face aspect of teaching and learning is the use of classroom discussion. Most advocates (e.g. Hung, Tan, & Cheng, 2005; Mayo, 2004; Smith, 2005) have argued that discussion between learners and instructors is a determining factor that either accelerates or impedes the learning process.

Therefore, face-to-face interaction discussion is a useful teaching technique that enables student to develop critical thinking skills and improve in-depth analytical skills. For this course, students were engaged in academic debate regarding the stated topic. As part of the discussion, they were required to present their views in class. The instructor was then able to guide students in arriving at the best answers to the question besides helping students understand why some answers were invalid and inappropriate.

MOBILE LEARNING

In this study, mobile learning is defined as learning using mobile devices with wireless connectivity such as mobile phones, smart phone, tablets or any others handheld devices that offer learners the opportunity to enhance their learning experience anywhere and at any time. As mobile learning has become

ubiquitous, many higher education institutions have embarked on a number of mobile learning initiatives to support their traditional learning modes. In order to enhance the course learning environment, Internet Technology and mobile learning activities were used to supplement face-to-face interaction. Two main applications were employed: SMS for content and reminders and Facebook for discussions, chats, exercises, videos, and quizzes.

SMS for content and reminders

SMS messages were used to supplement face-to-face interaction by delivering some mobile based content as well as course reminders. SMS messages were scheduled to be sent twice during weekdays at 8.00 pm. This time was suitable because the majority of students were involved in their homework at that time. Further SMS messages were scheduled after the topics were covered during face-to-face lectures to enhance students' learning.

At the end of every lesson SMS content was sent to every student. The content included summaries containing the main concepts learned in the face-to-face lectures. For example, an SMS might have included a statement or question together with the reference chapter. This increased the students' retention as well as understanding abilities. In addition, researchers at the Sheffield Hallam University of India found that when SMS messages containing important course content were received by learners, the content was more readily and easily assimilated because it was chunked into small sizes (Uday Bhaskar & Govindarajulu, 2008).

Facebook for discussions

Another mobile learning initiative employed was the use of Facebook discussions. Facebook discussion is a forum application enabling students to post messages and to reply to them asynchronously. For this study, discussion topics were posted on the forum and students were required to post their messages after reading the module. The instructor engaged the students in a critical discussion by posting comments that critically analyzed the responses they provided. The instructors also guided the students with cues and clues for answering the discussion questions appropriately. Many researchers have revealed that asynchronous discussions, such as forum discussion on Facebook, are useful in enhancing learning because students have more time to analyze and reflect on content and to compose thoughtful responses.

Another important benefit of asynchronous discussion is the teacher-student and student-student interaction outside of the classroom. Researchers have found that students who felt they did not have enough background knowledge in the subject matter did extra research before making a comment. They did so because they did not want to sound unintelligent in front of their colleagues (Du, Zhang, Olinzock, & Adams, 2008). For example, in traditional face-to-face classes, when an instructor asks the class about something, not everyone has an opportunity to give a response (Benson, 2003). However, in Facebook forum discussions, all students have the chance to express their opinion. Furthermore, Hrastinski (2008) reported that when students agree with their colleagues, they form social ties, and these are important for collaborative learning. The forum discussion provides a collaborative learning environment where students learn from each other, and it allows the instructor to ensure that students are on track.

Facebook for chats, quizzes, exercises and videos

Facebook chats, videos, quizzes, and exercises were used to supplement the face-to-face sessions. The instructor created a chat group so that various students could engage in exchanging their opinions regarding a specific topic. However, the chat sessions were centrally managed by the instructor in order to avoid personalized messages chats. Also, videos were posted on the Facebook page for reinforcing the theoretical concepts learned in class. For instance, the instructor posted a video created by a reputed professor in which the professor explained the fundamentals of website design using HTML.

Quizzes and exercises also were posted on the Facebook page. The quizzes and exercises were used to evaluate student understanding regarding key concepts learned in class. In addition, in order to engage students to take part actively in these activities, the results were discussed in the class. In sum, Facebook chats, videos, quizzes and exercises provided students with the opportunity to deepen their understanding by applying the different concepts learned in the class.

SUMMARY

The mobile learning framework developed was based on the ideas and opinions of the students regarding the key motivations behind the use of Facebook and SMS in the teaching and learning process. The design of the mobile learning framework was guided by the students' preference for flexibility and mobility as well as platform interactivity.

As a new technology in education, mobile learning has the potential to contribute to the existing mode of learning at the University of Djibouti. Integrating mobile learning with face-to-face interaction in the Internet Technology course, which is taught to second year students in the Department of Mathematics and Computer Science at the University of Djibouti, offered a significant opportunity for enhancing student learning. Mobile learning motivated learner engagement in the learning process and at the same time it offered them opportunity to learn anytime and anywhere.

Furthermore, mobile learning helped learners stay focused on their studies and also assisted them in better managing their studies and facilitated their learning. In sum, it is evident that mobile learning can be an effective learning enhancement tool if properly designed. In the near future, it is also possible that mobile learning will be implemented in most universities globally. From this perspective, the framework for mobile learning proposed in this study is timely.

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