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An experiment on conducting mobile learning activities on the virtual university

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Abstract

In this study, a mobile learning system is developed for a training program. With the assistance of the mobile learning system, the students are able to learn in an authentic learning scenario, in which they can physically face the target, with the personal guidance and supplementary materials from the learning system to support them. To show the effectiveness of this innovative approach, an experiment has been employed on the virtual university.

The experimental results show that the innovative approach is helpful to students in improving their learning achievements. Moreover, it was found that most students showed favourable attitudes toward the usage of the mobile learning system and their participation in the training program.

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1. Introduction

Recent advances in computer and communication technologies have encouraged researchers to develop computer-assisted learning environments or web-based learning environments that simulate problem-solving tasks and scenarios as close to the real-world situation as possible. However, this kind of simulation inevitably lacks the contextual complexity of the clinical environment, which should be taken into consideration when interpreting results (Taylor, 2000). Researchers have indicated that it is important to learn in an authentic environment as well as in a virtual world (Brown et al., 1989; Hung et al., 2010). Although traditional in-class learning is a method of authentic learning, it is difficult for the teacher to provide full personalized learning support to every student, especially when a large number of students are gathered in the same class (Hwang et al., 2009). Therefore, it has become an important and challenging issue to develop clinical learning environments that enable students to learn in real-world scenarios with personal support from the learning system (Peng et al., 2009; Hwang et al., 2010). The development of wireless networks and sensor technologies gives light to this goal, as it allows the establishment of a learning environment with both authentic and virtual resources (Hwang et al., 2008). With wireless networks, the students can interact with the Digital learning system outside of the classroom and extend their learning experience to the authentic learning environment. With the use of sensing technologies, the learning system can detect and record the learning behaviors of the students in the real world. Combining both technologies, context-aware mobile
learning has been recognized as a potential way to develop learning systems to interact with students in the real world (Hwang et al., 2008, 2009; Chu et al., 2010a; Hwang et al., in press); however, without proper guidance, the students are likely to get lost in such complex learning environments that integrate both real-world and digital-world learning resources, and their learning achievements could be disappointing (Lumpe and Butler, 2002; Sharma and Hannafin, 2007; Rooij, 2009).

1.1. Literature review

In this section, literature concerning the technologies and methods used in this study, such as Mindtools, expert systems, the repertory grid method, and mobile and sensing technologies, are given in detail.

1.2. Mindtools

Mindtools are computer-based tools which serve as extensions of the mind. Jonassen (1999, p9) defined Mindtools as “a way of using a computer application program to engage learners in constructive, higher-order, critical thinking about the subjects they are studying”. In the past decades, educators have pointed out several potential computer Mindtools, such as databases, spreadsheets, semantic networks (e.g., concept maps), computer conferencing, hypermedia construction, simulation programs, expert systems, and communication facilities (e.g., online discussion forums and search engines) (Jonassen et al., 1998; Valcke et al., 2007). Previous studies concerning Mindtools have shown that integrating constructionism, Mindtools and discourse offers an enormous potential to promote students' higher-order thinking skills in analysis, synthesis and evaluation. For example, Savage et al. (2003) reported a study concerning the use of a constructionist Mindtool approach in a course of logic, robotics, and programming for non-technical third level students. As noted by Jonassen and Carr (2000), technology can be used as a Mindtool to support the students in composing deep reflective thinking that is necessary for meaningful learning.

1.3. Expert systems and the repertory grid approach

An expert system is an artificial intelligence computer system designed for simulating expert reasoning based on the knowledge provided by domain experts who are the experts in that specified application domain. In the past decades, various applications of expert systems have demonstrated the benefits of applying this approach (Leitich et al., 2001; Hwang et al., 2006; Miranda-Mena et al., 2006; Chen et al., 2008; Chu and Hwang, 2008; Yang et al., 2008). Jonassen (1999) indicated that the development of expert systems results in deep understanding because they provide an intellectual environment that demands the refinement of domain knowledge; moreover, the process of building expert systems (i.e., knowledge acquisition) requires learners to synthesize their knowledge by making explicit their own reasoning, and hence it improves retention, transfer, and problem-solving abilities (Giarratano and Riley, 2004).

That is, with proper design, knowledge acquisition approaches could be innovative Mindtools for improving student learning efficacy (Chu et al., 2010a). Among the various knowledge acquisition approaches, the repertory grid method that originated from the Personal Construct theory proposed by Kelly (1955) has been recognized as being very effective. Various studies have reported the effectiveness of using the repertory grid method in assisting domain experts to better organize their knowledge and experiences (Boose and Gaines, 1989; Hwang et al., 2006; Chu and Hwang, 2008). Accordingly, the repertory grid method is adopted in the clinical practice of this study. A single repertory grid for clinical practice is represented as a matrix whose columns have element labels and whose rows have construct labels. Elements represent the decision to be made, objects to be classified, or concepts to be learned. Constructs are traits or features for describing or classifying the target decisions, objects or concepts. To represent the relationships between the elements and the constructs, a 5-scale rating mechanism is usually adopted; that is, each rating is an integer ranging from 1 to 5,
where “1” represents that the element is very likely to have the trait; “2” represents that the element may have the trait; “3” represents “unknown” or “no relevance”; “4” represents that the element may have the opposite characteristic of the trait; and “5” represents that the element is very likely to have the opposite characteristic of the trait (Chu and Hwang, 2008).

1.4. Mobile and sensing technologies

In mobile learning environment, students are equipped with mobile devices, such as personal digital assistants (PDAs), mobile phones, or portable computers. With mobile technology, learning activities can be conducted anywhere and anytime. Researchers have further indicated that what really matters is whether students can access the right resources at the right time in the right place (Shih et al., in press). Consequently, in addition to the use of mobile technology, various sensing technologies, such as Radio-frequency Identification (RFID) and Global Position System (GPS) have been used to identify the real-world locations of learners (Feeney et al., 2001; Kindberg and Fox, 2002). For example, in a learning environment with RFID, each learning target (e.g., the plant to be observed) is attached with an RFID tag, in which a code for identifying the learning target is recorded. The students are equipped with a mobile device with an RFID reader. Once a student walks close to a learning target, the reader will sense the code in the tag, and hence the learning system is able to identify the location of the student and provide corresponding learning tasks, hints or supplementary materials accordingly (Chiou et al., 2010; Chu et al., 2010b; Hwang et al., in press).

2. Learning through cell phones (Mobile Learning)

There are many definitions in different countries and nations about the Mobile learning such as: “Any kind of education or learning that is not performed in a preprogrammed learning environment (it’s not possible for the learner to attend in the class)” or in the other definition “any kind of instruction which is benefiting from mobile technology.”

On the other hand, mobile learning decreases the restrictions of learning environments by creating more flexibility, focusing on mobile technology and the mobility of learning environment. Therefore, the mobile learning is always concerned for its availability to different learning materials. Meanwhile, this kind of learning is completely interactive and pleasurable and it simply creates more effective and amusable learning. The mobile learning is a developed kind of electronic learning that in relation to the other kinds of electronic learning provides learners with more facility to access the learning contents.

It is evident that the mobile learning brings a communicative and interactive property for users. M-Learning is a kind of electronic learning through mobile devices such as PALM * WINDOWS CE MASHINES and even the cell phones. Mobile learning is a compound facility that includes two fields: the computer aided mobiles and the Electronic learning.

Mobile learning may include various kinds of instruction and learning methods that is only emerge in cell phone screens or it also can emerge in mobile tools such as personal mobiles, PAD, intelligent phones or laptops. On the other hands mobile learning is a kind of electronic learning. Like the other instructional electronic processes that using computer, M-Learning is also taking place by network and the internet. By using these mobile instructional tools it is not necessary that the instruction take place in a definite time or place. So M-Learning is the integral part of the instructional process in future. Having considered the time that people lose daily in traffic such as taxi, bus or metro queues, this technique use the opportunities in order to provide an effective learning by accessing to befavored materials.

Software of M-learning is designed and implemented in the Iran international university is benefited from the newest instructional concepts in the Micro Learning area. This software has the facility to provide users very short term courses with Micro Content.

2.1. The advantages:
There is no need to waste time or attend in class in order to access the update information of the world.
Enjoyment from a flexible method of study which is conformed to the students needs.
The progress rate in study depends on the student.
In this method like the other usual classes there are instructional curriculum, lesson guide and the reference.
The expenses of learning are decreased.
Easy access of public to the knowledge and information
More information sticks in the mind.

Multimedia has the ability to access the instructional resources out of time and place meanwhile instruction take place in travel and control learners by sending electronic posts, messages, emails and the other mobile specifications.

Insistence in instruction field until the fulfillment of learning.
Increase of group cooperation between learners

2.2. Learning objectives through Mobile Learning

Access to instructional materials in classrooms or lecture rooms
The increase of group cooperation between learners
Learning meanwhile service
Learning at the museums and the galleries
Outdoor learning such as in travel
Usage of it in informal or lifetime learning such as learning foreign languages
Growth of literacy rate and increase of cooperation in instructing teenagers
Usage of audio visual tools to increase learning objectives
Classroom management through sending messages
Usage of communicating specifications of mobile
Continuous instruction for the army people

3. Introduction of interactional properties

The ability to make a study menu
The ability to broadcast sound in each slide or all of them
The ability to attach pictures or texts and films in each slide
The system of shortcut button
Special effects while changing pages

3.1. An introduction to some capabilities of this software: Mobile LMS
This software has a client installed on the cell phone (mobile) and makes it possible to do many online instructional activities by GPRS service. This software is integrated with LMS system of organization or university and provides various properties in accordance with user’s roles in LMS system. The other capabilities of this software are such as:

We can use immovable and movable pictures or films instead of text. We can optionally change the size of writings in accordance to the situation. We can use the text reader or recorded voice and music with text. Getting tired of study we can use the entertainment properties of cell phone. There is a system of sending question to the teacher by email and also the system of sending question to the teacher by message. There’s a security system to prevent the entrance of impermissible persons to the instructional system. The backing property is improved in all java mobiles and even touchable cell phones and has the ability to add new applications. There’s a facility to enter the LMS system by usage of a defined username and password. There’s a facility to attend in virtual classes (just about the iPhone & Android phones). There’s a facility to attend in online examination. There’s a facility to observe users’ messages, sending and displaying new message in LMS system. There’s a facility to study the contents of electronic lessons in mobile (especially in high memory mobiles). There’s a facility to note meanwhile study and also send the instructional notes to center. There’s a facility to send questions and ideas to center and receive the reply in the inbox program. There’s a facility to update the contents directly through center. And many other instructional facilities that make it possible to benefit of time for students and teachers.

3.2. March production until use system

![March production until use system](image1.png)

Figure 1. March production until use system of the figure

3.3. Making the contents of mobile

Nowadays all virtual instructional courses are taking place by scorm (Sharable Content Object Reference Model) packages through LMS. Today all over the world modern technologies are used in virtual instruction to expand and improve the instruction area. One of these successful permanent technologies is the instruction technology through mobile or M-Learning. This system in accordance with new generation of mobile operators provides new opportunities and facilities for users such as the entrance of irancell to Iran. Providing connection with internet (GPRS) added to this system facilities.

M-Learning make the instructional environment easy to access for users such as sending question by message and email.

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