Building M-learning Program to Develop Skills and Problem Solving in Math to Laborers University Students

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ABSTRACT **-** In this paper, a mobile learning program is presented. This m-learning program aims to develop some skills such as (sequential natural numbers, sequential squares natural numbers, numerical sequences, and engineering sequences) and there are sup-skills under each skill. It aims also to develop problem solving for each skill.

This proposed m-learning program depends on fife steps: explain, solved example, unsolved example, negative or positive feedback, and several final exams. The program consists of four modules: educational module, interaction module, exams module, and student module.

KEYWORDS: Mobile learning, Mobile program, Math, University students.

1 INTRODICTION

Mobile learning or M-learning is a new concept of learning via mobile technology. In m-learning environment, knowledge can be transmitted via the mobile phones, laptops, tablet, PDAs and etc. M-learning places emphasis on the fact that the teaching and learning process can take place without being constrained by time or location. In other words, teaching and learning can be carried out at anytime and anywhere [1]. The freedom to learn what, where, when and how one likes, availability, adapt learning content to the context the learner finds him- or herself in, and taking place both in the classroom and outdoor across formal and informal settings are the major advantages of Mobile learning (m-learning) [2]. The characteristics and advantages of m-learning as that the information is always available whenever the learners need to use it, the information can be retrieved immediately by the learners, the learners can interact with peers and teachers through different media, the information remains unless the learners purposely remove it, flexible Learning, happen everywhere at every time. Additionally, most students engage as M-learning is based on modern technologies, which students use in everyday life [3]. There are a lot of benefits that help m-learning to spread and take place among the students faster. Students can interaction with instructors and among each other and work together. Mobile devices are lighter than books and enable the student to take notes or input data either typed, handwritten, or using voice. Increase motivation. In addition, the m-learning may assist learners with some disabilities. It is believed that m-learning could be an essential factor in involving young adults in learning, where more traditional methods have failed [4].

On the other side mobile devices are becoming a part of daily culture for almost all young generation. However, only few mobile applications are for learning purposes. Young generation normally used mobile devices as a platform for playing games [5].

This paper presents an m-learning program. This program aims to develop skills and problem solving in math for Laborers University students. The proposed program consists of four modules: educational module, interaction module, exams module, and student module. The student can get explanation to the math content, solved examples and unsolved examples with feedback through the educational module. Teacher can provide advice and answer students' questions, and the students can interact with each other to solve problems through

the interaction module. The exams module cares about the pre-test, final exams, and the post-test. The teacher can get the degrees of the student through the student module.

The paper is organized as follows: section 2 presents the literatures review, section 3 presents the proposed framework, section 4 presents applications and results, and section 5 presents conclusions.

2 Literatures Review

A popular definition of mobile learning is education that involves the use of mobile devices to enable learning anytime and anywhere [6]. Agah (2011) defines mobile learning as running of education through PDAs, pocket PCs and mobile phones. The specialty rendering mobile learning more advantageous than e-learning is the distribution of mobile device usage [7].

In accordance with the developmental history of mobile learning (three aspects can be specified for this type of learning [8] :

- Mobility of technology: focuses on examining the possibility of using portable and wireless devices such as mobile phones, laptops, and tablets for educational purposes.
- Mobility of learning: focuses on the extensive use of mobile devices for learning outside the classroom.
- Mobility of learner: focuses on the mobility of the learner, the design or the appropriation of learning spaces and on informal learning and lifelong learning.

The most important uses of m-learning are [7]:

- It can be used in projects of multi-persons, shortly in projects and studies requiring cooperation.
- It can be used in situations of being in different places of learners.
- It can be used as an alternative class to classes, laboratories, books and offline computers.
- It can be used in education of just in time workers requiring instant communication

There are a number of studies applied for the m-learning and its effect on teaching and learning. Taleb et. al. (2012) studied the students' viewpoints about the educational uses of mobile technology to support their learning process. They found that the most educational use of mobiles by university students are calculator usage, text messaging, and English dictionary. And having a mobile with multiple capabilities, long battery life and good network coverage are the most influential factors in the educational use of mobiles [9].

Hamat et. al. (2012) presented the results of a survey on conducted to assess the readiness of UKM academic staff for mobile learning. The results of the survey show that 65% of the respondents are owners of smart or mobile phones. The respondents also indicated a favorable perception of m-learning although 79% of them have never used it. The majority (85.7%) also believe that mobile learning would be useful for their students, and cited flexibility as the main reason (90.1%) [10].

Holotescu et. al. (2014) have found that the mobile groups and specific mobile learning features have enabled the building of numerous communities for learning and practice. They also ensure the openness to Open Educational Resources and practices. In addition, m-learning is building bridge between formal and informal learning [11].

Diaha et. al. (2010) presented a model for the development of a mobile educational game for primary one mathematics education. The result showed that learning Mathematics on the mobile devices through gaming approach is possible and can become a promising alternative learning approach [5].

Skiada et. al. (2014) attempted to design mobile application for children with special learning needs "EasyLexia". They focused on designing an application which is directed at improving children's fundamental learning skills, such as language and mathematical abilities by using of advanced technology (m-learning). The results show the promising prospects mobile learning holds in such contexts as students showed

progress in their overall game performance over a short period of time usage [12].

Alzaza et. al. (2011) discussed the development and user's evaluation of Student's Mobile Information Prototype (SMIP). The study aimed to utilize mobile learning services to facilitate education for students in the higher education environment. Results of user's evaluation on the SMIP indicate that most of the participants highly agreed on perceived usefulness, perceived ease of use, learn ability, functionality and didactic efficiency. Moreover, the results confirm that SMIP is useful for users to make their transactions easy, direct and successful, regardless of location and time [13].

3 The PROPOSED FRAMEWORK

The proposed system framework is shown in figure 1. It illustrates how the student can interact with the m-learning program and teacher.

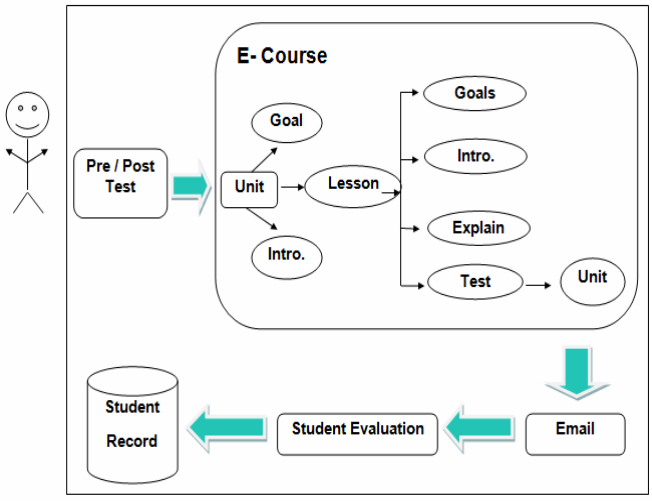

Fig. 1 The proposed system framework of m-learning program.

The system is composed of four modules. Those modules are: educational module, interaction module, exams module, and student module as shown in figure 2.

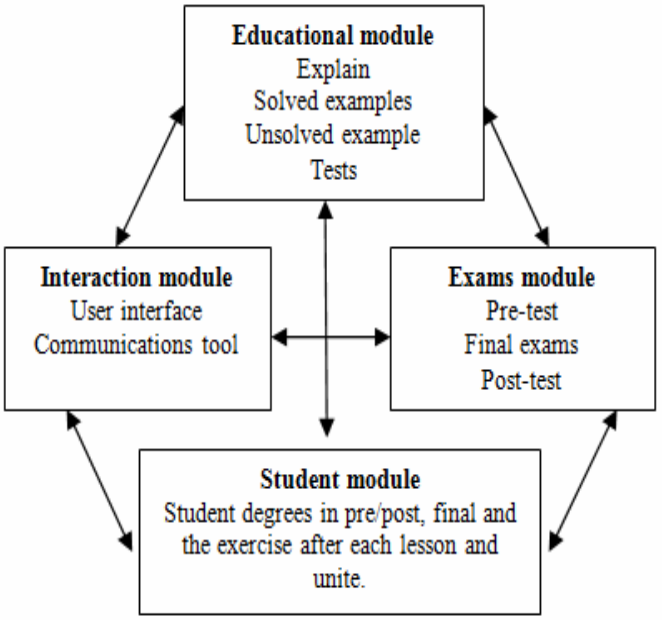

Fig. 2 The m-learning program modules.

3.1 Educational Module

The educational module organizes the learning resources. It presents educational material as shown in figures 3 and 4 (units, lessons, goals, introduction, explain, test). The teaching lessons consist of pages. Every math skill has a page that contains (images and text). After explain the math skill there is solved problem to this skill as an example. Then unsolved problem, the student tries to solve it with negative or positive feedback. He also has navigation tools to move from skill to another or back as shown in figures 5 and 6.

Fig. 3 Screenshot to the unite components.

Fig. 4 Screenshot to the lesson comonents.

Fig. 5 Screenshot to the lesson explain.

Fig. 6 Screenshot to the solved and unsolved lesson exercise.

The educational module uses the student module for tacking decisions about the curriculum sequencing. First of all, it returns to student module to find if the student undergoes the pre-test. Then, it controls the sequence of the presented topics. If the student passes the exam he can move from current topic to next.

3.2 Interaction Module

The interaction module provides the student user interface to can interact with the proposed program. The student can interact with the program throw the main menu as shown in figure 7. It also provides a communication tool (e-mail) to facilitate interaction between the teacher and student as shown in figure 8. It was designed and developed according to the quality standards for the construction of m-Learning environments. Additionally, the applications that already exist in mobile devices.

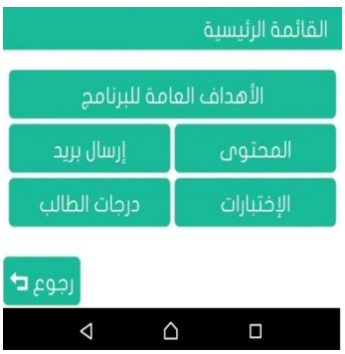

Fig. 7 Screenshot to the main menu.

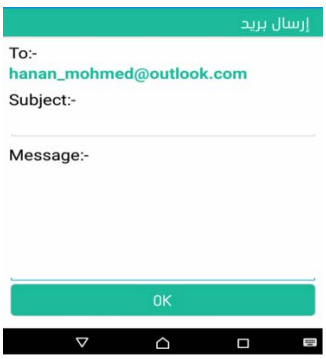

Fig. 8 Screenshot to the communication screen.

3.3 Exams Module

The exams module consists of the achievement tests (pre-test, final tests, and post-test) as shown in figure 9. The student has to undergo the pre-test to access the curriculum. Whenever the student finish the curriculum and pass all the exercise, he can access the final exams. There are several exams, every time the student press the final exam appears a random one. Finally the post-test becomes available to the student.

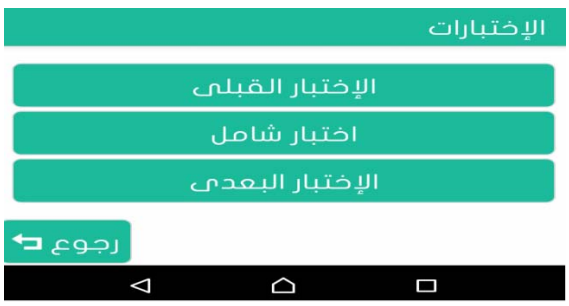

Fig. 9 Screenshot to exams screen.

3.4 Student Module

The student module is a small database. It works on save pre/post-test and all exams and tests degrees. Every student has his/her own student module on his/her application as shown in figure 10.

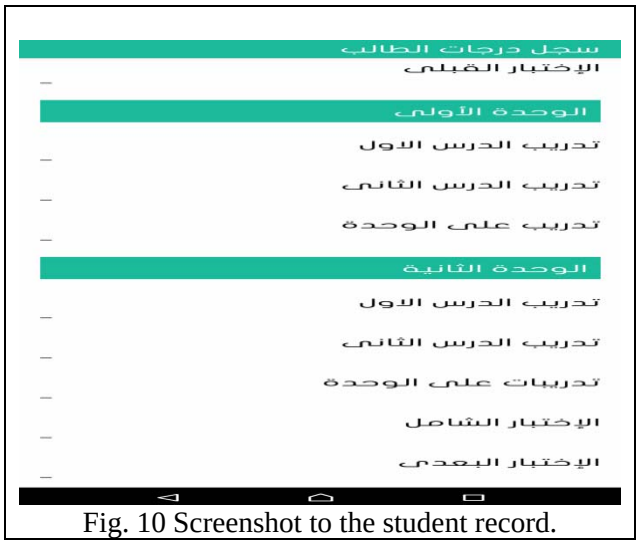

Fig. 10 Screenshot to the student record.

4 APPLICATIONS and RESULTS

The proposed m-learning program is an Android Application. The mobile program is designed and developed by Java – Eclipse.

The m-learning program is applied on a sample of 60 students in grade one Laborers University, Mansoura, Egypt. This sample is divided into two groups 30 to the treatment group (Tr. G.) and 30 to the control group (Co. G.). The treatment group passes the curriculum using the proposed m-learning program. While the control group passes the same curriculum using the traditional education. The curriculum aims to develop some skills in math like; Sequential natural numbers (Seq. natural n.), Sequential squares natural numbers (Seq. squares natural n.), Numerical sequences (Num. sequ.), and Engineering sequences (Eng. sequ.). Under each skill there are some sub-skills. The curriculum aims also to develop the problem solving for each skill. Both of them undergo the same pre-test to make sure that there are no differences between them. Then both of them undergo the same post-test. The differences between the treatment and control groups in pre and post-test degrees for each skill are shown in table 1 and 2. The effectiveness of the proposed m-learning program is measured by using Black's modified gained ratio as shown in table 3.

Table 1 Shows the differences between the treatment and control groups in pre-test degrees.

Skill	Group	Mean	EMB	T Value (0.05)	D. f.	Sign
Seq. natural n.	Co. G	1.17	1.19	0.32	58	Not significant
	Tr. G	1.07	1.06			
Seq squares natural n.	Co. G	1.4	1.33	1.85	58	Not significant
	Tr. G	0.9	1.08			
Nume. Seq.	Co. G	1.3	1.46	0.11	58	Not significant
	Tr. G	1.27	1.39			
Eng. seq.	Co. G	0.83	1.13	0.16	58	Not significant
	Tr. G	1.1	1.45			
Total degree	Co. G	4.7	3.15	0.50	58	Not significant
	Tr. G	4.33	3.21			

Table 2 Shows the differences between the treatment and control groups in post-test degrees.

Skill	Group	Mean	EMB	T Value (0.05)	D .f.	Sign
Seq. natural n.	Co. G	3.63	2.06	-0.86	58	significant
	Tr. G.	6.77	0.05			
Seq. squares natural n.	Co. G	3.47	1.91	-8.73	58	Significant
	Tr. G.	6.7	0.59			
Num. sequ.	Co. G	3.33	2.44	-9.34	58	Significant
	Tr. G.	7.73	0.51			
Eng. sequ.	Co. G	4.00	2.44	-8.03	58	Significant
	Tr. G.	7.7	0.59			
Total degree	Co. G	14.43	5.05	-14.98	58	Significant
	Tr. G.	28.9	1.27			

From the previous 2 tables, one can conclude that there are no statistically significant differences between the treatment and control group in the pre-test. There are statistically significant differences between the treatment and control group in the post-test in favor of the treatment group. The differences return to the effectiveness of the proposed m-learning program which improves students' skills and problem solving in math.

Table 3 Shows Black's Modified Gained Ratio

The average score for the Treatment group		Total score	Ratio Gain Score	Significance level
In post-test	In pre-test			
28.9	4.33	30	1.78	Accept

As shown in table 3, Black's Modified Gained Ratio was calculated at 1.78 which is greater than the reference value (1.2). That shows a high proportion of students who have benefited from the proposed program.

So, these results are showing the effectiveness of the proposed m-learning program to develop the skills and problem solving in math.

5 CONCLUSIONS

The characteristics and advantages of mobile devices technology like the increasing processing power, the development of touch screen, smaller size, light weight, net services, memory space, cheap prices, the communications applications. Additionally, the operating system that is opened for any developer to develop application for mobile devices like Android. All this and more are available in mobile devices world that help m-learning to spread.

In this paper, this technology is exploited to design and develop an m-learning Android program. This program is directed to improve skills and problem solving in math to Laborers University students. The program bases on fife steps: explain, solved examples, unsolved examples, negative or positive feedback, and several final exams. Additionally, it provides an easy communication with teacher anytime. This program consists of four modules: educational module, interaction module, exams module, and student module.

The analysis of results shows, that there are significant effect for m-learning program to develop skills and problem solving in math between the treatment and control group in favor of the treatment group.

The reasons of these results due to the characteristics and advantages of m-learning like; learning anytime and anywhere, provides the curriculum written, audio and video from a distance, overcomes the individual differences problem, easy of communication with peers and teachers, gives immediate feedback on their learning experience… etc.

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