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The effect of m-learning on mathematics learning

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Abstract

Mobile technology opens the door for next generation and let the learning occurs in anytime, anywhere and to be influence in a variety of learning contexts. The study was conducted in 329 teachers from 2352 secondary school teachers of Mathematics from 19 districts of Tehran using descriptive-field method during 2012-2013 academic years. A researcher-made Likhert-type questionnaire was developed to identify the teachers' viewpoint of the effect of M-learning in different aspects of Mathematics learning. Twenty six questions measured the effect of different functional capabilities of mobile technology on increased motivation of learning Mathematics. Thirty seven questions measured the effect of different aspects of mobile learning on diversity of training methods of learning Mathematics. Thirty one questions measured the effect of different functional capabilities of mobile learning on students' participation in learning Mathematics. The reliability of the questionnaire using Chronbach's Alpha was 92%. One sample T test was used to examine significance of difference among the variables supporting the effect of M-leaning on different aspects of Mathematics learning. ANOVA was used to examine the effect of teachers' educational level and teaching experience on the effect of M-leaning on Mathematics learning. The results revealed that in teachers' viewpoint, mobile learning has a positive effect on motivating the students towards Mathematics. Also there is a positive and significant relation between using mobile learning and students' participation in Mathematics. Moreover, the relation between mobile learning and diversity of training methods of teachers is positive and significant. The findings of this survey show that teachers of Mathematics are interested in using the mobile technology in Mathematics learning. In their view this technology could increase students' motivation and participation in Mathematics learning and provide the opportunity of diversity of training methods of Mathematics.

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Introduction

The generation of students born with digital technology bring with them a significantly different approach to learning (Barbaux, 2006). They are used to having access to multiple and instantaneous sources of information, multitasking and being socially connected to peers through mobile devices. The combination of mobile technologies and the new generation's 'digitally-enhanced' cognitive and social skills will need new solutions in the current concept of Learning (Uzunboylu, Bicen, and Cavus, 2011).

One potential solution is mobile learning. M learning is the exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance and extend the reach of teaching and learning (VaniKalloo,and Permanand,2012). It offers enormous potential as a tool to be used in situations where learners are geographically dispersed, to promote collaborative learning, to engage learners with content, as an alternative to books or computers, as an alternative to attending campus lectures and for 'just-in-time' delivery of information. With mobile technology, we can "push" and "pull" information and deliver learning to any one at any time and at any place. It provides learning on-the-go or just-in-time learning (Zoraini Wati & Norziati; 2009)

Mobile devices are cheaper than a personal computer and are used by many because the devices are more affordable and in the case of mobile phones, is almost a necessity to have. Hence, e-inclusion is made more possible through use of mobile phones for information downloads or for learning purposes. Recent developments in the mobile and wireless technologies have facilitated this new mode of learning, M-learning (Taleb & sohrabi, 2012). Educational applications for mobile devices motivate the students and engage their attention while focusing on solving problems, improving their memory, their reading and writing skills. In addition to the traditional classroom contexts, the use of advanced technology in the learning process and its assessment through the m-learning tests enables the learner to develop the time of use according to his/her needs, by personalizing their experience (Saleh and Alias ,2012). M-learning seems to be favoured by students, as it can potentially accommodate a wide range of features and sections which offer a highly interactive learning experience. It provides a stress free environment that is enhanced by specially designed user friendly interface. The design and text layout can eliminate the frustration and confusion, while making the information a much easier source to take in speciously in some subjects such as Mathematics (Skiada, Soroniati, Gardeli & Zissis, 2013).

Mathematics is not only for science but also a very important tool for people that we use to solve the problems in our daily lives (Ozdamli, Dervis Karabey, Besime, Nizamoglu, 2012). In Mathematics lesson student is needed to change the abstract concept into concrete concept and to understand while doing it. The role of the technology supported education here is to help student not only being able to concretize complicated abstract concepts but also to facilitate once again the configuration in student's mind through some known theorem graphics and multidimensional studies(Persico & Pozzi ,2011).Today, most of the scientific researchers have pointed out that m learning tools whether being in a programming way or teaching the topics in various effects (such as writing, voice, graphic) have been facilitating not only the comprehension of mathematical concepts but also increasing the motivation of student and the trust of himself/herself (Yenilmez, 2009).

Based on reviews of m-learning (Goh & Kinshuk, 2006), it can be concluded that m-learning can significantly complement e-learning by creating an additional channel of access for users of mobile devices such as headphones, PDAs, MP3 and MP4 players, laptop and tablet.

Tablet PCs have the potential to change the dynamics of classroom interaction through wireless communication coupled with pen-based computing technology that is suited for analysing and solving engineering problems. Amelito G. E (2009) found that results of student surveys show overwhelmingly positive student perception of the effects of using tablet on their learning experience. .Mobile learning in past years has proven to be successful in many different contexts and with various target groups. In the research of Duru, Peker, Akçakın (2010), it is aimed to define the attitudes of students towards Mathematics, computer, and using computer in Mathematics lesson and to examine these according to some variables. As a conclusion, that research has pointed out that participants' attitudes towards computer supported Mathematics teaching are more positive (Duru, Peker, Akçakın, 2010). Laptops have been shown to improve student achievement. Kay & Lauricella (2011) found that for two-thirds of the students, the laptop computer made a significant difference in study habits. Students reported that laptops helped

with classroom assignments, email, communication and research. Nuraihan & et al. (2014)research on the trust- build factors that are able to influence users for M-Learning Technology are: to trust the m-learning were familiarity, information quality, interaction, feasibility, goal setting, third party recognition, attractive reward, and rules while factors such as consistency, reliability, experience sharing, integrity, security control, community building, open communication, site quality, feedback, time, and external auditing contributed to sustain the trust. Shin & Mills (2011) investigate the effect of game technology on elementary students learning Mathematics. In this study, students who played technology-based arithmetic games outperformed students who played paper-based arithmetic games .Zameni & Kardan (2011*)* performed a study entitled "the effect of using information and communications technology on learning Mathematics" and concluded that utilization of the information and communications technology is effective on changing the attitude and stability of subject matters, reasoning and creativity and finally active learning of Mathematics. VaniKalloo & Permanand (2012) conducted a survey in this regard and They used game-based learning, personalization, and multiple learning strategies in conjunction with mobile learning to help students improve their performance in Mathematics. Conway-Smith (2011) reported on a study using mobile learning in South Africa where the results revealed an overall increase in Mathematics scores by 3.36% in 18 weeks. Cook, Bradley, Lance, Smith & Haynes (2007) reported on a mobile learning study where 73% of the students thought it was important to learn anytime and anywhere. Chu and Liu (2007) conducted evaluations that revealed that students thought it was useful to use mobile devices for learning English. McLuckie (2010) showed that using mobile devices increases motivation and retention of subject matters. Some advances have also been observed in the results of students' final exams. This project which targeted ninth grade students who were at risk helped them focus on enhancement of their mathematical skills through smart phones.

As a result of this experimental research it can be suggested that the students' attitudes towards Mathematics and technology have been facilitated and improved in an effective way after involving in the activities through technology supported collaborative learning. Therefore technology supported collaborative learning settings can be used to aide in teaching Mathematics and technology Ozdamli, Karabey, Nizamoglu (2012).

Despite this, no study exists for effect of mobile learning specially in mobile phone, laptop, and tablet components between Iranian students. For this purpose, it would be needed to determine the effect of mobile education on Mathematics learning. So, we did this study to answer the following hypotheses:

- Hypothesis 1: Mobile learning has a positive effect on increased motivation of learning Mathematics.
- Hypothesis 2: Mobile learning has a positive effect on diversity of training methods of Mathematics.
- Hypothesis 3: Mobile learning has a positive effect on students' participation in learning Mathematics.

Methodology

The present survey was conducted using descriptive-field method during 2012-2013 academic years. Among 2352 secondary school teachers of Mathematics from 19 districts of Tehran-Iran, 329 teachers were selected using Morgan and Krejcie Table. All schools in Tehran province were classified into north, south, east and west areas through cluster random sampling and the number of teachers in each group was determined using stratified sampling method. A researcher-made Likhert-type questionnaire was developed to identify the teachers' viewpoint of the effect of M-learning in different aspects of Mathematics learning. Twenty six questions measured the effect of different functional capabilities of mobile technology on increased motivation of learning Mathematics. Thirty seven questions measured the effect of different aspects of mobile learning on diversity of training methods of learning Mathematics. Thirty one questions measured the effect of different functional capabilities of mobile learning on students' participation in learning Mathematics. The reliability of the questionnaire using Chronbach's Alpha was 92%. For statistical analysis, each item of the questionnaire was scored from 1 to 5 (1.Very Little; 2. little; 3.Medium; 4.Much; 5.Very much). The mean for each item was calculated by sum of each score multiplied to percentage of respondents to that score. We used One sample T test to examine significance of

difference among the variables supporting the effect of mobile learning on different aspects of Mathematics learning. ANOVA was used to examine the effect of teachers' educational level and teaching experience on the effect of M-leaning on Mathematics learning.

Results

Table 1 shows individual characteristics of the participants. Most of the teachers had B.A with at least 10 years teaching experience. Table 2 shows the mean and standard deviation for different aspects of Mathematics learning.

Table1. Characteristics of the respondents

Gender	Male (45.9%)	Female (54.1%)	
Teaching experience	1-10 years (12%)	10-20 years (59.7%)	20-30 years (28.3%)
Educational level	Associates (7%)	B.A (75.7%)	M.A and higher (17.3%)

Table 2. Descriptive statistics of research variables

Variables under study	The relevant question number	Mean	Standard deviation
Students' motivation	1-26	3.7	
Diversity of teaching methods	27-62	3.9	0.6
Students' participation	63-93	3.9	0.6

In order to test the effect of mobile learning in any of the above aspects we hypothesize that the mean of the responders' scores is more than 3 at significance level 95%. Table 3 shows the effect of mobile learning on increased motivation of learning Mathematics.

Table 3. One-sample t-test for hypothesis 1

Hypothesis	Mean	T	Degree of freedom	P
Hypothesis 1	3.7	21.5	328	0.000

As shown in Table 3, different capabilities of mobile technology (mobile phone, laptop, and tablet) has a positive effect on increased motivation of learning Mathematics from teachers' viewpoint. Table 4 shows the effect of different aspects of mobile learning on diversity of training methods of learning Mathematics.

Table 4. One-sample t-test for hypothesis 2

Hypothesis	Mean	T	Degree of freedom	P
Hypothesis 2	3.8	25.2	328	0.000

As shown in Table 4, different aspects of mobile learning has a positive effect on diversity of training methods of learning Mathematics from teachers' viewpoint. Table 5 shows the effect of different functional capabilities of mobile learning on students' participation in learning Mathematics.

Table 5. One-sample t-test for hypothesis 3

Hypothesis	Mean	T	Degree of freedom	P
Hypothesis 3	3.8	25.2	328	0.000

As shown in Table 5, functional capabilities of mobile learning has a positive effect on diversity of training methods of students' participation in learning Mathematics from teachers' viewpoint. Tables 6 and seven show the result of ANOVA for teachers' educational level and teaching experience. The results showed that the effect of M- learning on Mathematics learning is independent of teachers' educational level and teaching experience exept in the effect of teaching experience on students' motivation for mathematics.

Table 6. ANOVA results for teachers' educational level

Variable	F	p
Students motivation	12.08	0.09
Diversity of training methods	6.78	0.12
Students' participation	2.53	0.08

Table 7. ANOVA results for teaching experience

Variable	F	p
Students motivation	4.27	<0.01
Diversity of training methods	4.37	0.09
Students' participation	1.42	0.24

4. Discussion and conclusion

We have stepped into the age where we can learn anywhere and anytime. The utmost need is to know how to utilize these ubiquitous devices in our learning environment. A variety of devices are used and m-learning with its capability is solutions that offered in all subjects. This paper discussed about The Effect of m learning on Mathematics learning.

The result of this paper shows that utilization of mobile devices increases motivation. It means that there is a direct and significant relationship between utilization of mobile devices and students' motivation towards Mathematics. Generally, results of the current survey are consistent with results of accomplished studies. The result of researches done by shin & Mills (2011) Duru, Peker, Akcakın (2010), shine(2007) shows the relationship between mobile education and learning. Results of the current survey and the similar studies can be examined in terms of the fact that whatever students have a stronger motivation for learning, teaching lessons such as Mathematics will become more enjoyable for them. As a result, their learning is improved; they will have a better performance in Mathematics and school drop-out will be reduced. Because mobile learning

3+devices such as mobile phones, Tablet and laptop are now a days accessible for all people, students in the remote and deprived areas can enjoy the capabilities of this device in education by help of their teachers (VaniKalloo, 2012).

Moreover, the findings show there is a significant relationship between utilization of mobile learning devices such as mobile phone, laptop, and tablet with teaching methods. Finding of this hypotheses is similar with the Result of Redondo, Fonseca, Sanchez & Navarro (2013), Shin et al (2011) and Ozdamli (2012) researches , they indicate Students have been satisfied and motivated when teacher use this devises in learning. M-learning can help them to improve student's academic performance. It is not enough to

simply equip each student with a laptop, Mobil or tablet and expect a miraculous fix to the problems in classrooms. Teachers need to be educated on the benefits of incorporating this technology into their classrooms and then trained on how to integrate the computers effectively. Students need to challenge their mental models of what a classroom should look like and have an open mind about what it could look like if each student had direct access to m learning tools (Righi, 2012). Teachers by using m-learning in class are able to make the inappropriate and inflexible content of textbooks more attractive for students. Also the teacher's role as the sole speaker is changed into a director where the former is resulted in authoritative teaching and presenting inappropriate education methods by emphasizing the memory and speed which is boring for students.

The last result of this study show Mobile learning has effective on students 'participation in learning Mathematics. A research done by Righi (2012) also shows increase in students' participation by using laptop and their collaboration with each other. Noreen et.al (2014) had a similar research that explores the relationships between student participation in Mathematics classroom by use of technology. The results show that the level of student engagement with each other's ideas and the incidence of students providing detailed explanations of their problem-solving strategies were positively related to student achievement. In conclusion, the findings of our survey show that teachers of Mathematics are interested in using the mobile technology in Mathematics learning. In their view this technology could increase students' motivation and participation in Mathematics learning and provide the opportunity of diversity of training methods of Mathematics.

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