# M-learning: M-learning Applications, Students Input for M-learning In Science Instruction

Özkan Yılmaz (Corresponding author)

Department of Science Education, Education Faculty, Erzincan University

24000-Erzincan, Turkey

E-mail: ozkanyilmaz@erzincan.edu.tr


Vehbi Aytekin Sanalan

Department of Computer Education and Instructional Technology

Education Faculty, Erzincan University

E-mail: sanalan@erzincan.edu.tr

**Abstract**

This study is an attempt to explore availability and functionality of mobile devices among students of using mobile devices in science instructional settings based on student input. By reviewing the relevant literature about m-learning implementations and discussions, several ambiguous or incompletely studied factors are identified. A related survey is developed to gather data about the student needs and views considering the recommendations and findings from the literature. Survey was then administered to preservice science teachers. Findings are analyzed and descriptive statistics and m-learning applications are evaluated on practicality. Some recommendations are put forward based on the conclusions drawn by the results.

**Keywords:** M-learning, Learning needs, Student views

## 1. Introduction

Today, mobile phones are very useful devices in our life. We use mobile phones for listening music (also for downloading music), watching TV, gaming, surfing internet, and for doing countless other activities. Current cell phones are also used as a personally customizable device for organizing the daily life. And it allows socialization by using web technologies like twitter, facebook and instant message (IM). Internet costs are dropping significantly; usage is growing very fast and phones are becoming available for a larger bulk of users day by day. This is so for mobile devices using internet and electronic social networks. Growing interest on mobile technologies entails its implementation in other areas such as pedagogical applications. There is still a rapidly increasing focus on the research of using mobile technologies in education.

Various studies are carried out till the turn of the millennia. Sharples, (2000) emphasized that individualized and learner-centered practice of teaching is increasing with new digital technologies. At this point, personal mobile technologies have a great potential. Today, m-learning is becoming a novel research base in the field of education. M-learning is defined as using mobile devices in a learning activity for delivering personalized education.

Personalized learning is one of the favored perspectives in education in last decades. Many educational technology applications provide students and educators personalized environment for learner to some degree. At this point, mobile devices are the best technology to design learning environments that have the potential to reflect individual needs and expectations. So, a new concept, m-learning is introduced to education field.

Many researchers have the similar sight that m-learning very well may be the learning technology in education in near

future (Liang et al., 2005; Clough, Jones, McAndrew, & Scanlon, 2008; Sharples, 2000; Sung et al., 2005; Roschelle, Penuel, Yarnal, Shechtman & Tatar, 2005). Many studies in this area report that mobile technology is becoming widespread and its use in education is improving. Today, almost all students have at least one type of mobile device such as mobile phone, PDA (Personal Digital Assistant) or Smartphone. Students already use this device to access information about their interest from many sources (Corlett, Sharpless, Bull & Chan, 2005).

Mobile devices are implemented in different learning environments and generally considered to support learning in literacy, language teaching, math, management, computer science, etc. Using such devices are reported to strengthen the effectiveness of certain instructional activities, for example, sharing course documents, applying formative and summative assessment, giving and collecting homework, tutoring, researching and writing (Corlett et al., 2005; Massey, Ramesh, & Khatri, 2006; Stockwell, 2007; Thornton & Houser, 2005; Sharples, Taylor & Vavoula, 2005; Roschelle, Sharples & Chan, 2005). While the body of literature shows that m-learning applications have a strong support for learning and assessment, the success was not as expected due to the factors described below.

For instance, in their study, Huang et al. (2008) compare student preference of computer vs. mobile technology to carry out a variety of instructional activities. Vast majority prefers computers to finish the learning task and rates desktop higher in usefulness and manipulation of user interface. Some instructional activities required reading and answering questions while some others involved brief writing or reading activities. The authors found, on the other hand, seventy percent of the students report an increase in their motivation to learn when mobile devices are used properly. This shows that the mobile learning devices increase motivation and in turn, increase attendance, although it is not as convenient for the complex tasks requiring more navigation and manipulation. In another article, it is reported that SMS (short message service) applications are useful for teaching various concepts, but students said that the technology seemed complex. A thorough cost/benefit analysis would be required to judge the true effectiveness of this approach (Sakkopoulos, Lytras & Tsakalidis, 2006).

Stockwell, (2008) concludes that students who are using mobile technology for learning have low level using frequency but they have high interest and expectation. Praul & Lynch, (2008) conducted a study on 112 university student and find out that reading on mobile phones more fruitful than reading on paper for student while preparing for exam but researcher said that the result is not widespread. Nevertheless, all of these researchers have same idea that mobile phones have potential for supporting learning environment and improving instruction.

College students eagerly use their mobile phones. They carry the phones almost all day wherever they go, share their photos, music and ideas. Actually, they somewhat accomplish informal learning with established wireless network using mobile phones. In educational environments, as the research shows, students may prefer not to use them for various reasons. In a general sense, the main drawback reasons can be added up to two categories:

### 1.1 Technological Barriers

Small screen: Students complain that screen size is not useable to carry out relatively complicated instructional tasks. Amount of reviewed literature state persistently that it is quite difficult and slow to browse the pages on smaller screen (Stockwell, 2007, 2008; Thornton & Houser, 2005).

Cost: When the user gets reflective with e-mail or text message (SMS), this brings a financial burden to users. One of the main reasons why students are unwilling to use the mobile devices for learning is that the connection and/or transfer fees can be really high (Stockwell, 2008).

Keypad and navigation difficulties: Students expressed negative comments about using the keypad. A literature review shows that navigation on screens can be particularly difficult on mobile devices (Schwabe & Göth, 2005). If given choice, students prefer to use computers rather than mobile devices especially when the content is offered over the web.

### 1.2 Pedagogical Cause

M-learning applications have a high potential in education but this potential is not to be used as a content transfer means. It should be based on interactive learning strategies (Sung, Gips, Eagle et al., 2005). Research shows that m-learning should reflect user culture and learning characteristics as well as it requires a well designed pedagogy (Thornton & Houser, 2005; Clough, Jones, McAndrew & Scanlon, 2007).

Failing to involve user preferences in m-learning applications seem to be one of the most important reasons why these research efforts did not produce positive results with enough success. We believe that the key here is using the technology as the tool, not as aim (Cortez et al., 2005). That is also applicable for using mobile devices in learning environments. Therefore pedagogy has to be developed to support learning with the help of mobile technologies in a learning environment where traditional practices would not aid otherwise (Motiwalla, 2007; Huang, et al., 2008). As in

all improvements in educational technology, learners' inclinations are the basic trendsetter for the innovation to be successful.

Mobile devices have various specifications; small dimension, no waiting communication, flexibility on learning environment and increasingly cheaper technology. Therefore developing higher than other devices (Suki & Suki 2007). Mobile phones among all mobile devices are considered convenient due to its ease of use (Shen, Wang, & Pan, 2008). With increasingly innovative technology, mobile phones' features are becoming more like the PDAs (Personel Digital Assisstant). According to the OECD report, (2007) mobile phones are no longer mere communication devices. Today's mobile phones have multimedia content and higher data transfer quality and rate. At the same report, mobile phones with even higher data transfer rate will be used by majority of the people by 2020.

It can be concluded that learners should have a strategy to follow consistent with their needs, and the technology to support this strategy should be mobile phones. There are various criteria for the implementation of m-learning applications; users' mobile phones specifications, needs of usage in learning, personal preferences, opinions about the use in education. In this study, it is aimed to uncover the ideas of preservice science teachers about using mobile phones as a learning tool, whether these ideas change with characteristics of the technology or, what kind of needs and expectancies they have to employ m-learning applications.

## 2. Methodology

In this study, students who enrolled science teacher education program at a small town university in northeastern part of Turkey are surveyed to determine student views about using communication devices for learning and about implementation of mobile devices to reach a learning goal. Students are asked to provide information on type and number of cell phones they own, purpose of use, and needs and preferences for m-learning implementations. The survey is designed and administered to 244 preservice science teachers and findings are analyzed using descriptive statistical techniques.

### 2.1 Sample

Sample is selected from a total of 277 students in science teacher education program at a small town university in northeastern part of Turkey. Our sample consists of 244 students. Gender distribution is 136 females (%56) and 108 males (%44). They are generally coming from low to middle income range families.

### 2.2 Instruments

A survey is created to gather data about students' general use of cell phones as well as their opinions about implementation in educational applications. The survey consists of three parts. First part with seven multiple choice questions is to collect information about the type and number of mobile devices they currently own, their family income, and the current specification of their mobile devices. This part provides a sense on general profile and capabilities of the devices that may be used for m-learning purposes.

Second part contains four questions about their preferences and major purposes of using cell phones, frequency and type of use they are willing, and suggestions for applications in learning environment. The information collected from this part is used to provide insights of students' views and preferences of mobile device implementation in educational settings as a learning tool. Third part contain one open ended question to get their conceptions, ideas and new suggestions about cell phone using for educational purpose.

### 2.3 Data Collection

Completing the survey takes about 20 minutes for one group and four group of college students are sampled. Data collection is carried out within a week and in seven separate sessions. Freshmen, junior and sophomores are two groups each. Seniors are one group and take one session to collect data.

### 2.4 Data Analysis

Counts and figures are analyzed using descriptive techniques. Each question is separated into categories and frequencies and percentages are given accordingly. Content analysis is used to analyze open ended question.

## 3. Results

In this part, data found by surveys about the hardware required for mobile devices to be used in learning activities and views of students about this issue are discussed. The statistical results are given in Table 1.

Statistical results about commonly used mobile devices are given below. As shown in Table 1 97% of students have mobile phones. And the ratio of students who have at most one mobile phone is 72.5%. On the other hand, 25.8 % of students have two or more mobile phones.

<Table 1 about here>

Findings about students' total family incomes are given below. As shown in Table 2, families' revenues are under the middle by 50.8%.   Next year, there will probably be a decrease in the costs of mobile phones and increase in family income.    So people will be able to buy more functional mobile phones.

<Table 2 about here>

Findings about connection protocol types are shown on Table 4 which shows mobile phones having support of Bluetooth are 69.3 % and W-Lan are 34%.    The analysis shows that there is a significant relationship between number of devices owned and the family income level, as expected ($\chi$=12.424; p<0.05).

<Table 3 about here>

Findings about OS (Operation Software) of mobile phones are given below. As shown on Table 4, the percentage of students who have no idea about OS of mobile phone is 69.3%. Also it is shown that mobile phones having the ability of software specification are rated by 38.9%.

<Table 4 about here>

Communication way findings are given below. As shown on Table 5, students choose text messages for communication by 77.5%. Students' having mobile internet packet that is given by any GSM company statistical findings is shown on Table 5 that %84.8 of students has no mobile internet connection. GSM companies will let down the mobile internet packet prices with new wideband protocols; 3G, 4G, Wi-Max etc (OECD, 2000).

<Table 5 about here>

Students' views of usage of mobile phones for learning activity are given below. As shown in Table 6, students who are interested in using mobile phones in education are 61%. Students prefer using this method more often (%71.3). It can be seen that there is a huge interest. They desire learning activity in practical lessons to be more.

<Table 6 about here>

Findings about students' views about using mobile phone in learning activities are given Table 7 below. First, students want to use mobile phone as a multimedia content device is evident from following comments:

"We can record experiment in    natural science application laboratory. Then, watch it at home."

"We can use as a voice recorder to record lecture. Then, listen and listen again any time anywhere."

"In science lectures, we can use as a calculator."

"When we have a journey for educational activity in science lectures, we can record video or take a photo."

"When we herborize in microscope, I want to take a photo with my selfphone."

Second, students want to use mobile phone to access knowledge when they need a help in lecture is evident from following comments:

"Mobile phones have some conveniences. For instance, we can access to web with mobile phone to get any information".

"We can access to web from mobile phones' browser to get information about the lecture. You can say that you can use computer to do this. But, you can not find computer at all time whereas you carry your mobile phones with your own."

"I want to use learn I do not know the meanings of words or terms with my mobile phone in lecture."

Third, students want to use mobile phone to communicate teacher or friends is evident from following comments:

"We can get lectures notes from teacher and we can ask our questions with our mobile phones"

"Teacher can send to us questions about our lecture with using mobile phones."

<Table 7 about here>

## 4. Discussions

In the studies about usage of mobile devices on learning activity, it is thought that students` expectations and needs are not considered. Therefore basically two important factors are researched. Comments are made by existing hardware and data about students` expectations from m-learning application.

Adequate number of mobile devices should be provided in learning environment. Research shows that students have

mobile phones by %97.5, only one mobile phone by %72.5, two mobile phones by %23.8. It is shown that technology usage is highly rated. On this account, it is an advantage for education applications.

Surely the high number of mobile phones does not show that they can be used for learning activities. Meanwhile devices must have some features in them. Devices must have an appropriate OS, at least one connection protocol type and the program installation feature. Very few rates of mobile phones have appropriate OS (22.9%). However, connection support rate is mid-leveled as 69.3% Bluetooth and 34% Wi-Fi. One other important fact, program installation feature is close to mid-level by %38.9. Most revenues of families are mid-leveled and under by 78.3%. So it is considered that students have mid-level featured mobile devices.

Number of students preferring to use text message in communication shows that students have common practice on keypad. In class communication, students use mobile phones as a tool. Therefore they have to input with keypad what they want to write.    In this way, keypads are used as a pen in m-learning applications.

Users have no internet connection with mobile phones by %84.8. GSM operators` high service price can be the cause to that situation. Communication costs will be decreased in near future so that mobile internet packet using will be increased with incoming technology (OECD, 2000). So prices will no longer have a limiting effect on m-learning applications because of widespread use of wireless communication devices.

Students' thoughts regarding to the use of mobile devices in learning activity are positive (%61) and they want these activities to be often in the direction of achieving by %71.3. They also want that learning activity in application oriented courses (Chemistry Lab, Biology Lab, Laboratory Applications in Science Teaching) by %56.

On the studies about usage of mobile devices on learning activity, it is thought that students` expectations and needs are taken into consideration. By this research, information is got about what students are thinking, data on existing equipment; and all of these reports will be the base for feasibility of mobile learning applications.

The equipment required for usage of mobile devices on learning activities is directed towards mobile phone. Equipment should be selected as mobile phone for the learning activities. These mobile phones must have support of at least one wireless connection type for freedom of movement to provide a learning activity. On devices, students have these features included in mobile phones but not at enough level to be used in learning activity. Students have positive thoughts about m-learning applications. While designing and using the m-learning application in Natural Science Department, Laboratory Application must be in primary consideration.

M-learning will support the students' learning when it is used in accordance with eligible technologies and pedagogies. For this reason, student input, like in other educational researches, has a significant importance to create a favorable educational environment. Just within last decade, educational technologies have greatly progressed in terms of functionality and mobility for considerably lower prices.    Considering fast developing technology, it can be concluded that the insufficient hardware will not cause any problems since better and faster technology is being made available everyday. This research effort needs more support with new detailed work on pedagogy, hardware and software.

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Table 1. Portable devices used regularly

| Measure | Number (N) | Percent (%) |
|---|---|---|
| **Type of Device** | | |
| Mobile Phones | 238 | 97.5 |
| Notebook | 65 | 26,6 |
| PDA | 7 | 2,9 |
| Other | 12 | 4,9 |
| **Number of Device** | | |
| One | 177 | 72.5 |
| Two | 58 | 23,8 |
| Three or more | 5 | 2 |

Table 2. Family income

| Revenue | Number (N) | Percent (%) |
|---|---|---|
| 0-457TL | 45 | 18.4 |
| 458-915TL | 79 | 32.4 |
| 916-1373TL | 67 | 27.5 |
| 1374-1831TL | 26 | 10.7 |
| 1832TL and over | 18 | 7.4 |
| Numbers vary due to missing answers | | |

Table 3. Type of wireless connection protocol of mobile phones

| | Number (N) | Percent (%) |
|---|---|---|
| **Bluetooth** | | |
| Yes | 169 | 69.3 |
| No | 62 | 25.4 |
| No Idea | 3 | 1.2 |
| Total | 234 | 95.9 |
| **Wi-Fi** | | |
| Yes | 83 | 34 |
| No | 99 | 40.6 |
| No Idea | 24 | 9.8 |
| **Total** | 206 | 84.4 |

Table 4. Software specifications

|  | Number (N) | Percent (%) |
|---|---|---|
| **Mobile Phone OS** | | |
| Symbian | 21 | 8.6 |
| MWM(Microsoft Windows Mobile) | 23 | 9.4 |
| PALMOS | 3 | 1.2 |
| Linux | 7 | 2.9 |
| Other | 2 | 0.8 |
| No idea | 169 | 69.3 |
| **Software Installation Feature** | | |
| Yes | 95 | 38.9 |
| No | 90 | 36.9 |
| No idea | 39 | 16 |
| Total | 224 | 91.8 |

Table 5. Communication way of users

|  | Number (N) | Percent (%) |
|---|---|---|
| **Communication way with mobile phones** | | |
| Text Message | 189 | 77.5 |
| On Internet Based | 48 | 19.7 |
| Call Up | 186 | 76.2 |
| **Mobile Internet Packet** | | |
| No | 207 | 84.8 |
| 1-5Mb | 13 | 5.3 |
| 6-10Mb | 6 | 2.5 |
| 11-15Mb | 2 | 0.8 |
| 6Mb. And over | 9 | 3.7 |
| **Total** | 237 | 97.1 |

Table 6. Students views about using mobile phone in Education

|  | Number (N) | Percent (%) |
|---|---|---|
| **Needs** | | |
| Very necessary | 85 | 34.8 |
| Necessary but has difficulties | 64 | 26.2 |
| Not sure | 33 | 13.5 |
| Makes life easier but unnecessary | 50 | 20.5 |
| Totally unnecessary | 10 | 4.1 |
| Time | 169 | 69.3 |
| Every course | 95 | 38.9 |
| Once in a week | 79 | 32.4 |
| Once in a month | 8 | 3.3 |
| Rarely | 61 | 25 |
| **Learning Environment** | | |
| Theoretical courses | 92 | 37.7 |
| Applied courses | 138 | 56.6 |
| Field trips | 116 | 47.5 |
| Other | 3 | 1.2 |

Table 7. Students' views about using mobile phone in learning activities

|  | Number (N) | Percent (%) |
|---|---|---|
| **Usage Dimensions** | | |
| Multimedia content device | 43 | 28,9 |
| Access to knowledge | 17 | 11,4 |
| Social communication | 11 | 7,4 |
| None categorized | 78 | 52,3 |
| **Total** | 149 | 100 |