New trends on mobile learning area: The review of published articles on mobile learning in science direct database

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Abstract

Articles published in Science Direct between 2009 and 2014 (May) were screened in this research. This is because of its respectable position in the field of technology and peer-reviewed secured structure of this database. From a total of 161 articles within the scope of the screening 156 articles were included in the study. Through this research, new trends in mobile learning activities in recent years will be determined and a new way will be shown for researchers . "Mobile learning" keywords used during researching process and all the articles with "mobile learning" keywords were included in this study. As a result of this research, it is determined that the most studies in the field of mobile learning were published in 2013 in Malaysia, UK and Taiwan. Particularly undergraduate students was selected as the sample group of the researches. It is emerged that, experimental research was used maximum as a research model. Quantitative data collection tools were used most as a means of data collection. It was emerged that foreign language education is the most widely used field in mobile learning. It is seen that smart phones as mobile learning devices and IOS operating system as an operating system were used in the most researches. Mobile-based method is seen to be used as the teaching method in the present study.

Keywords: mobile learning, mobile education, mobile technology, content analysis.

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1. Introduction

A simple form of communication established between mobile communication devices and personal computers thanks to the development of today's internet technologies and computers with wireless connectivity. This change introduced that mobile learning again can be used effectively in distance learning applications (Taleb & Sohrabi, 2012).

Different learning environments and contents are needed for the individuals who learn and teach. This will connect individuals to each other for education in different places and times with the help of technology (Ozdamli, 2011; Ozdamli, Soykan & Yildiz, 2012; Yengin, Ince, Karahoca, Karahoca & Uzunboylu, 2012). This is the reason why the content is prepared and used for distance learning environments is increasing diversification. This status and innovative developments in mobile devices has given rise to appropriate environment for distance learning. The best features of the mobile devices are being small and portable. Therefore, users can continue their training any time and any place (Uzunboylu, Cavus & Ercag, 2009; Vavoula, Sharples, Rudman, Meek, & Lonsdale, 2009; Wang, Doll, Deng, Park & Yang, 2013). These devices which can be used for information sharing and communication focused are produced with different hardware and software specifications. Therefore, these devices offer sufficient experience opportunity in order to meet many different needs.

A simple form of communication established between mobile communication devices and personal computers thanks to the development of today's internet technologies and computers with wireless connectivity. This change also introduced that mobile learning again can be used effectively in distance learning applications (Taleb & Sohrabi, 2012).

If we are to sort out the advantages of mobile learning;

a. Life-long learning

b. Implicit learning

c. Learning in immediate needs

d. Time and place independent learning

e. Adjusted learning according to the location and conditions

(Seppala & Alamaki, 2003; Fadare, Aladeselu, Ekuobase, Aboderin & Kumuyi, 2013). As it can be understood from the advantages above, they are consistent with the advantages of distance education. The development of technology and the widespread use of smart phones are also make this mobile technologies useful in education (Tarımer & Okumus, 2010). Mobile devices become more useful because desktop computers and fixed broadband lines are necessary for e-learning and mobile devices eliminate disadvantages (Keser, 2010).

It is possible to say that benefits of mobile learning can be summarized as more flexible, accessible and personalised learning activities (Dewitt & Siraj, 2011). As a main objective of mobile learning, it is needed to increase the effectiveness of teaching method and strategies of computer-based teaching materials rather than transferring them into mobile devices. By this way, it can be expected learners to become a broader range and increase their productivity. Computers, mobile devices and the Internet connection of the rapid growth in mobile learning are made great changes with concept of education (Lu, Ting, Little & Murphy, 2013; Ahmed & Parsons, 2013).

According to the literature in this area, some content analysis studies previously conducted in 2011 by Keser & Ozcan. He tried to determine new trends in the field of educational technology in his content analysis studies. Eryilmaz & Akbaba (2013) are also tried to determine orientations in the researches related to content analysis studies in the field of educational technology in 2013. Another study is carried out by Martin and his friends in 2011. Through this study, they tried to determine the new technologies with a content analysis. It is possible to see sufficient number of content analysis in the field of mobile learning apart from these studies in the literature we faced before. Therefore, this

study is necessary to fill the gaps in this field and identifying the orientations in the field of mobile learning. It aims to help the individuals who desire to work in the field of mobile learning by showing them in which direction they should go, which discipline they should choose and determining the other factors.

1.1. Aim

The purpose of this study is to identify the trends in the articles related to the field of mobile learning which were published in the Science Direct database between 2009 and 2014 (May). As a result; the most studies in the field of mobile learning are done in 2013 according to the years. The most studies are published in Maleysia, UK and Taiwan. The reason to choose this database is because of its open and easy access for the users. It is peer-reviewed and has a respectable position in the academic environment. Another objectives of this study are as follows;

1. How is the number of publications by the year of studies?
2. What is the number of publications according to the countries?
3. How is the distribution of studies in terms of sample groups?
4. What are the research models used in the studies?
5. What are the data collections tools used in the studies?
6. What are the subjects areas of studies carried out?
7. What are the applications used in the studies?
8. What are the mobile devices used in the studies?
9. What are the operating systems used in the studies?
10. What teaching methods are used in the studies?

2. Method

This research is a content analysis study. It is aimed to determine and evaluate the new orientations in the field of mobile learning. Science Direct database has been selected and a year limit has been set between 2009-2014 (May) for this research. The year 2014 only contains the articles published until May. Keyword "mobile learning" was written in the search engine during scanning process. All the articles which contains "mobile learning" as a keyword are included in this research.

2.1. Criteria

Content analysis criteria;

- Publication Year
- Research Countries
- Sample Groups
- Research Model
- Data Collecting Tools
- Research Field
- Used Mobile Applications

- Used Mobile Devics
- Used Mobile Operation Systems
- Used Teaching Methods

2.2. Data Analysis

All the data was accumulated for each article in SPSS package program formed according to content analysis criteria. Later on, the data reports are classified and frequiences were taken according to stated criteria by using filter characteristics.

3. Findings

3.1. Distribution of Articles According to Publication Years

Table 1. Number of Articles According To Publication Years

Publication Year	Frequency	%
2014 (May)	26	16,8
2013	44	28,4
2012	34	21,9
2011	24	15,5
2010	22	14,2
2009	5	3,2

As it can be seen in Table 1 the highest research publications on mobile learning is in year 2013 (f=44) and the lowest is in year 2009 (f=5). Even though reserach time of year 2014 is limited till may the publication number of the year 2014 has also respectable results. So we can say that the publication number will increase after may during 2014. In addition this result showed us that the number of articles have increased every year since 2009 until prestent.

3.2. Distribution of Articles According to Countries

Table 2. Number of Articles According To Countries

Countries	Frequency	%
Malaysia	14	9,0
UK	14	9,0
Taiwan	14	9,0
USA	13	8,4
Spain	12	7,7
Turkey	10	6,5
Iran	10	6,5
North Cyprus	6	3,9
Germany	5	3,2
China	5	3,2
Arabia	5	3,2

Out of forty one country only the top ten countries are given in table 2. As it can be seen in Table 2 the highest publications on mobile learning is in Maleysia, UK and Taiwan (f=14) and the lowest is in Germany, China and Arabia (f=5).

3.3. Sample Group

Table 3. Sample Groups of Articles

Sample Groups	Frequency	%
Undergraduate Students	38	24,5
Primary School	11	7,1
High School	10	6,5
Adults	9	5,8
Academicans-Undergraduate Students	8	5,2
Secondary School	5	3,2
Teachers	5	3,2
Nursing	4	2,6
Academicans	3	1,9
Preschool Students	2	1,3
Master Students	1	0,6
In-Service	1	0,6

According to table 3 the most used sample group is seen as undergraduate students (f=38). Following this the second highest data is seen as primary school (f=11) and the third highest data is seen as high school students (f=10). The lowest data is seen as in-service training students (f=1) and master students (f=1).

3.4. Distribution of Articles According to Research Methods

Table 4. Researching Methods of Articles

Researching Methods	Frequency	%
Experimental	56	36,1
Environment Design	28	18,1
Application Development	19	12,3
Case Study	16	10,3
Descriptive	15	9,7
Litarature Review	7	4,5
Semi Experimental	5	3,2
Content Analysis	2	1,2
Scale Development	1	0,6

The most of the studies are seen to be experimental (f=56) in table 4. The second highest result is seen as environment design (f=28). The other respectable result is seen as application development (f=19) on mobile learning area.

3.5. Used Data Collecting Tools in Articles

Table 5. Data Collecting Tools Used in Articles

Data Collecting Tools	Frequency	%
Quantitative	80	52,0
Quantitative – Qualitative (Blended)	22	14,0
Qualitative	17	11,0
Documnetary Review	9	5,8

The most of the data collection tools of studies are seen to be quantitative (f=80) in table 5. Following this the second highest result is seen as blended (f=22).

3.6. Research Fields

Table 6. Subject Fields of Articles

Subject Areas	Frequency	%
Foreign Language	18	11,6
Science	15	9,7
Engineering	15	9,7
Medical	11	7,1
History	8	5,2
Information Technologies	7	4,5
Lifelong Learning	5	3,2
Architecture	4	2,6
Marketing	3	1,9
Geography	3	1,9
Orientation	3	1,9
Mathematics	3	1,9
Accounting	2	1,3
Environmental Science	2	1,3
Special Education	1	0,6
Physic	1	0,6
Business	1	0,6
Driving Course	1	0,6
Blended Field	1	0,6

As it is seen in table 6, mobile learning is used in the various fields of education. Mobile learning applications and activities are mostly preffered in fields of foreign language (f=18), science (f=15), engineering (f=15) and medical (f=11) education.

3.7. Used Mobile Applications

The name of used mobile applications in examined articles are seen as follow. The name of the applications are given originally as written in articles.

Evernote, CMS, MEL, Synote, FLOM, QuesTInSitu, MKC, SULMS, MILS, CAD ,CAD, UoLmP, ABC, Skype, Web 2.0 Tools, MLM, m-Books, Touch to Learn, AR, KWL, SABER, MLEA2Dbarcode, MANET, SolarCell, MLSS, MLE, RLP, MLAS, AMLS, MASS, ERMA, HCCI, MCVD, RFID, FLAGMAN, MEL ,WAP, CollPad, KWL, SLS, RSS, CSCL, ms-Software, InquiBiDT, SEM, MANET, CLFP, ThinknLearn, UML, CRUD, FJU, uDirect, MathRush, mCSCL, MobiNaG, GACR, MDA, iLeC, QTI, MUKS, EcoMOBILE, SCORM, LILOs, FreshUP, GuestSpeaker, MuseumScouts, MLM, mLearning, LieksaMyst, BrainDive, UMLS, PocketPC, myArtspace

3.8. Used Mobile Devices

Table 7. Used Mobile Devices in Articles

Used Mobil Devices	Frequency	%
Smart Phone	30	19,4
Blended Usage	25	16,1
PDA	20	12,9
Tablet PC	11	7,1
Tablet PC-Smart Phone	8	5,2
Mobile Phone	6	3,9

As it is seen in table 7, among used mobile devices, smart phones (f=30) are mostly preferred as a mobile teaching tool in education. The second highest result is seen as blended (f=25) devices used in education as a mobile teaching tool. The third highest used mobile device is seen as pda (f=20). Even though pda's are absolute mobile devices this result shows us that the pda's usage is still continues as a mobile teaching tool in education.

3.9. Used Mobile Operation Systems

Table 8. Operatin Systems Used in Mobile Devices

Used Operation Systems	Frequency	%
iPhone OS	30	19,4
iPhone OS-Android OS	23	14,8
Symbian - PalmOS	21	13,5
Android OS	9	5,8
Windows OS	3	1,9
Blended Usage	2	1,3

As it is seen in table 8, iOS (f=30), iOS-Android (f=23) and Symbian-PalmOS (f=21) are mostly used in mobile learning devices. So we can say that the mobile learning applications are being developed generally for iOS and Android OS. Because these operation systems are mostly using nowadays by learners.

3.10. Used Teaching Methods

Table 9. Teaching Methods Used in Articles

Teaching Methods	Frequency	%
Mobile-Based Learning	40	25,8
Mobile-Assisted Learning	20	12,9
Game-Based Learning	10	6,5
Collobrative Learning	8	5,2
Cloud-Based Learning	5	3,2
Ubiquitous Learning	3	1,9
Authentic Learning	2	1,3
Project-Based Learning	2	1,3
Augmented Reality Based Learning	1	0,6
Scenario-Based Learning	1	0,6
Trip-Based Learning	1	0,6
Situated Learning	1	0,6
Museum-Based Learning	1	0,6
Robot-Assisted Learning	1	0,6
Reinforcement-Based Learning	1	0,6

As it is seen in table 9, there are many kinds of teaching methods as mentioned above. The most of used teaching methods are seen as mobile-based (f=40), mobile-assisted (f=20) and game-based learning (f=10) in screened articles.

4. Result and Discussion

According to the investigation on the search engines including the years between 2009 and 2014 (May), it can be seen that a lot of studies are included related to the mobile education. This also shows us that mobile technology and educational environments are being used effectively and this give a rise to the new researches.

Sample group of university students has been the most preferred as the implementation of the study. The reason behind this can be explained as this mass very effective ability use mobile devices as a result of a lot of use of these mobile devices in their everyday life. Examples of groups that already have these skills, the results of studies in the field of mobile learning is likely to make it more efficient. The most commonly used another sampling groups were primary school and high schools students. Accordingly, a new generation grow up to be able to use mobile technology is observed as a significant improvement.

It is emerged that experimental research method was the most preferred method as a research model in the researches. The reason for this the effectiveness of the mobile learning researches is emerged as developed applications. The efficiency of the catalyst system is come out due to experimental studies. Only 4 content analysis in the field of mobile learning are found among the scanned articles. This shows us the deficiency in this field and by this way this study increases its qualification.

If we look at the most commonly used subject fields of mobile learning, foreign language education, science, health, engineering and history are the most commonly used fields in this sense. It is emerged that with the help of interactive applications of mobile technology foreign languages education play a major role in learning foreign words or grammar (Gromik, 2012; Agca & Ozdemir, 2013; Sandberg, Maris & Hoogendoorn, 2014). Yet another area in which the field of science studies the use of mobile learning technologies is quite high. Especially with the developed mobile applications, examples which

were impossible to show in the class environment are now possible to transfer to the students. (Chung-Ho & Ching-Hsue, 2013). On the other hand, again mobile technologies are being used effectively in the field of health. It is seen that frequency of using mobile technologies are quite a lot especially for nurses' personal developments or their tracking of application training (Pimmer, Brysiewicz, Linxen, Walters, Chipps & Grohbiel, 2014).

We can see in the results of this study that with the elimination of time and place concepts the major problems in the approach of life-long learning such as insufficient time for the education for individuals and the restriction of educational environments are caused mobile learning being used more in the field of life-long learning in the recent years (Seppala & Alamaki, 2003). Also, ICT skills are also developed and thus it is provided to access information in the right way during all their lives with the development of individuals' skills in the field of mobile learning (Soykan, 2013).

One of the most important advantages of mobile technologies is the interaction. It is started to be used in the field of special education for children with the help of its visual design according to the target audience (Lopez, Fortiz, Almendros & Segura, 2013). In recent years the use of mobile technology in the field of special education has begun. We can say that the reason that makes use of the children is the size and making learning more effective interaction (Sakar, 2009; Venkatesh, Greenhill, Phung, Adams & Duong, 2012; Yee, 2012).

Other notable new field of cloud technology is now also begun to take place in the field of education. With the information stored permanently and safely cloud technologies provide sharing information and establishing a link between learner and teacher. This link helps to share and transfer knowledge in an active way (Gezgin, 2013; Armutlu & Akcay, 2013). Furthermore, mobile and e-learning environment can be moved to cloud computing and with the help of cloud technologies so it is possible to share information more secure and store permanently (Banica, Stefan, & Rosca 2013). Cloud technology which is known as a system that supports all of the mobile technology is used in the information sharing and facilitate knowledge sharing in the field of mobile learning. According to the results of these studies, it is possible to claim that cloud technologies will evolve continually in the recent years and this will help new studies to emerge in the future (Dinh, Lee, Niyato & Wang 2011).

Thanks to mobile technologies mobile-based learning, mobile-assisted learning, game-based learning and collaborative learning have emerged as new learning methods with their increasing effectiveness in education (Kim, Buckner, Kim, Makany & Teleja, 2012; Chung-Ho & Ching-Hsue, 2013).

Eryilmaz ve Akbaba (2013) have identified the trends took place in the field of educational technology in British Journal of Education Technology (BJET) through their content analysis in 2013 Field of Mobile technology has a great importance for the results of our study as it is in the field of educational technology. When we look at the study's findings, it can be seen that university students were used most in the selection of sample group. It is one of the most important outstanding similar data. As data collection tools, it can be observed that again qualitative data collection tools are used in the maximum level. Another similar result is the use of most frequently used experimental research model.

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