

## **STUDENTS' ATTITUDES AND PERCEPTIONS TOWARDS THE EFFECTIVENESS OF MOBILE LEARNING IN KING SAUD UNIVERSITY, SAUDI ARABIA**

Dr. Fahad N. Al-FAHAD

Dean, College of Applied Studies and Community Service  
King Saud University, P. O. Box 22459, Riyadh - 11495  
alfahadfn@hotmail.com

### **ABSTRACT**

The main aim of this research study is to better understand and measure students' attitudes and perceptions towards the effectiveness of mobile learning. This paper reports on the results of a survey of one hundred eighty six undergraduate female students at King Saud University about their attitude and perception to the use of mobile technology in education. An analysis of the quantitative survey findings is presented focusing on the ramification for mobile-learning (m-learning) practices in university learning and teaching environments. The author has attempted to determine how this technology can be optimally used to improve student retention at Bachelor of Art and Medicine programmed at King Saud University in Saudi Arabia. Result of this survey clearly indicate that offering mobile learning could be our method for improving retention of B.A ,and M.D. students, by enhancing their teaching/learning. The biggest advantage of this technology is that it can be used anywhere, anytime and adopt their mobile learning systems with the aim of improving communication and enriching students' learning experiences in their open and distance learning.

**KEYWORDS:** M-learning; student attitudes; student perception; mobile technology.

### **INTRODUCTION**

#### **DISTANCE EDUCATION**

In the last decade, distance education has developed in two major directions: "the individual flexible teaching model and the extended classroom model" (Rekkedal and Dye, 2007). The former allows students to start the class at any time, study in isolation and communicate with instructors and classmates through asynchronous tools. The latter organizes students into groups, requires them to meet at local study centre, and allow them to use interactive technologies such as video conferencing to interact (Rekkedal & Dye, 2007).

Due to the rapid development of technology, courses using a variety of media are being delivered to students in various locations in an effort to serve the educational needs of growing populations. In many cases, developments in technology allow distance education programs to provide specialized courses to students in geographically remote areas with increasing interactivity between students and teacher. Although the ways in which distance education is implemented differ markedly from country to country, most distance learning programs rely on technologies which are either already in place or are being considered for their cost-effectiveness. Such programs are particularly beneficial for the many people who are not financially, physically or geographically able to obtain traditional education.

Distance education has experienced dramatic growth both nationally and internationally since the early 1980's. It has evolved from early correspondence education using primarily print based materials into a worldwide movement using various technologies. The goals of distance education, as an alternative to traditional education, have been to offer degree granting programs, to battle illiteracy in developing countries, to provide training opportunities for economic growth, and to offer curriculum enrichment in non traditional educational settings. A variety of technologies have been used as delivery systems to facilitate this learning at a distance. Distance education relies heavily on technologies of delivery. Print materials, broadcast radio, broadcast television, computer conferencing, electronic mail, interactive video, satellite telecommunication and multimedia computer technology are all used to promote student-teacher interaction and provide necessary feedback to the learner at a distance.

However, recent development in interactive multimedia technologies which promise to facilitate "individualized" and "collaborative" learning, are blurring the distinctions between distance and traditional education. These technologies also have the capability of creating new environment for learning such as "virtual communities". Students in traditional settings are being given entire courses on CD-rom multimedia disks through which they progress at their own pace, interacting with the instructor and other students on electronic mail or face to face according to their needs (Technology Based Learning, 1994). Through international collaboration, students around the world participate in cooperative learning activities sharing information using computer networks (Riel, 1993). In such cases, global classrooms may have participants from various countries interacting with each other at a distance. Mediated educational activities allow students to participate in

collaborative, authentic, situated learning activities (Brown & Palincsar, 1989; Brown, Collins, & Duguid, 1989). In fact, the explosion of information technologies has brought learners together by erasing the boundaries of time and place for both site based and distance learners. Research in distance education reflects the rapid technological changes in this field. Ozgur (2007), evaluated audio books as supported course materials in distance education. It takes an initiative role to meet the needs of higher education in Turkey by providing equal opportunity with the help of information and communication technology. Although early research was centered around media comparison studies, educators have recently become more interested in examining how the attributes of different media promote the construction of knowledge (Salomon, Perkins, & Globerson, 1991). It is within the theoretical framework of knowledge construction and expert systems (Glaser, 1992) that some of the most promising research on mediated learning appears (Barrett, 1992; Harasim, 1993; Salomon, 1993). Also Ajadi, Salawn and Adeoye (2007), discussed the relevance of e-learning in the position of education in Nigeria.

### **MOBILE LEARNING**

People often think mobile or wireless technologies are the same as mobile wireless technologies (Cook, Pachler and Bradley (2008). Strictly speaking, mobile wireless technologies are different from mobile or wireless technologies simply because not all mobile technologies are wireless nor are all wireless technologies mobile. According to Malladi and Agrawal (2002), mobile wireless technologies consist of two aspects: mobility and computing. They claimed that mobile computing represents users' continuous access to network resources without limitation of time and location. Wireless means transmission of any form of data-text, voice, video or image which is conducted through radio waves, infrared waves or microwaves, rather than using wires (Dubendorf, 2003). Therefore, mobile wireless technology is defined as any wireless technology that uses radio frequency spectrum in any band to facilitate transmission of text data, voice, video, or multimedia services to mobile devices with freedom of time and location limitation.

The freedom of time and location is related to the concept of anytime and anywhere access that represents the two main characteristics of mobile wireless technologies-mobility and reachability (BenMoussa, 2003; Camponovo & Pigneur, 2003; Ng-Kruelle, Swatman, Rebne, & Hampe, 2002; Turban, Lee, King, Warkentin, & Chung, 2002). Rismark, Solvberg, Stromme and Hokstad (2007), found that affordance of constant access to LMS by mobile phones may represent new learning opportunities in higher education. Mobile wireless technologies use public stations- antennas-or Wireless Access Points (WAPs) that are connected to wired-network in a building or public area to give a way of access for web resources and communication for mobile wireless technology users. With mobile wireless network or service in mobile wireless devices, users can access network information anytime, anywhere. (Hahn, 2008). For example, people can carry wireless laptops anytime, anywhere and can access a network in public places, such as an airport and a library. In addition, handheld devices can be carried and connected to a network anywhere, anytime using public stations (e.g., antenna).

In the Kingdom of Saudi Arabia, recently, all major mobile network providers have announced commercial packages offering broad band internet connection for mobile devices in economical prices, making the necessary technology available and affordable. Precisely, nowadays mobile devices, present in Saudi Arabia market, are enhanced with technology, like GPRS and UMTs, presenting the user with the opportunity to exploit all the advantages of actual internet connection. Additionally, the new technology announced by network providers: High Speed Packet Access (HSPA), offer a download speed of 7.2 Mbps.

Here, we refer to the experience of the Kingdom of Saudi Arabia (KSA) in the application of e-learning and distance education, which is one of the leading and promising experiments in the Arab world. Saudi Arabia has announced officially the utilization of distance learning, and to achieve this objective leading towards the future, has launched initiatives to establish six infrastructures for higher education and distance education initiative to 1) bridge (Tajseer), the e-learning educational portal system; 2) bridges management, (Jusur LMS System) in e-learning; 3) launch an award in university for e-learning excellence, 4) the national repository for learning objects Taiseer service for e-learning and 5) the establishment of Saudi National Center for e-learning, and distance education for university education, and functions circulated e-learning management system in harmony with needs of university education in the Kingdom of Saudi Arabia; and 6) developing the academic and administrative skills and management system, e-learning and distance education, building electronic curriculum contents and forms of digital and print for a number of university courses, and to build the educational portal for e-learning and distance learning and awareness programme for electronic education and distance education. For further details of the system proposed by the Ministry of Higher Education and National Center in KSA, you can visit the Web site of the Ministry of Higher Education ([www.ElC.Edu.sa](http://www.ElC.Edu.sa)).

## LITERATURE REVIEW

Distance education is on the brink of another shift. M-learning education is on the go, thanks to mobile phones and personal digital assistants (PDAs) which expands the boundaries of anytime, anywhere learning. It was approximately ten years ago that distance education experienced a shift in course delivery methods. North American libraries in particular embraced the World Wide Web. As internet access methods, they began moving from mailing course content such as books, audio or video tapes, or photocopies of journal articles, to creating or linking to digital content which could be read on line. Students could access course materials from wherever they were, 24 hours a day without the help of a librarian.

Traditional research on digital libraries focused on developments in technology (Hong et al., 2002). Levy and Marshal (1995), Hahn (2008), challenge those who would maintain the traditional view of the library in a digital environment. Various projects, such as WiTEC, tested the usefulness of wireless devices in classroom environments (Wang et al., 2003); White, (2004) Benson, Samarawickema, & O'Connel, (2005), or in class field trips. Yet, as a distance education institution, Australia has no classrooms. Australia has had to adapt courses to fit the goals of students who are never in the same room with their instructors and tutors, or with other students. Australia has conquered these challenges by employing innovation and flexibility, earning a reputation as "Canada's Open University" through a commitment to research into the state of the art of distance education.

It has only been recently that studies of digital libraries ( Tennant , 2008), have moved outside the classroom. Dong and Agogino (2004), concluded that Mlearning is most useful when it links real-world situation to relevant information resources. They explored how downloading key information to a PDA would help to enrich the learning experience of students of a field trip. They also suggested the scenario of students at a learning experience of students on a field trip. They also suggested the scenario of students at a museum being able to use their PDAs to provide relevant information. They explored two approaches: transforming and transcoding for delivering digital content intended for full-sized personal computers to mobile computing devices. Transformation require that all content be marked up in XML and presents content with style sheets appropriate to the capabilities of the remote device that will be displaying it. Transcoding also takes into account the capabilities of the mobile device as well as its network conditions but it displays content without changing it. The approach they didn't use in their study, web clipping, such as AvantGo, delivers only text content by stripping out any multimedia contents, an approach that doesn't exploit a digital library's versatility.

Waycott and Kukulska-Hulme (2003) also studied the use of PDAs outside the classroom. They focused exclusively on student' experiences with reading course materials and taking notes on PDAs. Using PDAs for reading and note taking was discovered to be less than ideal. Students were getting lost in the documents, and were unable to make notes as comprehensively and easily as they could with a paper copy of the materials. However, their study was conducted using a Palm m105 PDA; a PDA which at the time was relatively affordable and which offered most features common to PDAs, but which doesn't come close to offering the technology available today (Ogata, etal. 2008).

The technological capacity of PDAs has increased tremendously in the past three years. Screens are bigger with more clarity; systems have more memory and more multimedia capabilities with more refined methods for imputing data. There are constant advancements in this field as well as the plethora of possibilities, such as PDA models with unique capabilities, and a wide variety of systems and applications. These wide ranging advancements provide researchers with more questions than answers on possible methods for delivering digital library content to PDAs. According to Clyde (2004), the challenge "is to identify the forms of education and training for which M-learning is particularly appropriate, the potential students who most need it and the best strategies for delivering mobile education" (p. 46).

### Analysis of student perceptions on m-learning

The survey was conducted to explore and analyze the factor crucial in overcoming the possible hindrance of m-learning implementation in higher education, student perception of m-Learning may be influenced by specific individual variables. The variable taken into consideration in the study were gender, course of study and attitudes to new technology. The research has indicated that female students are attracted to the ease of use. The three specific objective of the survey were :

- 1- To explore the student attitudes and the perceptions on the effectiveness of mobile learning.
- 2- To draw the student's preferences for mobile learning in distance education.
- 3- To examine the extent of use mobile learning by distance learners.

## **METHODOLOGY**

In order to study the attitudes of students on the effectiveness of mobile learning, a questionnaire was developed with 8 items designed to measure students' attitudes and perception on the effectiveness of mobile learning. A five point Likert Scale with strongly agree; agree; undecided; disagree; and strongly disagree, was used from main items. This approach is commonly employed in distance education research (Biner, 1993; Roberts, Irani, Telg & Lundy, 2005).

The Study was conducted in the King Saud University, Riyadh, Saudi Arabia. A random sample of undergraduate female students (N= 186), age range 18 - 26 years filled in a questionnaire (the questionnaire was in Arabic language). All participants were asked to complete a questionnaire which included all types of measuring students' attitudes and perceptions on the effectiveness of mobile learning. Eight, key questionnaire were adopted from this stage as shown in Table 1.

The questionnaire, including a cover letter, was distributed to participants during the class. All subjects were asked to respond to the questionnaire and their responses were guaranteed confidentiality. The data of this study was gathered by means of a paper and pencil survey. Respondents of the survey were undergraduate students from different colleges. Students from Applied studies and Community Service (Group 1) were undertaking 5 selected courses, in different areas, in specific 1) Introduction to Islamic culture (IS 101); 2) Islam and building society (IS 102);, 3) Arabic language skills (Al 101); 4) Arabic writing (Al 103); 5) English (Eng. 101). Group (2) consisted of students from Educational Kindergartens faculty and group (3) students were from and Medicine.

Every course contained approximately (50-70) students. The total number of respondents was 186. The questionnaires were distributed and collected at the end of semester in June, 2008. The data collected was processed and statistically analyzed through SPSS Ver.10. In our first study on the students' attitude and perception towards the effectiveness of mobile learning in King Saud University, Kingdom of Saudi Arabia, the questionnaires were distributed to 186 students (female) in different colleges, college of Applied Studies and Community Service (represented group 1, 37.6%); department of educational Kindergartens (representing group 2, 34.9%), and College of Medicine (representing group 3, 27.4%). Respondents of the survey were college students undertaking different selected courses. All the students who participated in this survey owned cellular phone. Other type of mobile devices such as PDAs, iPods, and MP3 players were owned by fewer than half of the respondents. This lead to an important issue to be considered in any future mobile learning implementation.

## **RESULTS AND DISCUSSION**

Mobile phones seem the best device to use in the learning of high student ownership, yet a requirement to use them in a course would deprive a small percentage of students who do not own or use a mobile phone. The first objective namely the student's attitudes and perceptions to m-learning was measured using eight closed questions ( Table 1). Table (1) shows the percentage of the descriptive statistics for the effectiveness of mobile learning.

Responses to each of the indicators on effectiveness of mobile learning were measured on a Linkert Scale of 1 to 5, ranging from "Strong agree" to strong disagree" Scores greater than 3.0 indicate relative importance, below 2.0 indicate relative unimportance; a score of 2 to 3 shows it to be neither important nor unimportant. Data in Table 2, provides an overview of the relative importance of these indicators. Mean scores of the sample indicate that more than 50%, of respondents strongly support mobile learning as an effective method for learning. This data indicates that some how, mobile technologies are more flexible and enable students greater freedom of learning any place, any time. Responses to a question on availability of mobile phones show that respondents did not agree with the suggestion that mobile phones are unavailable to large number of students. Respondents also strongly agree with the suggestion that there would be high cost involved in owning and using mobile devices for mobile learning. Respondents did, however, report apprehension regarding the quality of networking presently available to them. Mobile technologies such as mobile phones can be used to enrich students' learning environment by providing timely information.

Mobile learning can also provide good support to micro-learning, a new and effective way of learning (Habitzel, Mark, Stehno & Prock, 2006). It has been observed by Habitzel and his colleagues (2006), for example, people can learn more effectively if "information" is broken down into smaller, more easy-to-comprehend units. Therefore it is suggested here, that mobile learning is an ideal medium simply because it supports this "new way" of learning via the use of SMS, pre-recorded MP3 fits, and so forth.

Also, the study found that only 25.3% (N=47), of the respondents were aware of mobile learning. In survey on the use of different communication tools like PDAs, iPods, and MP3 players, results show that, less than 50% of the respondents owned these mobile devices. The finding of 100% of respondents reported owning a mobile

phone, suggests that mobile technologies are rapidly becoming more ubiquitous and, arguably, more accessible to a large number of learners in Saudi Arabia.

The majority of these cell phones present advanced characteristics like relaying and displaying photos (96.8%); use of alarm (79.6%); and use as an organizer (78.50%); downloading e-mail (19.4%); reading news (22.0%); and watching movies (15.1%). The students do not use mobile devices too much in the movies application.

In specifically, 25.3% of (N=47) students strongly agree that mobile learning can be an effective method of learning as it can give immediate support, with 39.2% (N=73) feeling that the mobile learning will be more flexible method of learning as it can be done anytime anywhere. 31.7% (N=59), of respondents strongly agree that the mobile learning will improve communication between student and teacher, and 30.69% (N=57) strongly feel that expenses are involved in mobile learning. 24.7% (N=46%), of the respondents, feeling that the mobile learning will bring new opportunities of learning. Further more, there are several indicators in the survey (Table 1) related to the effectiveness of mobile learning. The majority of the respondents preferred the effective use of mobile technology in promotion of distance learning where as Traxler (2003) ,also support the findings of the study. Also, the majority of respondents in this study confirmed the importance of mobile devices for its flexible availability, improving the communication between students and teacher.

However, The results of this study can be explained in Table (3). Table (3) gives the results of extracted communalities of all the variables. It shows the proportion of the variance of a variable explained by the common factors. From Table (3), it is very clear that the "mobile learning will improve communication between student and teacher" has the least percentage (48.1%), of variance that can be predicted or explained by other 7 variables. On the other hand, "mobile learning will bring new opportunities of learning" has the highest variation (74.4%), that can be accounted for by other 7 variables. These results reveal the importance attached to the fact that "mobile learning will improve communication between student and teacher". The communality of (74.4%), in the "mobile learning will bring new opportunities of learning" can be predicted by the usage of other variable studies. Thus an improvement in the usage of other variables will have corresponding effect on the new opportunities of learning.

Another statistical analysis instrument is reliability coefficient, Cronbach's alpha (Cronbach, 1951), to estimate the scale of consistency among items in the group (Hair, Anderson, Tatham & Black, 1998).

The Cronbach's alpha is generally acceded upon the level of 0.70, albeit it is acceptable at 0.60 in exploratory research (Hair et al., 1998). Table 4, illustrates the factors extracted from factor analysis and the Cronbach's alpha from reliability analysis of the data. Factor analysis loaded eight questionnaire statements into two components. Statements 1-5, and 6-8 respectively.

The internal consistency, represented by coefficient alpha, of all items is as much as 0.6641. It reports an existence of cohesive internal relationships of all measurements statements in representing the mobile learning, and this result provides confidence, that statistical results produced are coming from stable measurement source.

The first component represents the most contributory element to mobile learning. Alpha value of this factor is 0.8419 representing a high internal consistency of this component. The alpha value of the second factor is 0.6079, which is quite low owing to the very limited number of items (3 items).

**Table 1: Descriptive Statistics for the Effectiveness of Mobile Learning**

Item No.	Questionnaire Indicator	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Not responded	Total
1	Mobile learning can be an effective method of learning as it can give immediate support.	47 (25.3)	53 (28.5)	36 (19.4)	27 (14.5)	21 (11.3)	2 (1.1)	186
2	Mobile learning will bring new opportunities of learning.	46 (24.7)	66 (35.5)	27 (14.5)	28 (15.1)	15 (8.1)	4 (2.2)	186
3	Mobile learning will be more flexible method of learning as it can be done anytime, anywhere.	73 (39.2)	73 (39.2)	16 (8.6)	18 (9.7)	5 (2.7)	1 (0.5)	186
4	Mobile learning will improve communication between student and teacher.	59 (31.7)	60 (32.3)	27 (14.5)	22 (11.8)	14 (7.5)	4 (2.2)	186
5	Mobile learning is a quicker method of getting feed back in learning.	30 (16.1)	48 (25.8)	44 (23.7)	44 (23.7)	13 (7.0)	7 (3.8)	186
	Mobile learning cannot be used for learning due to:							
6	unavailability of mobile phones with a larger number of students.	24 (12.9)	27 (14.5)	14 (7.5)	66 (33.5)	43 (23.1)	12 (6.5)	186
7	expenses involved in Mobile learning.	57 (30.6)	47 (25.3)	31 (16.7)	36 (19.4)	6 (3.2)	9 (4.8)	186
8	poor networking in the city.	48 (25.8)	49 (26.3)	29 (15.6)	29 (15.6)	22 (11.8)	9 (4.8)	186

Note: figures in brackets indicate percentage.

**Table 2: Indicators for Effectiveness of Mobile Learning Mean Score**

Item No.	Questionnaire Indicator	G1 (N=70)		G2 (N=65)		G3 (N=51)		Overall	
		M	SD	M	SD	M	SD	M	SD
1	Mobile learning can be an effective method of learning as it can give immediate support.	2.20	1.40	2.86	1.40	2.63	1.06	2.55	1.34
2	Mobile learning will bring new opportunities of learning.	2.09	1.30	2.62	1.35	2.55	2.10	2.44	1.29
3	Mobile learning will be more flexible method of learning as it can be done anytime, anywhere.	1.80	1.08	2.02	1.10	2.39	1.08	1.96	1.06
4	Mobile learning will improve communication between student and teacher.	1.97	1.35	2.43	1.32	2.65	1.09	2.25	1.28
5	Mobile learning is a quicker method of getting feed back in learning.	2.50	1.40	2.91	1.30	3.55	1.33	2.68	1.29
	Mobile learning cannot be used for learning due to:								
6	unavailability of mobile phones with a larger number of students.	2.84	1.68	3.37	1.58	2.47	1.24	3.22	1.58
7	expenses involved in Mobile learning.	2.27	1.40	2.27	1.40	2.25	1.30	2.25	1.30
8	poor networking in the city.	2.59	1.56	2.59	1.56	2.47	1.45	2.47	1.45
	Overall, G1, G2, & G3	1.9	.80						

**Table 3: Communalities (Extaction Method: Principal Component Analysis**

	Initial	Extraction
1	1.000	.687
2	1.000	.744
3	1.000	.619
4	1.000	.481
5	1.000	.593
6	1.000	.703
7	1.000	.621
8	1.000	.675

**Table 4: Rotated Component Matrix and Cronback'sAlpha of Mobile Learning**

Statement	Component	
	1	2
1	.828	
2	.847	
3	.778	
4	.691	
5	.764	
6		.811
7		.783
8		.624
<i>Cronbach's Alpha</i>	<i>.8419</i>	<i>.6079</i>

## CONCLUSIONS

This paper investigates the students' attitudes and perceptions of 186 University Student's from different colleges towards effectiveness of mobile learning in their studies.

The authors have analyzed the answers to the qualitative questions in the surveys in an attempt to gain an understanding of how current students view the use of mobile devices in learning environments. The analysis of student perception on m-learning points to the fact that mobile learning is widely embraced by the student community. The majority of student supported the notion that the wireless networks increase the flexibility of access to resources in learning and that they could work independently of variable resources like lab or library PCs. The Students also were keen to use all sources of m-learning approaches through lab tops, mobile phones and PDAs so that access to information would be anytime and anywhere. As the date reveals m-learning activities can much better engage students in the learning process. Students in this survey changed from passive learners to truly engaged learners who are behaviorally, intellectually and emotionally involved in their learning tasks.

The Mobile technologies are perceived as an effective tool in improving communication and learning. In developing countries like Saudi Arabia, where WAP and PDA – based mobile technologies are not yet popular due to the cost involved in owning and using such higher-end mobile technologies, less expensive SMS-based mobile technologies such as mobile phones, do hold tremendous potential which can be strategically used to support and improve student relation.

## REFERENCES

- Ajadi, T.O., Salawn, I.O. and Adeoye F.A., (2008), E-learning and Distance Education in Nigeria. The Turkish online Journal of Educational Technology (JOJET), volum (7), Issue (4) article (7).
- Barrett, E. (Ed.) (1992). *Sociomedia: Multimedia, hypermedia and the social construction of knowledge*. Cambridge, MA: The MIT Press.
- BenMonssa, C. (2003, April). Workers on the move: New opportunities through mobile commerce. Paper presented at the UKAIS Conference, University of Warwick, Retrieved November 16, 2005, from <http://www.Warwick.Ac.Uk/Nbsral/UKais/abstracts.php#73>.
- Benson, R., Samarawickrema, & O'Connell, M., (2002). Showcasing examples of good practice in e-learning: an opportunity for research in distance education? *Research in Distance Education* 6, Geelong, Australia, pp. 71-82. <http://www.Deakin.edu.au/education/rads/conferences/publications/ride/2004/index.php>.
- Binar, P. M. (1993). The development of an instrument to measure student attitudes towards television course. *The American Journal of Distance Education*, 7 (1), 62-73.
- Brown, A. L., & Palincsar, A. S. (1989). Guided, cooperative learning and individual knowledge acquisition. In L. B. Resnick (Ed.), *Knowing, Learning and Instruction: Essays in Honor of Robert Glaser* (pp. 393-452). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational researcher*, 18 (1), 32-42.
- Clyde, L. A. (2004). M-Learning. *Teacher Librarian* (Internet) October, 31 (1). Available from [http://www.teacherlibrarian.com/tltoolkit/info\\_tech\\_32\\_1.html](http://www.teacherlibrarian.com/tltoolkit/info_tech_32_1.html). (Accessed: March 31, 2005).
- Cook, J., Pachler, N. and Bradley, C. (2008), Bridging the Gap? Mobile phones at the interface between informal and formal learning: Accepted by RCET's Special Issue: Learning while Mobile, the Journal of the Research Centre for Education Technology, Kent State University. Available. [http://www.rcetj.org/files/RCETJ\\_4\\_Learning whilemobile cook\\_pdf](http://www.rcetj.org/files/RCETJ_4_Learning%20while%20mobile_cook.pdf).
- Cronbach, L.J., (1951). Coefficient alpha and the internal structure of test. *Psychometrical*, 16, 297-334.
- Componva, G., & Pigneur, Y. (2003, April). Business model analysis applied to mobile business. Proceedings of the 5th International Conference on Enterprise Information systems (ICEIS), Angers, France.
- Dong, A. and Agogino, A. M. (2004). In International conference on digital libraries., Vol. 2 the Energy and Resources Institute, New Delhi, PP. 892-898.
- Dubendorf, V. A. (2003), *Wireless data technologies*. New York: John Wiley & sons.
- Glaser, R. (1992). Expert knowledge and processes of thinking. In D. f. Halpem (Ed.), *Enhancing thinking Skills in the Sciences and Mathematics* (pp. 63-76). Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Habitzel, K., Mark, T.D, Stehno, B., & Prock, S. (2006). Microlearning; Emerging concepts, practices and technologies after e-learning. Proceeding of Micro learning 2005 Learning & Working in New Media, In conference Series: Innsbruck University press: Retrieved June 6, 2007 from [http://www.microlearning.org/micropapers/microlearning\\_2005\\_proceedings – digit aversion. Pdf](http://www.microlearning.org/micropapers/microlearning_2005_proceedings-digit%20aversion.Pdf).
- Harasim, L. M. (1990). Online education: An environment for collaboration and intellectual amplification. In L. M. Harasim (Ed.), *Online Education: Perspectives on a New Environment* (pp. 39-64). NY: Praeae.

- Hair, J. F., Anderson, R.E., Tatham, R.L., & Black, W.C., (1998). *Multivariate Data Analysis*. 5<sup>th</sup> ed. Upper Saddle River, New Jersey: Prentice – Hall.
- Hahn J. (2008), Mobile Learning for the Twenty – First Century Librarian. *Reference Services Review*, 36(3), (pp. 272-288).
- Hong, W., Thong, J. Y. L., Wong, W. M. and Tam, K. Y. (2002). Determinants of user acceptance of digital libraries: an empirical examination of individual differences and system characteristics. *Journal of Management Information Systems*, 18, pp. 97-124.
- Levey, D. M. and Marshal, C. C. (1995). Going digital: A look at assumptions regarding digital libraries. *Communications of the ACM*, 38, pp. 77-84.
- Maladi, R., & Agrawal, D.P. (2002). Current and future applications of mobile and wireless networks. *Communications of the ACM* (10) 45.
- Ng- Kruelle G., Swatman, P. A. Rebne, D. S., & Hamp, F. (2002). The price of convenience: Privacy and mobile commerce. *Quarterly Journal of Electronic Commerce*, 3 (3), 273-285.
- Ogata, H., Saito A., N., Paredes, R. G., San Martin, G. A., and Yano, Y. (2008). Supporting Classroom Activities with BSUL System.
- Ozgun, A. Z. (2007), Evaluating Audio Books as supported Course Materials in Distance Education: the experiences of the blind learners. *The Turkish online Journal of Education Technology (TOJET)*, Volume (6), Issue (4), Article(2).
- Rekkedal, T. & Dye, A. (2007). Mobile distance learning with PDAs: Development and testing of pedagogical and system solutions supporting mobile distance learners. *International review of Research in Open and Distance Learning*, 8, (2), pp. 1-21.
- Rieger, r. and Gay, G. n.d. Using mobile computing to enhance field study. (Internet) Available from <http://www.oise.utoronto.ca/cscl/papers/rieger.pdf> (Accessed: November 23, 2004).
- Riel, M. (1993). Global education through learning circles. In L. M. Harasim (Eds.), *Global networks* (pp. 221-236). Cambridge, MA: The MIT Press.
- Rismark, M., Solvbery, A. M., Stromme, A. and Hokstad, L. M. (2007). Using Mobile Phones to Prepare for University Lectures: Student's Experiences. *The Turkish online Journal of Educational and Technology (JOJET)*, Volume (6), Issue(4) Article(9).
- Roberts, T. G., Iran; T. A., Telg, W. & Lundy, L. K., (2005). The development of an instrument to evaluate distance education courses using student attitudes. *The American Journal of Distance Education*, 19 (1), 51-64.
- Salomon, G. (Ed.). (1993). *Distributed cognitions: Psychological and educational considerations*. Cambridge: Cambridge University Press.
- Salomon, G., Perkins, D. N., & Globerson, t. (1991). Partners in cognition: Extending human intelligence with intelligent technologies. *Educational Researcher*, 20 (3), 2-9.
- Tennant, R. (2008). On the move with Mobile Web: Library and Mobile Technology. *Library Technology Reports*, July, 44 (5).
- Traxler, J. (2003), M-Learning – evaluating the effectiveness and the cost. *Proceeding of Mlearn 2003 : Learning with mobile devices*, (pp 183-188). London: Learning and Skills Development Agency.
- Wang, H. Y., Liu, T. C., Chou, C. Y., Liang, J. K., Chan, T. W. and Yang, S. 2003. The framework of three learning activity levels for enhancing usability and feasibility of wireless learning environment (sic). *Journal fo Educational Computing Research*, 30, pp. 331-351.
- Waycott, J., & Kukulska-Hulme, A. (2003). Students' Experiences with PDAs for reading course materials. *Personal and Ubiquitous Computing*, 7 (1), 30-43.
- White, N. (2004). M-Learning with Disadvantaged Kids. Full Circle Associates Community Blog (Internet) November 2, Available from <<http://www.fullcirc.com/weblog/2004/11/m-learning-withdisadvantaged-kids.htm>> (Accessed: November 30, 2004).