Vol 8. No. 4 – December, 2015

African Journal of Computing & ICT

www.ajocict.net

Android-based Mobile Learning Environment System – A Case Study of Undergraduate Learners

A.A. Elusoji (PhD)
Department of Computer Technology
Yaba College of Technology, Yaba – Lagos, Nigeria
elusoji872@yahoo.com

A.E. Aiyegbusi
Department of Computer Science
Micheal Otedola College of Primary Education, Epe-Lagos, Nigeria
aiyegbusied@yahoo.com

G.R. Akeredolu
Department of Computer Science
Federal Polytechnic, Idah – Nigeria
akmasgbenga3@gmail.com

ABSTRACT

Nowadays, educational technology, even in the early stages, enables curriculum adjustment to meet students' learning and life situations. It also provides alternatives to traditional educational methods and enhances higher education lectures. For example, new technology eliminates spatial and temporal constraints, as students and teachers needn't be in the same classroom, or even within the same area, to exchange information or educational material, but can be anywhere without hampering their work. Furthermore, the operating cost of schools and universities is reduced, since all course materials can be presented using cheap technology, through the screens of electronic devices. Basically, mobiles devices and apps are not just playing tools but more importantly, it is an educational tool for learning and teaching process. Mobile-learning is the new sensation in the field of education. It is creating a new wave of educational development for sustainable and viable learning option as a result of convergence of mobile technologies and wireless infrastructure.

Keyword: Android, Mobile App, Google, Platform, Development, Web, E-Learning

African Journal of Computing & ICT Reference Format:
A.A. Elusoji, A.E. Aiyegbusi & G.R. Akeredolu (2015): Android-based Mobile Learning Environment System – A Case Study of Undergraduate Learners. Afr J Comp & ICTs. Vol 8, No. 3. Pp 101-110.

1. INTRODUCTION

Mobile technology has entered into the mainstream society, affecting the lives of many in recent years. According to the report "Information and Communications for Development: Maximizing Mobile [1]," which was released on August 16, 2012, there were 101 mobile cellular subscriptions for every 100 people in the Philippines in 2011, a jump from 41 subscriptions for every 100 people in 2005. Worldwide, the number of mobile subscriptions grew from one billion in 2000 to more than six billion in 2011, of which nearly five billion were in developing countries. Mobile phones based on android platform have become an indispensable communication device for many people, particularly in younger segments of the population, such as students. Smart Telecommunications noted a steep rise in the use of the top three smartphone operating systems in its network.

Google's mobile OS, Android, tallied the highest increase with a 300% spike, followed by BlackBerry OS with 66%, and Apple's iOS with 62%. The figures were culled from a series of one-day snapshots of Smart's network taken every month. As stated by Mr. Orlando B. Vea, Smart's Chief Wireless Advisor [2], from August to December 2011, the company has seen a doubling of the number of subscribers using smartphones in the last four months of 2011 due to increased availability of devices and the growing demand for mobile Internet.

Android is an open source mobile operating system that has been supported by Google Corporation, the world leading search Engine Company. One major reason for the pervasive adoption of android in the mobile market is that mobile applications developed through android development technology is more efficient and effective compared to the other technologies, such as mobile Window or Symbian operating systems, producing fast, user friendly and appealing applications.

With this formidable mobile technology advancement, more and more students can now seek informal education. Another benefit of these tools is that learning cost incurred unto students is drastically reduced as independent, and self-paced learning can be done outside the schools and campuses [3].

The study by Chan (2003) shows that it is important for providers of mobile academic content and information to understand the following characteristics: First, mobile learning addresses the urgency of individual information acquisition and learning needs. Second, the initiative of knowledge acquisition is based on an information seeker's request and the information is obtained immediately. Third, a mobile learning setting enables information seeking and learning to occur when and where it best fits individual needs. Fourth, interactivity of the learning process is provided through wireless devices. Learners and information seekers are provided broader access to experts (e.g., librarians, instructors, etc.) and knowledge than is available through other distance learning technology. Fifth, activities are situated instructional activities in a way that extends learning and information seeking into natural, authentic, and contextual situations of an individual's personal life. Finally, instructional content (e.g., information resources, activities, etc.) is integrated into mobile device use wirelessly [4].

Given the mass technological consumption of this new technology, a new learning pattern will dawn over the academic horizon, Mobile Leaning, bringing in new learning opportunities to all.

2. RELATED WORKS

Computer Assisted Learning (CAL) has grown enormously during the past decades and has been enhanced by the recent advances in web-based applications, multimedia technology, intelligent systems and software engineering. CAL may be used by instructors in a complementary way for their courses. Students may use educational software inside and outside classrooms in order to learn, practice and consolidate their knowledge.

They may also use software from remote places in cases where the instructor is far from the student. The quite recent area of Mobile Assisted Language Learning (MALL) has made its appearance during the last decade and is currently widely used to assist in language learning (Virvou et al. 2011). MALL has evolved to support students' language learning with the increased use of mobile technologies such as mobile phones, mobile music players, PDAs and mobile smartphone devices.

3. METHOLOGY

Three instruments were used to collect primary data: a pre-study survey, student reflections for class projects, and a post-study survey. All participants were required to complete the pre-study survey, which was administered one week prior to the beginning of the study. This survey gathered students' views on their use of personal mobile devices; results of this survey determined the students' different TACI classifications (i.e., their degree of comfort with adopting new technology). Based on the types of mobile devices they owned—determined from the results of the pre-class survey—participants were divided into two user groups (A and B) to complete this study's six class projects.

After finishing each class project, all students were required to complete a student reflection as a separate assignment. Approximately one week after all the projects were completed, a post-study survey was administered and collected to re-examine the students' TACI classification score. The post-study survey scores were used as a proxy for understanding how exposure to and use of mobile technologies by a student can impact overall willingness to adopt new technology.

3.1 Participants

A total of 53 MA students in TESOL were recruited from three different graduate classes during the spring 2012 semester at one Central US university. As shown in Table 2, of the 53 students, 17 were male and 36 were female. Participants' ages ranged from 21 years to 50 years. Some students were simultaneously enrolled in more than one class in which they used the mobile devices. Participants varied in their levels of experience as language teachers and came from various countries around the world.

Table 2. *Range of Participants' Ages*

Age	21–25	26–30	31–35	36–40	41–45	46–50	Total
Male	0	2	8	4	2	1	17
Female	13	6	5	4	8	0	36
Total	13	8	13	8	10	1	53

Using the results of the pre-survey, the participants were separated into two groups based on the devices they recorded as owning: Group A consisted of mobile device users and Group B consisted of mobile computer users. These groups were defined in order to compare the results of six class projects in the specialized learning environments as shown in Table 3.

Table 3. *Mobile Device User Groups*

Group	Group A	Group B
Number of participants	25 students	28 students
Registered devices	Apple iPhones, Android Phones, iPads, tablets, and other mobile devices	Laptops, MacBook, Netbooks, and other mobile computers

3.2 Survey Questionnaires

The pre-study survey was used to gather students' perceptions toward new technology such as mobile devices and to determine the students' pre-study TACI classification. The post-study survey was used to re-evaluate students' TACI classification and to investigate how exposure to and use of mobile technologies as a student can impact the students' overall willingness to adopt new technology.

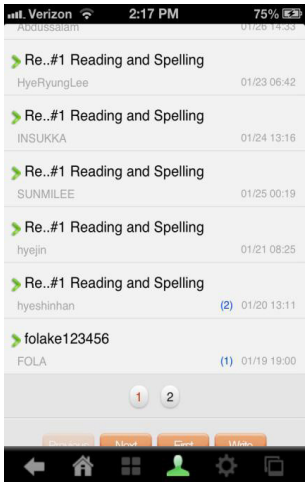
3.2 Class Projects

A specialized learning environment (i.e., a mobile learning site) was created to simplify the students' use of their personal mobile devices, when tasked to complete the different mobile activity assignments. The authors developed the layout and design of the learning environment to support different mobile operating systems (e.g., iOS, Android OS, Windows Phone, etc.), mobile browsers (e.g., the native Android browser, Opera Mini, Firefox, etc.) and to support the significantly reduced screen sizes of their mobile devices. For example, the learning content was fitted to the different screen sizes so that the learners could easily access it with their mobile devices when they logged in to the mobile learning site. Students could post their responses to topic prompts that the instructor had posted on a discussion board and then respond to postings made by their peers.

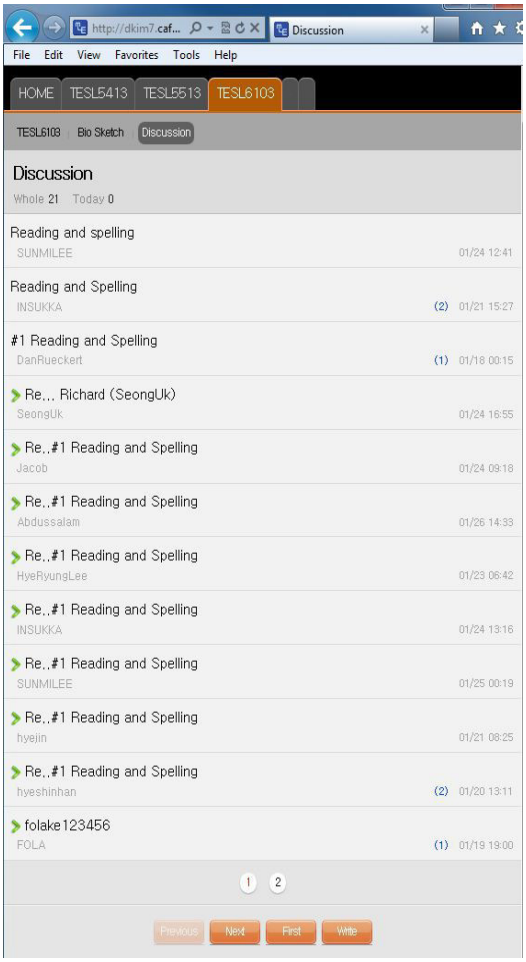
This learning site facilitated the use of social online sites such as YouTube, Facebook, and VoiceThread, as shown in Figure 1.

Class projects were designed according to the following criteria: (a) projects must demonstrate the use of personal mobile devices for connecting, communicating, and collaborating as students create personalized learning experiences; (b) projects must demonstrate the use of personal mobile devices for MLL such as participating in individual and group discussion activities; (c) projects must demonstrate the use of everyday technologies (already known or easily learned) for MLL; and (d) projects must demonstrate both quantitative and reflective information that it promotes new learning experience with mobile technologies.

Based on these criteria, a total of six class projects were generated: a bio-sketch, an online discussion, Spring Break Facebook updates, YouTube video watching, VoiceThread presentations, and YouTube video authoring. These projects shared concerns such as the need to engage with mobile activities and the perceived benefits of using mobile devices to cooperate with others as a way to trigger personally meaningful learning experiences in MLL. All class projects spanned a 12-week period between January 2012 and April 2012. For each project, students were given two weeks to make their contributions.



View of iPhone user



View of laptop user

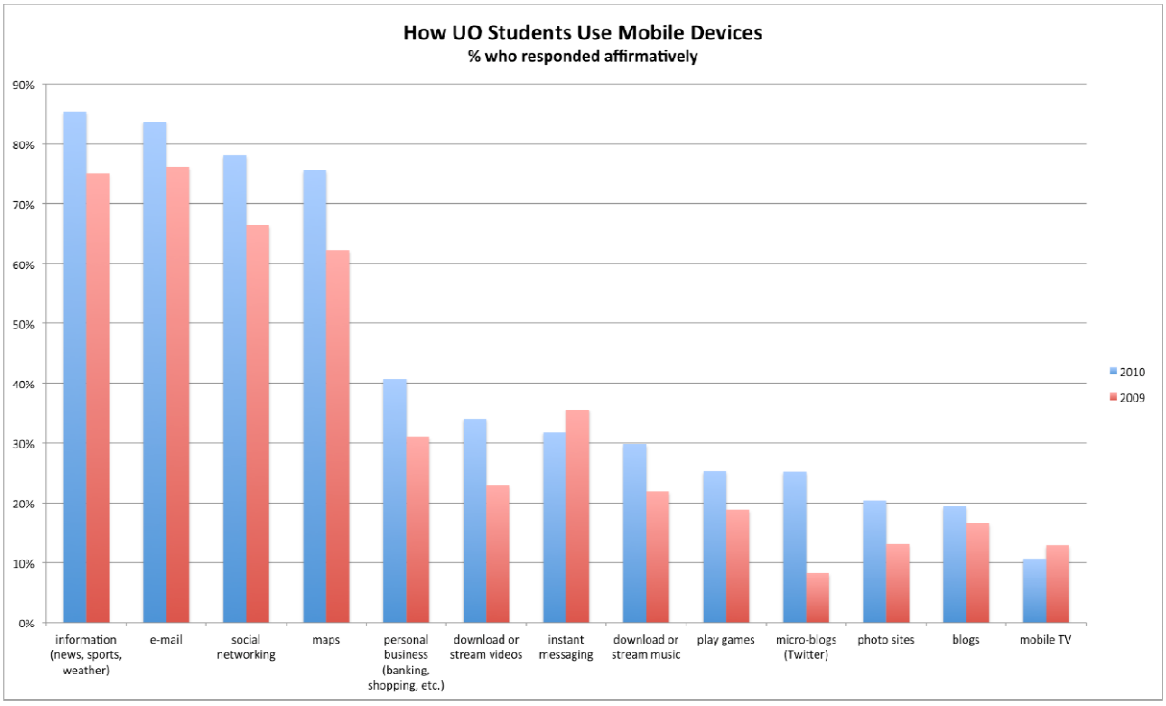
Figure 1:. **An example of the specialized learning environment for different users.**

3.4 Student Reflections

We also sought to document what students thought about their learning experiences with mobile devices. To this end, we developed a student reflection questionnaire to elicit their thoughts and suggestions. We also focused on student resistance and possible reasons why the use of mobile technologies would be resisted. The reflection questions solicited students' thoughts on four categories of interaction with the mobile resources: how to connect, communicate, collaborate, and create personalized learning. Each category more specifically asked about the types of tools students used, the number of times they used their mobile devices, the time period, their feelings about the tools used, and their suggestions for improvements.

4. DATA ANALYSIS AND DISCUSSION

Frequency counts and means are the primary statistical treatment to be used to analyze and interpret the survey results. The mean scores obtained along the different areas will be analyzed using the following scale of equivalents: 4.20- 5.00= "Strongly Agree," 3.40- 4.19= "Agree," 2.60- 3.39= "Neutral," 1.80- 2.59= "Disagree," 1.00- 1.79= "Strongly Disagree." The mean scores ranging from 2.60- 5.00 indicate a *high level of perception* of the respondents which means that they accept and are ready with mobile learning implementation. On the other hand, mean scores ranging from 1.00-2.59 indicate a *low level of perception* which means that respondents may not be ready to be introduced with mobile learning applications.



In 2009, the University of Oregon began participating in the ECAR Study of Undergraduate Students and Information Technology. Today's data were gathered in the 2010 Study of Undergraduate Students and Information Technology.

A.Survey Design

To determine the extent of usage of mobile devices among students, a survey was done among a random population of 151 undergraduate students in a Malaysian university. The response rate was 33%. The objectives of the survey were to check on: (1) students' appreciation towards mobile learning and the popularity of the smart phone; (2) the extent of usage of the different mobile devices and the kind of mobile activities engaged in; (3) and the possibility of bringing in smaller mobile devices like smart phones or PDAs in mobile learning; (4) their expectation regarding when true mobile learning would happen; (5) the reasons for supporting mobile learning. The questionnaire was intended to collect quantitative and qualitative data. In view of the first objective, three statements were given to measure student responses on a 5-point Likert scale from 1-5, where 1 represents "Strongly Agree" (SA), 2 represents "Agree" (A), 3 represents "Unsure" (US), 4 represents "Disagree"(D),5 represents "Strongly Disagree"(SDA). They were: (1) Mobile learning should be supported in this mobile, digital era. (2) Mobile learning is an innovation in education. (3) Among the listed mobile devices - iPod, MP3 player, PDA, Pen Drive, Cell phone, Smart phone and laptop, I rank smart phone to be the best/efficient form of mobile device for mobile learning, available now.

In alignment with the second and third objectives, there were given three questions for which multiple answers could be chosen. (1) "Which of the following mobile devices do you own?" The choices were given as – iPod, MP3 player, PDA, Pen Drive, Cell phone, Smart phone, Laptop. (2) "Devices like mobile/smart phones be very popular learning tools if the following technology issues can be addressed well. Choose the relevant options that you feel are a must." The choices given were: Larger displays/screens, Lower network traffic, Larger memory capacities, Faster data transmission, Technology unification (integration of wireless technologies like 3G, Wi-Fi, WiMAX, bluetooth etc),and Better proliferation/deployment/implementation. (3) "What mobile activities do you do?" The choices given were: Download and listen to music, watch videos, Send and receive emails, Send and receive instant messages, Send and receive short text messages, Send and receive Multimedia messages, Transfer files from one place to another through bluetooth, Play interactive games through internet or through hand held game devices, Transfer photo/audio or other data through hand phones or smart phones. This represented the qualitative part of the data collection.

B.Survey Results — Quantitative Analysis Table 1 show the responses to the three questions whose responses were measured using the Likert scale. 66% of the students were agreeing to the fact that mobile learning should be supported in this mobile era. The mean response was 2.2 with a standard deviation (SD) of 0.9. Both values point to a consistency in agreement to the statement. 84% were of the opinion that mobile learning is an innovation in education.

The respective mean response value of 2.1 and standard deviation (SD) of 0.7 confirms the majority of students are in agreement with the statement. Nearly 90% agreed that laptop is the best/efficient form of mobile device available now. This confirms the popularity of laptops in mobile learning [10]. The mean response here is 1.7 with a standard deviation (SD) of 0.8, which point to a strong agreement in favour of the statement.

Table 1: Responses Of Malaysian University Students

Items	Responses						
	SA	A	US	DA	SDA	Mean	SD
Mobile learning should be supported in this mobile, digital era	10	23	14	2	1	2.2	0.9
Mobile learning is an innovation in education	7	35	6	1	1	2.1	0.7
Laptop is the best/efficient form of mobile device available now	24	20	2	3	0	1.7	0.8

Fig. 2 reveals that the most popular devices among students are pen drives, cell phones and laptops. The users of MP3 players are the next highest category followed by iPods and smart phones. PDAs seem to be the least used mobile device in the list. The findings are in line with the results in [8].

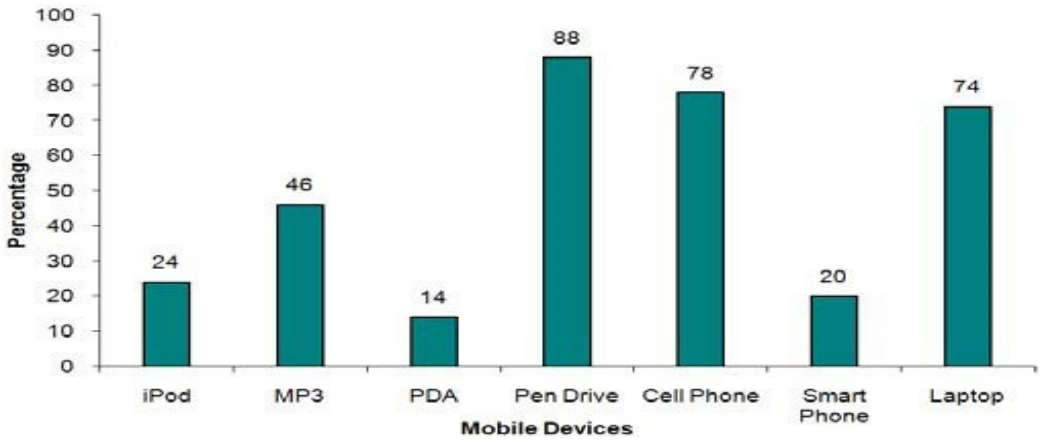


Figure 2. The usage of mobile devices among students.

Table 2 shows the interest of the students in the technology issues to be addressed. More than 50% responses were evident in relation to larger displays, larger memory capacities, faster data transmission and technology unification. Faster data transmission and technology unification seem to have bothered the students more than the others. *Hypothesis: True mobile learning will happen in the next 3-5 years.* Fig. 3 reveals the hypothesis is true from the point of view of the students too. A majority of about 75% have predicted that this would take place within the next five years or less, with the highest percentage of about 40% supporting the technology would be fully active in the next three years. The responses were indicative of the readiness for mobile learning in the campus.

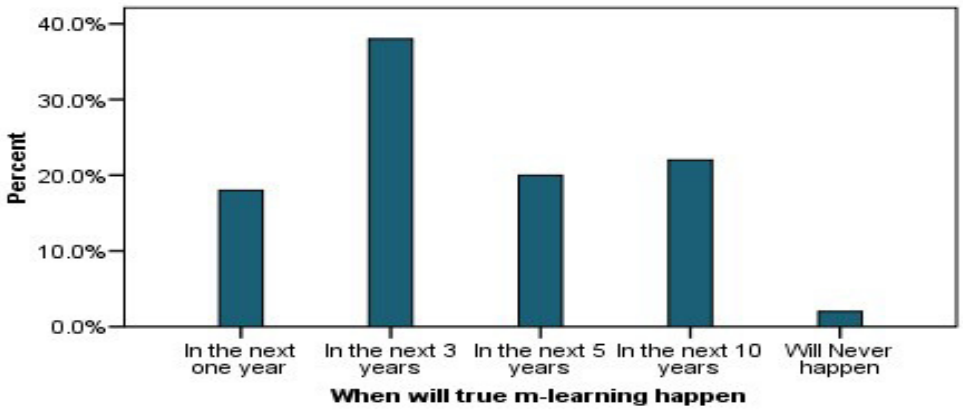


Figure 3:. The expectation of true mobile learning to happen.

Table 2: Technology Issues To Be Addressed In Order To Make Smaller Mobile Devices Popular

Technology issues to be addressed	Percentage
Mobile devices must have larger displays/screens	54
Mobile devices must have lower network traffic.	30
Mobile devices must have larger memory capacities.	52
Mobile devices must have faster data transmission.	64
Mobile devices must have technology unification.	64
Mobile devices must have better proliferation/deployment/implementation	38

Among the kind of mobile activities engaged in by the students, Table 3 shows that sending short text messages, transferring files using the pen drive and email usage top the list. This undoubtedly confirms the modern day trend of high usage of mobile phones, pen drives and emailing via laptops. Still, 50% or more do engage in the other activities listed in the table which shows the popularity of the usage of mobile devices. The findings of table 3 tallies with the results of fig. 2 which also shows the popularity of mobile phones, pen drives and laptops among the different mobile devices owned by the students. It looked as if many of these students were living in a digital world.

Table 3: Type Of Mobile Activities That Students Engage Themselves In

Type of Mobile activities engaged in	Percentage (%)
Send and receive emails	82
Send and receive instant messages	90
Send and receive short text messages	88
Send and receive Multimedia messages	50
Transfer files from one place to another through bluetooth	84
Play interactive games through internet or through hand held game devices	58
Transfer photo/audio or other data through hand phones or smart phones	60

C.Survey Results — Qualitative Analysis

The qualitative comments given by students were in response to the statement: "Mobile learning is an alternate way of learning – Give two reasons to support or not support this." Most of the comments were supportive and we are giving a sample of both type of comments.

•*Supportive Comments:*

1. I support mobile learning as an alternate way of learning. This is because the contents can be retrieved more easily. It also promotes learning without geographical limitations.
2. It is widely used and it has become a need nowadays (although it is still a luxury). We have now entered into an era of technology. We will drop out if we are not updated or not learned.
3. Because if some students don't attend the class, they still can download the audio file that have been provided and will not miss the topic taught in class. It also can be used by those students who miss some parts in the lecture class.
4. With mobile learning, I think I could learn anytime and anywhere without bringing bulk of books or materials around.
5. If all these devices such as hand phone, PDAs and laptop integrated together....mobile learning is fun..
6. I support mobile learning indeed. With mobile learning, students can just repeat the lecture again and again using their iPod or they can save the lecture slides to their PDA so that they can refer back anytime.
7. Mobile learning should be encouraged in the future years, mainly as a way to support our legacy lecture system. I don't mean that attending lecture class should be diminished. Mobile learning should be considered as a way to support teaching in the class, e.g. as a learning supplement.
8. This will definitely make the subject much more interesting to learn. It's a new way to learn, so this might help us to expand our knowledge and live towards the new technology. Hence I support this.

•*Non-Supportive Comments:*

1. I don't support, simply because not every student owns sophisticated electronic gadgets since they are expensive and buying those things doesn't really support studies. In contrary, those electronic gadgets cause students to fool around and entertain themselves.
2. I don't support especially because for teenagers, having classes virtually (e-learning or virtual world classes) could be a problem. Not only that, students tend to get easily distracted, it would be even worse when they are somewhere doing something they prefer than to "attend class".
3. Given the slow development rate of our state, its very unlikely that this feature will be accomplished any time soon, could take ages. Paper documents/ printed out docs are the most efficient for me. They help me to concentrate better when looking at the paper than at a screen.
4. I personally think online media like Blackboard is sufficient enough for learning (no need for IPod, PDA etc).Otherwise learning from textbook is somehow more efficient, because by reading we will get detailed explanation rather than searching anywhere else on the Web because what is available on the net is too brief and not too trustable since everyone can manipulate the information on the Web.
5. It can only act as an added support in learning. It can never be a substitute for classroom learning. The interaction between students-students and teacher-students goes a long way in learning anything.

5. RESULTS

1. The readiness of the students for full fledged mobile learning was very clear.
2. A majority expected true mobile learning to be in vogue within the next 3-5 years.
3. The popular mobile devices used among the students were pen drives, cell phones and laptops. The most popular mobile activities correspond to these devices as well – send and receive short text messages, send and receive emails, transfer files through pen drive.
4. The students raised technology issues like faster data transmission, technology unification of mobile devices, larger display screens and larger memory capacities to be addressed in order to make mobile devices popular.
5. The supportive comments show the students' enthusiasm for podcasting, technology unification of mobile devices. They see m-learning as a means to make the subject interesting and an effective learning supplement.
6. The non supportive comments convey the fear that technology would fully replace the direct teacher-student interaction; non affordability of mobile devices to some students; technology being a distracter to serious study time. Given the overall positive feedbacks and balanced negative feedbacks, the authors conclude there is a great potential of introducing mobile technologies into the teaching and learning process of higher education. These feedbacks are in line with the study done in [11]. The study provides the foundation for the further development and expansion of mobile devices integration in higher education.

6. CONCLUSION

The use of mobile technologies, in particular the non-proprietary android technology, offers many educational opportunities to the stake holders: the students, the instructors, and the administrators. However, as for today, there are many emerging information and communication technologies entering the educational realm that forces practitioners to rethink how this novelty can be judiciously applied to improve the overall learning process. Many educational benefits of the novelty can be easily identified; however, realizing these is not a straightforward process as there is a web of interrelated factors that needs delicate unweaving to ensure effective and efficient implementations in educational institutions.

REFERENCES

[1] G. Vavoula, "KLeOS: A Knowledge and Learning Organisation System in Support of Lifelong Learning," Unpublished Ph.D dissertation, University of Birmingham, UK, 2004.

[2] M. Sharples, "Disruptive devices: mobile technology for conversational learning," *International Journal of Continuing Engineering Education and Life Long Learning*, 12(5/6), 2002, pp. 504-520.

[3] M. Sharples, "Learning As Conversation: Transforming Education in the Mobile Age," in Proceedings of Conference of Seeing, Understanding, Learning in the Mobile Age, Budapest, Hungary, 2005.

[4] June – 2007 - Defining, Discussing and Evaluating Mobile Learning: the moving finger writes - John Traxler, University of Wolverhampton, UK

[5] C. Quinn, M-learning: Mobile, Wireless, In - your – pocket- learning, *LineZine*, Fall 2000. Available: http://www.linezine.com/2.1/features/cqmmwiyp.htm

[6] J. Attewell, "Mobile learning: Reaching hard-to-reach learners and bridging the digital device," in G. Chiazesse,, M. Allegra, A. Chifari, S. Ottaviano Ed., Methods and Technologies for learning. Southampton: WIT Press, 2005, pp. 361-365.

[7] A. Trifonova and M. Ronchetti, International Journal of Information Technology & Computer Science (IJITCS) (ISSN No : 2091-1610) Volume 9 : Issue No : 1 : Issue on May / June, 2013

[8] Cavus, N., & Ibrahim, D. (2009). m-Learning: An experiment in using SMS to support learning new English language words. *British Journal of Educational Technology, 40*(1), 78–91. doi: 10.1111/j.14678535.2007.00801.x

[9] Chen, L., Xie, X., Fan, X., Ma,W., Zhang, H., & Zhou, H. (2003). A visual attention model for adapting images on small displays. *ACM Multimedia Systems Journal, 9*(4), 353–364. doi: 10.1007/s00530-0030105-4

[10] Demouy, V., & Kukulska-Hulme, A. (2010). On the spot: Using mobile devices for listening and speaking practice on a French language programme. *Open Learning*, *25*(3), 217–232. doi: 10.1080/02680513.2010.511955

[11] Denton, D. (2011). Reflection and learning: Characteristics, obstacles, and implications. *Educational Philosophy and Theory, 43*(8),838–852. doi: 10.1007/s00530-003-0105-4

[12] Dugas, C. A. (2005). *Adopter characteristics and teaching styles of faculty adopters and nonadopters of a course management system*. Unpublished doctoral dissertation, Indiana State University, Terre Haute, IN.

[13] Grossman, R. (2009). Structures for facilitating student reflection, *College Teaching*, *57*(1), 15–22. doi: 10.3200/CTCH.57.1.15-22

[14] de Jong, T., Specht, M., & Koper, R. (2010). A study of contextualised mobile information delivery for language learning. *Journal of Educational Technology & Society, 13*(3), 110–125. Retrieved from http://www.ifets.info/journals/13_3/11.pdf

[15] Kim, D., & Kim, D. (2012). Effect of screen size on multimedia vocabulary learning. *British Journal of Educational Technology*, *43*(1), 62–70. doi: 10.1111/j.1467-8535.2010.01145.x

[16] Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *European Association for Computer Assisted Language Learning, 21*(2), 157–165. Retrieved from http://oro.open.ac.uk/16987/2/

[17] Krashen, S.D., & Terrell, T.D. (1983). *The natural approach: Language Acquisition in the Classroom*. New York, NY: Pergamon Press.

[18] Lan, Y.-F., & Huang, S.-M. (2012). Using mobile learning to improve the reflection: a case study of traffic violation. *Educational Technology & Society, 15*(2), 179–193. Retrieved from http://www.ifets.info/journals/15_2/16.pdf

[19] Lu, M. (2008). Effectiveness of vocabulary learning via mobile phone. *Journal of Computer Assisted Learning, 24*, 515–525. doi: 10.1111/j.1365-2729.2008.00289.x

[20] Looi, C.-K., Seow, P., Zhang, B., So, H.-J., Chen, W., & Wong, L.-H. (2010). Leveraging mobile technology for sustainable seamless learning: A research agenda. *British Journal of Educational Technology, 41*(2), 154–169. doi: 10.1111/j.1467-8535.2008.00912.x

[21] Maniar, N., Bennett, E., Hand, S., & Allan, G. (2008). The effect of mobile phone screen size on video based learning. *Journal of Software, 3*(4), 51–61. Retrieved from http://ojs.academypublisher.com/index.php/jsw/article/view/03045161/974

[22] Norton, B. (2000). *Identity and language learning: Gender, ethnicity and educational change*. London, UK: Pearson Education Limited.

[23] Pollara, P., & Kee Broussard, K. (2011). Student perceptions of mobile learning: A review of current research. In M. Koehler & P. Mishra (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2011* (pp. 1643–1650). Chesapeake, VA: AACE.

[24] Rau, P., Gao, Q., & Wu, L.-M. (2006). Using mobile communication technology in high school education: Motivation, pressure, and learning performance, *Computers & Education, 50*(1), 1–22. doi: 10.1016/j.compedu.2006.03.008

[25] Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: The Free Press.

[26] Rueckert, D., Kiser, R., & Cho, M. (2012, March). "Oral language assessment made easy via

[27] VoiceThread!" *TESOL International Convention and English Language Expo*, Philadelphia, PA, March 28–31.

[28] Stockwell, G. (2007). Vocabulary on the move: Investigating an intelligent mobile phone-based vocabulary tutor. *Computer Assisted Language Learning, 20*(4), 365–383. doi:

[29] 10.1080/09588220701745817

[30] Stockwell, G. (2008). Investigating Learner Preparedness for and Usage Patterns of Mobile Language

[31] Learning. *ReCALL, 20*(03), 253–270. doi:10.1017/S0958344008000232

[32] Stockwell, G. (2010). Using mobile phones for vocabulary activities: Examining the effect of the platform. *Language Learning & Technology*, *14*(2), 95–110. Retrieved from http://llt.msu.edu/vol14num2/stockwell.pdf

[33] Tai, Y. (2012). Contextualizing a MALL: practice design and evaluation. *Educational Technology &*

[34] *Society, 15*(2), 220–230. Retrieved from http://www.ifets.info/journals/15_2/19.pdf

[35] Thornton, P., & Houser, C. (2002). M-learning: Learning in transit. In P. Lewis (Ed.), *The changing face of CALL: A Japanese perspective* (pp. 229–243). Lisse, The Netherlands: Swets & Zeitlinger

[36] Valk, J., Rashid, A.T., & Elder L. (2010). Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *International Review of Research in Open and Distance Learning, 11*(1),

[37] Zhang, H., Song, W., Burston, J. (2011). Re-examining the effectiveness of vocabulary learning via mobile phones. *TOJET: The Turkish Online Journal of Educational Technology*, *10*(3), 203–214.