International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Enhancing ICT in Education: Evaluating its Roles and Perceptions in Tertiary Institution

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Abstract: ***Information and Communication Technologies (ICTs) have widely gained acceptance over the years by students, lecturers and institutions, thus playing various roles in teaching and learning processes in tertiary institutions. These roles ICTs play in learning environments have a relationship with their perceived usefulness thus acceptance. This then became the basis for identifying the prevalent roles and underlying student perceptions which necessitated usage of ICTs in a tertiary institution. The study used a survey conducted on samples chosen from the student population engaged in ICT-related courses (forming a total of 180 students) in the conveniently selected tertiary institution. The self-administered questionnaire for collecting data from the sample contained 8 open-ended and 2 close ended questions. The statistical method used for the study was a one way ANOVA and the data was analysed using SPSS. Results showed that students tend to use specialized software more often than internet, computer system and handheld devices. It also revealed that students use the internet for communication, learning and research more than other mentioned ICTs. The results also showed that students had positive perceptions about the use of ICTs in their academic activities and processes. This suggests that the reception is favourable for the integration of more ICTs in the school learning environment. Additionally, from the study, it is concluded that the internet services should be made more accessible to students. Furthermore, it suggests tertiary institutions subsidize the cost of handheld devices for students to encourage their usage.***

Keywords: ICT, education, technology, learning, students.

1. Introduction

Information and Communication Technologies (ICTs) are changing classrooms into more, collaborative, engaging and productive learning environments. It has become incumbent for school authorities to employ one form of ICT or the other in the teaching - learning process and as well as in the management processes of their institution. Nevertheless, technology is never stagnant and all stakeholders need to conform and adapt to various newer technological advancements and innovations. Consequently, these already technology-infused learning environments further provide instructions which can be tailored to student's specific needs, interests and learning styles. The concepts, theories and methodologies in designing, developing and evaluating the teaching-learning processes more effectively in transforming the entire education systems and practices is as a result of the advancement in ICT. For the purposes of this study, we confine the scope to only ICT tools like handheld devices, computer system, internet and special software. The various roles these ICTs play towards learning of tertiary institution students, their usage of ICTs and associated perceptions form the core basis of this study.

A new era of teaching and learning is on the rise: a student-centered, technologically- and socially-rich environment that promises breakthroughs across the educational spectrum [1].These ICTs are changing the way students learn and teachers teach, and influencing the dynamics and reshaping the nature of education. These ICT tools contribute greatly to student net-centric attitude. In a form of computer and network based technologies, they are heavily laden with impressive potential for increasing the access to information and bridging the digital divide.

United Nation Group on the Information Society [2] is of the view that new ICTs have become critical enablers for sustained human development. These technologies are closely linked to developments. Consequently, the educational sector is not left out and in support of this, [3] identified that ICT are crucial disciplines that, when integrated into schools, human resources become more developed and more productive. Institutions globally are employing various forms of ICTs to either complement or replace their traditional teaching-learning processes. The benefits of such moves are vastly impressive and institutions who are rightly applying these technologies are reaping great fruits as well as making great strides. Such institutions are aware of the benefits these technologies have for their teaching – learning process and school management activities. They also adapt various efficient and effective ICTs. Sikkim Manipal University, Ghana seems to be making notable and commendable strides in implementing various ICTs and a few others being experimented before an all-inclusive rollout. This study intends to evaluate the roles and perceptions behind the newer roles of ICT in a tertiary institution.

2. Objectives

The following objectives are framed for the purpose of the study:

1. To identify the subsequent newer roles ICTs play in activities and processes of the selected tertiary institution

2. To assess perceptions of students which influenced newer ICT roles

3. Literature Review

The rapid and continuous development of sciences and technologies and the strong socio-economic transformations are significantly influencing both the social structure and the organization of the educational systems [4]. In a study to identify the impact of education Technology on Student Achievement, [5], pointed that students with access to computer assisted instruction or, integrated learning systems technology or, simulations and software that teaches higher order thinking or, collaborative networked technologies or and design and programming technologies, show positive gains in achievement on researcher constructed tests, standardized tests, and to national tests. A look is then taken at the application of ICTs in the education process.

ICTs in Education

The use of ICTs in education has encouraged teaching and learning through the use of the internet and other electronic media (which is consequently referred to as e-learning). This has contributed immensely to the reach and richness of tertiary education. E-learning recommendation system helps learners to make choices without sufficient personal experience of the alternatives, and it is considerably requisite in this information explosion age [6]. E-Learning is generally meant for remote learning or distance learning, but can also be used in face-to-face mode [7]. Every eLearning system establishes a basic 'infrastructure' of computers, networks, communications and a technical department filled with ICT professionals to consistently maintain and upgrade the infrastructure, train the users and continuously provide technical support as and when required by them [8]. With an understanding of how ICTs are fused into tertiary education, the benefits of ICT technologies are discussed next.

Benefits of ICT technologies

In understanding benefits harnessed from the use of ICTs in education, a look at [9], suggests that goals foreseen for educational technology may be summarized as follows: supporting learning, improving effectiveness and productivity of learning-teaching and of the resources used in these processes, transforming relevant theoretical information into practice, and supporting the instructor. In addition, ICTs are beneficial in the sense that they are also transformational tools which, when used appropriately, can promote the shift to a learner-centered environment [10].

Furthermore, ICTs are widely acknowledged as builders and supporters of organizational processes on a competitive global platform [11]. ICTs not only help tertiary institutions of less developed countries in narrowing the global digital divide and thus producing knowledge-based societies; but also help improve quality of learning and educational outcomes. With these in mind, it then becomes important to review Ghana's situation from a comparative global stance. This is discussed in the subsequent section.

ICT Effectiveness: Comparisons

The 21st century demands ICT skills in all fields, most importantly for education, employment and for everyday life [12]. ICT has been used in science and technology education, and in other areas of the curriculum, for over 20 years [13]. Nations are now adopting it for various purposes and in education. The advanced nations are leading in production and use of ICT however the developing and poor states are also no more unaware of harnessing ICT for development (ICT4D) [14]. In Ghana, ICT for Accelerated Development (ICT4AD) is designed to propel educational technology in Ghana, but unfortunately, there have been issues surrounding its effectiveness [3]. Though some persons were adamant and resistive to change, others have changed their perception of ICT over time. This is because they are aware and had discovered the advantages of some ICT tools and applications being introduced in the classrooms whereby scientific technology are been joined with learning theory in classroom applications. In other words, these persons are of the opinion that the educational system is in a technological revolution and this has also re-shaped the methodology used in teaching and learning. More importantly, the evolution of ICT and the increasing need for efficiency has led to the equivalent formation of physical world processes in the virtual world [11].

Having reviewed various issues concerning ICTs usage and in education, the study is better positioned and the methodology is subsequently discussed.

4. Research Methodology

A surveying methodology was adopted and samples chosen from the student population were for the data gathering process. The study's population included the students engaged in ICT related courses. Of those students, 180 were chosen. In collecting data, a self-administered questionnaire instrument was used containing 8 open-ended and 2 close ended questions. The statistical method used for the study was a one way ANOVA and the data was analysed using SPSS. Using all the above mentioned as the study's methodology, the following however delimits the study.

5. Delimitations

The findings of this study are mainly applicable to the students of ICT related courses in a selected university in Accra and not applicable to other universities students. Only one institution was conveniently selected for this study since studying of other institutions would be not possible for the researchers, owing to constraints of administering and collecting of questionnaires, lack of appropriate funding and duration of the research which might last up to months.

6. Data Analysis and Discussion

Based on the objectives of the study, data was gathered and analyzed with results as presented below: This section presents the results of the study using df= degree of freedom, f= frequency, and sig.= level of significant.

In line with the objectives of the study, identification of newer roles of ICTs was performed under the following categorizations; communication, learning, research and assessment. Furthermore, these ICTs available to students have been categorized as follows: handheld devices between and within groups, computers system between and within groups, internet between and within groups; and special software between and within groups. These were analysed using a one way ANOVA.

Research objective One: *To identify the subsequent newer roles of Tertiary Institutions activities and processes.* Identifying the role of ICT in communication, table 1 shows how students use various ICT's for communication.

Table 1: Students using ICTs to communicate

		Sum of Squares	df	Mean Square	F	Sig.
Handheld Devices for communication	Between Groups	98.348	4	24.587	117.395	.000
	Within Groups	36.652	175	.209		
	Total	135.000	179			
Computer System for communication	Between Groups	46.879	4	11.720	58.067	.000
	Within Groups	35.321	175	.202		
	Total	82.200	179			
Internet for communication	Between Groups	207.067	4	51.767	916.620	.000
	Within Groups	9.883	175	.056		
	Total	216.950	179			
Special Software for communication	Between Groups	194.472	4	48.618	440.197	.000
	Within Groups	19.328	175	.110		
	Total	213.800	179			

Source: Field Source Data

From table 1, there was a statistically significant difference between groups as determined by one-way ANOVA for Handheld devices for communication (F(4,175)=117.395, p =.000), computer system for communication(F(4,175)=58.067, p =.000), internet for communication (F(4,175)=916.620, p =.000), special software for communication (F(4,175)=440.197, p =.000). In this case majority of students use internet more than the other ICTs specified in the study for communication.

Table 2: Students using ICTs to learn

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Handheld Devices for Learning	Between Groups	98.348	4	24.587	117.395	.000
	Within Groups	36.652	175	.209		
	Total	135.000	179			
Computer System for Learning	Between Groups	46.879	4	11.720	58.067	.000
	Within Groups	35.321	175	.202		
	Total	82.200	179			
Internet for Learning	Between Groups	207.067	4	51.767	916.620	.000
	Within Groups	9.883	175	.056		
	Total	216.950	179			
Special Software for Learning	Between Groups	194.472	4	48.618	440.197	.000
	Within Groups	19.328	175	.110		
	Total	213.800	179			

Source: Field Source Data

Table 2 represents how students use ICTs for learning between and within groups. From table 2, there was a statistically significant difference between groups as determined by one-way ANOVA for Handheld devices for learning (F(4,175)= 89.518, p =.000), computer system for communication(F(4,175)= 60.192, p =.000), internet for communication (F(4,175)= 79.245, p =.000), special software for communication (F(4,175)= 84.735, p =.000). In this case, majority of students use internet more than any other ICTs specified in this study for learning.

Table 3 shows how students' used ICTs for research between and within groups. The table further shows that there was a statistically significant difference between groups as determined by one-way ANOVA for Handheld devices for research (F(4,175)= 158.550, p =.000), computer system for communication(F(4,175)= 67.188, p =.000), internet for communication (F(4,175)= 183.137, p =.000), special software for communication (F(4,175)= 28.592, p =.000). In this case majority of students use the internet to a greater extent than other mentioned ICTs for research.

Table 3: Students using ICTs for research

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Handheld Devices for Research	Between Groups	98.348	4	24.587	117.395	.000
	Within Groups	36.652	175	.209		
	Total	135.000	179			
Computer System for Research	Between Groups	46.879	4	11.720	58.067	.000
	Within Groups	35.321	175	.202		
	Total	82.200	179			
Internet for Research	Between Groups	207.067	4	51.767	916.620	.000
	Within Groups	9.883	175	.056		
	Total	216.950	179			
Special Software for Research	Between Groups	194.472	4	48.618	440.197	.000
	Within Groups	19.328	175	.110		
	Total	213.800	179			

Source: Field Source Data

Research Objective Two: *To assess perceptions of students that influenced newer ICT roles*

Table 4: Perceptions of Students that influenced newer ICT roles

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
I am more enthusiastic about the subjects for which involve the use of computers	Between Groups	92.101	4	23.025	98.735	.000
	Within Groups	40.810	175	.233		
	Total	132.911	179			
The use of ICTs reduces my personal interaction with my colleagues and lecturers	Between Groups	54.571	4	13.643	41.734	.000
	Within Groups	57.207	175	.327		
	Total	111.778	179			
ICTs makes provision which favours my style of learning	Between Groups	114.571	4	28.643	90.575	.000
	Within Groups	55.341	175	.316		
	Total	169.911	179			
The internet provides a means of expanding and applying what has been taught in class	Between Groups	155.352	4	38.838	218.599	.000
	Within Groups	31.092	175	.178		
	Total	186.444	179			
With available ICTs, I have access to more information resources than my lecturer offers	Between Groups	159.068	4	39.767	33.802	.000
	Within Groups	205.882	175	1.176		
	Total	364.950	179			
I feel the use of ICTs for various University Processes affects my overall performance	Between Groups	65.941	4	16.485	92.900	.000
	Within Groups	31.054	175	.177		
	Total	96.994	179			

Source: Field Source Data

Table 4 shows results of perceptions of students which influenced newer ICT roles that have been analysed using a one way ANOVA between and within groups at .000 level of significant.

From table 4, there was a statistically significant difference between groups as determined by one-way ANOVA for students who, are more enthusiastic about the subjects for which involve the use of computers ($F(4,175)= 98.735$, $p =.000$), use of ICTs reduces their personal interaction with their colleagues and lecturers ($F(4,175)= 41.734$, $p =.000$), ICTs makes provision which favours their style of learning ($F(4,175)= 90.575$, $p =.000$), internet provides a means of expanding and applying what has been taught in class ($F(4,175)= 218.599$, $p =.000$), claims With available ICTs, they have access to more information resources than my lecturer offers ($F(4,175)= 33.802$, $p =.000$), feel the use of ICTs for various University Processes affects their overall performance($F(4,175)= 92.900$, $p =.000$).

The study thus revealed that amongst all the perceptions which influenced emerging newer roles of ICTs, the Internet providing a means of expanding and applying what has been taught in class was ranked highest.

7. Discussion

The study revealed that with respect to ICTs (handheld devices, computer systems, internet and special software) available in the school learning environment, they were used summarily for communication, learning and research. According to results from the study, situations which prevail in the selected tertiary institution have been discussed under the following categorizations starting with using the Internet for communication.

(i) Using Internet for Communication

The use of the Internet continuously creates newer forms of communication for individual expressions as well as for cohesive community development [15].Research by others have also revealed trends similar to this current study that computer–mediated communication (CMC) environments such as chat rooms, blogs, newsgroups, and multi–user domains (MUDs) and Social Networking Sites have revealed interesting trends in the way individual identity is

presented, language is used and interactions have transpired [15], [16], [17], [18], [19], [20].

Thus, communication mediated through the Internet is an ever-evolving aspect of communication amongst tertiary institutions as it provides efficient, convenient and cost-effective means of exchanging information. The internet goes beyond providing learners a means for communication but as a means for learning which has been discussed subsequently as follows.

(ii) Using Internet for Learning

Portable handhelds and Personal Computers are widely gaining internet functionality granting users extensive access to the internet. The functional screen size (including modes of navigation), portability, multimedia, internet accessibility and other specifications of these devices unleash teaching and learning affordances for the classroom and beyond [21, 22, and 23]. The findings of the study that these Internet-enabled devices were used for learning, is in line with [23] who stated that finding information rather than possessing it or knowing it becomes the defining characteristic of learning generally and of mobile learning especially, and this may take learning back into the community. Chan, Lee and McLaughlin [24]also describe a study where positive learning outcomes have been achieved through experienced university students creating and producing podcasts for novice students on aspects of information technology.

These internet-enabled devices have found their way into the school learning environment and are actively transforming the way students learn and teachers teach. The purposes of the Internet are not exhaustive; they go beyond providing a means for communicating and learning to include aiding academic research. The internet as a means of undertaking academic research has been detailed in the following section.

(iii) Using Internet for Research

As with the finding of this study where Internet was predominantly used for research, many other studies have documented a positive correlation between computer use and various positive educational outcomes, including math and reading test scores [25], school enrolment (Fairlie, 2005), and high school graduation [26]; [27].Although learners access the Internet from a variety of geographical locations, home access allows a degree of flexibility and autonomy difficult to replicate elsewhere [28]; [29].

Since access to the internet is mainly achieved through computer systems and/or handheld devices which possess a positive correlation to learning outcomes, learners successfully also undertake research through these means. Having looked at the Internet as a means for undertaking academic research, its purposes as subsequently viewed as a means of expanding and applying knowledge.

(iv) The Internet as a Means of Expanding and Applying Knowledge

Having access to the internet arms learners with tools and requisite information resources to ensure their success at academic endeavours particularly in the tertiary institution. Various researchers are of the view that the Internet 'blows' up the traditional trade-off between richness (overall quality of information) and reach (number of people involved in the exchange of information) [30]. Weigel[30] applies this framework to higher education institutions and challenges institutions not only to focus on the increased 'reach' but also on 'the wonderful opportunities for enhancing the richness of students' educational experiences'. With its role in education, many educators have positive perceptions about the potential for Internet-enabled learning [31]; [32]; [33]; [34]; [35]; [36]; [37]; [38]; [39]; [40]; [41].

8. Findings

The study showed that students had uses for various forms of ICTs and their usage varied depending on the tasks to be achieved. The Internet comparatively yielded more worth and cut across various aspects of academic activities and processes. Access to the Internet is primarily perpetuated through Personal Computers and/or handheld computers thus indicating a high usage of such devices by learners. Furthermore, learners as per an analysis of their responses had positive perceptions towards the use of ICTs in their academics.

It also revealed that students uses internet for learning more than other mentioned ICTs. Internet availability had been a problem to students in their research. Not all students could afford handheld devices that will enhance learning.

9. Conclusion

The use of various forms of ICTs in education has greatly transformed traditional academic activities and processes. Its role to the overall function of a tertiary institution is crucial and should not be taken for granted as results showed a high reliance on the Internet for their communication, learning and research. Gradually, there is a noticeable shift from teacher-centred forms of instruction because learners have access to even better resources and learning aids. The Internet facilitates these and has to a great extent proven to be comparatively efficient when integrated into academic activities and procedures. Both learners and teachers are innovatively incorporating ICTs into teaching-and-learning activities which send cues to tertiary institutions to realign themselves policy-wise and ICT-provision-wise. This is necessary because there was a noted positive perception towards ICTs and their perceived usefulness in the study.

These conclusions necessitate the following recommendations and suggestions for further study.

10. Recommendations and Suggestions for Further Research

From the study, results showed that there was a heavy reliance on the Internet by learners for their communication, learning and research needs. Since the Internet is mostly accessed through computer systems or handhelds, the prices of such devices primarily used in school learning environments can be waived for learners. Furthermore, access to the Internet should be improved and faster speeds

should be provided to learners so as to aid their academic activities and processes.

To this, tertiary institutions should consider providing more resources to learners through the Internet because students have shown positive perceptions towards the integration and usage of ICTs in their academics. Further research can carried out to take a look at these issues on a larger scale and could include facilitators and school authorities to find out their perceptions on the use of ICTs.

References

[1] Derek E. Baird, Mercedes Fisher (2005-2006). Neomillennial user experience design strategies: utilizing social networking media to support "always on" learning styles, Journal of Educational Technology Systems, Issue: Vol. 34(1) 5-32, 2005-2006
[2] UNGIS (2011).Harnessing Information and Communication Technologies (ICTs) for Development, opportunities and challenges for LDCs. UNGIS Conference, Turkey.(http://www.ungis.org/ThematicMeetingsActivities/HarnessingICTsforDevelopment.aspx)
[3] Gyau, Y. O. (28th October, 2011). Educational and Instructional Technology for Development of Education in Ghana: Adopting the concepts of Seels, Richey and McGriff. Assessed: 11:55am- 10th November, 2013. (http://adcue.blogspot.com/2011/10/educational-and-instructional.html)
[4] EfstratiosPapanis, PanagiotisGiavrimis, Eirini-MyrsiniPapani (2010). The contribution of the Internet into learning, Review of European Studies, Vol 2, (1)
[5] Schacter, J. (1999). The impact of education technology on student achievement: What the most current research has to say.
[6] Huiyi Tan, JunfeiGuo, Yong Li (2008). E-learning Recommendation System, Computer Science and Software Engineering, 2008 International Conference on (Volume: 5) p. 430 - 433
[7] Rimmi Anand, Sharad Saxena, Shilpi Saxena (2012). E-Learning and Its Impact on Rural Areas, International Journal of Modern Education and Computer Science (IJMECS), Vol.4, (5), June 2012
[8] Allah Nawaz, Muhammad Zubair Khan (2012). Issues of Technical Support for e-Learning Systems in Higher Education Institutions, International Journal of Modern Education and Computer Science (IJMECS), IJMECS Vol.4 (2), 2012, PP.38-44
[9] Simsek, N. (2005). Perceptions and Opinions of Educational Technologists Related to Educational Technology. Educational Technology andSociety, 8 (4), 178-190.
[10] Achimugu, P., Oluwagbemi, O., and Oluwaranti, A. (2010).An evaluation of the impact of ICT diffusion in Nigeria's higher educational institutions. Journal of Information Technology Impact, 10(1), 25-34.
[11] Geoff D. Skinner (2010). Information and Innovation Management within Information Technology Enterprises. International Journal of Social, Management, Economics and Business Engineering.Vol.4 (11).
[12] Shaikh, Z. A. (2009). Usage, acceptance, adoption, and diffusion of information and communication technologies in higher education: a measurement of critical factors. Journal of Information Technology Impact, 9(2), 63-80.
[13] Wellington, J. (2005). Has ICT come of age? Recurring debates on the role of ICT in education, 1982–2004. Research in Science and Technological Education, 23(1), 25-39.
[14] Qureshi, Q.A., Ahmad, S., Najibullah., Nawaz, A., and Shah, B. (2009). eLearning development in HEIs: Uncomfortable and comfortable zones for developing countries. Gomal University Journal of Research, 25 (2),47-56.
[15] Huffaker, D. (2004). The educated blogger: Using weblogs to promote literacy in the classroom. First Monday, 9(6).
[16] Calvert S.L., Mahler B.A., Zehnder S.M., Jenkins A. and Lee M.S. (2003). Gender differences in preadolescent children's online interactions: Symbolic modes of self–presentation and self–expression. Applied Developmental Psychology.http://dx.doi.org/10.1016/j.appdev.2003.09.001
[17] Crystal D.(2001). Language and the Internet. Cambridge: Cambridge University Press.
[18] Greenfield P.M. and Subrahmanyam K. (2003). "Online discourse in a teen chatroom: New codes and new modes of coherence in a visual medium," Applied Developmental Psychology, volume 24, pp. 713–738. http://dx.doi.org/10.1016/j.appdev.2003.09.005
[19] Henning J.(2003). The Blogging Iceberg: Of 4.12 Million Weblogs, Most Little Seen and Quickly Abandoned. Braintree, Mass.: Perseus Development Corp.
[20] Turkle S. (1995). Life on the Screen. New York: Simon and Schuster.
[21] Banister, S. (2010). Integrating the iPod Touch in K-12 education: Visions and vices. Computers in the Schools, 27, 121-131. http://dx.doi.org/10.1080/07380561003801590
[22] Gupta, B. & Koo, Y. (2010). Applications of mobile learning in higher education: An empirical study. International Journal of Information and Communication Technology Education, 6(3), 75-87.http://dx.doi.org/10.4018/jicte.2010070107
[23] Traxler, J. (2010). Distance education and mobile learning: Catching up, taking stock. Distance Education, 31(2), 129-138. http://dx.doi.org/10.1080/01587919.2010.503362
[24] Chan, A., Lee, M.J.W., and McLoughlin, C. (2006) Everyone's learning with podcasting: A Charles Sturt University Experience. Paper presented at the 23rd ASCILITE Conference: Who's learning? Whose technology, University of Sydney, Australia.
[25] Attewell, Paul and Juan Battle. (1999). ''Home Computers and School Performance.'' The Information Society15:1-10.
[26] Beltran Daniel O., Kuntal K. Das, and Robert W. Fairlie. (2010). "Home Computers and Educational Outcomes: Evidence from the NLSY97 and CPS," Economic Inquiry, (forthcoming).

[27] Malamud Ofer, and Cristian Pop-Eleches. (2011). "Home Computer Use and the Development of Human Capital," Quarterly Journal of Economics, 126: 987-1027.
[28] DiMaggio, P., E. Hargittai, C. Celeste, and S. Shafer. (2004). "Digital Inequality: From Unequal Access to Differentiated Use." Pp. 355-400 in Social Inequality, edited by Kathryn Neckerman. New York: Russell Sage Foundation.
[29] Fairlie, Robert W., and Rebecca A. London. (2011). "The Effects of Home Computers on Educational Outcomes: Evidence from a Field Experiment with Community College Students," Economic Journal (forthcoming).
[30] Weigel, V. (2000). E-learning and the tradeoff between richness and reach in higher education. Change 33(5), 10-15.
[31] Caverly, D. C., Ward, A. R. & Caverly, M. J. (2009). Techtalk: Mobile learning and access. Journal of Developmental Education, 33(1), 38-39.
[32] Cobcroft, R. S., Towers, S., Smith, J. &Bruns, Z. (2006). Mobile learning in review: Opportunities and challenges for learners, teachers, and institutions. In Proceedings Online Learning and Teaching Conference. Brisbane, Queensland: Queensland University of Technology. http://eprints.qut.edu.au/5399/1/5399.pdf
[33] Cochrane, T. & Bateman, R. (2010). Smartphones give you wings: Pedagogical affordances of mobile Web 2.0. Australasian Journal of Educational Technology, 26(1), 1-14. http://www.ascilite.org.au/ajet/ajet26/cochrane.html
[34] Cornelius, S. & Marston, P. (2009). Towards an understanding of the virtual context in mobile learning. ALT-J: Research in Learning Technology, 17(3), 161-172. http://www.researchinlearningtechnology.net/index.php/rlt/article/view/10874/12547
[35] Demirbilek, M. (2010). Investigating attitudes of adult educators towards educational mobile media and games in eight European countries. Journal of Information Technology Education, 9, 235-247. http://www.jite.org/documents/Vol9/JITEv9p235-247Demirbilek777.pdf
[36] Dyson, L. E., Litchfield, A., Lawrence, E., Raban, R. &Leijdekkers, P. (2009). Advancing the m-learning research agenda for active, experiential learning: Four case studies. Australasian Journal of Educational Technology, 25(2), 250-267. http://www.ascilite.org.au/ajet/ajet25/dyson.html
[37] Guy, R. (Ed.) (2009). The evolution of mobile teaching and learning. Santa Rosa, CA: Informing Science Press.
[38] Kukulska-Hulme, A. &Traxler, J. (Eds.) (2005). Mobile learning. Abingdon, Oxon: Routledge.
[39] Mahmoud, S. S. (2008). A proposed model for distributing e-courses content through mobile technology architectures. Proceedings of the World Academy of Science, Engineering and Technology, 27, 274-289. http://mobilelearninghighered.wikispaces.com/file/view/A+Proposed+Model+for+Distributing+ECourses.pdf
[40] Wang, R., Wiesemes, R. & Gibbons, C. (2012). Developing digital fluency through ubiquitous mobile devices: Findings from a small-scale study. Computers & Education, 58(1), 570-578. http://dx.doi.org/10.1016/j.compedu.2011.04.013
[41] Zawacki-Richter, O., Brown, T. & Delport, R. (2009). Mobile learning: From single project status into the mainstream? European Journal of Open, Distance and E-Learning. http://www.eurodl.org/materials/contrib/2009/Richter_Brown_Delport.pdf