How Use of Technological Devices is related to Students Category: A Review

Satinder Kaur[#1], Simmi Bagga[*2]

[#1] GNDU, RC, Sathiala,
[*2] Sant Hira Dass Kanya MahaVidyalaya, Kala Sanghian

Abstract— : **Today, people recognize ICT devices act as catalysts for change in working conditions, handling and exchanging information, teaching methods, learning approaches, scientific research, and in accessing information i.e. in every field of life. Almost in every university, the technological needs are rapidly growing due to ownership and usage of ICT devices amongst students entering undergraduate programs. Almost all students report owning a mobile phone, laptops and tablets as educational tools, as well as for non-academic activities. Also, distance education learning environments provide tremendous convenience and flexibility to adult learners to engage in education while coping with their limited resources in terms of time, energy and finances with the usage of mobile devices. This paper discusses how different ICT devices are used by different students to perform various activities. It also shows how the adult's aims for education differ from young students and hence, uses of ICT techniques also get varied.**

Keywords— **Lifelong learning, videoconferencing, interactive learning environments, laptops, smart phones, cell phones, tablets, unstructured mobile device use.**

I. INTRODUCTION

ICTs are continually making changes in society. They are influencing every field of life. Because ICTs are providing more and more facilities to students in learning as well as instructors in teaching to individual needs, so, the influences are felt more and more in education. Also, society is forcing schools aptly respond to this technical innovation. Tinio (2002), states the potentials of ICTs in increasing access and improving relevance and quality of education in developing countries. ICTs provide very good facilities to acquire and absorb the knowledge, thus offer unprecedented opportunities to developing countries for enhancing educational systems. ICTs can open access to knowledge in ways which are unimaginable not long ago to poor who live in sense of isolation.

Recent studies about the use of mobile technology determine that students at the post-secondary level frequently use smart phones, laptops, cell phones and tablets (Emanuel, 2013; Grajek, 2011; Pearson Foundation, 2012). In a survey which consists of 403 undergraduate students of varying majors from a single university, 99.5% was found having owned a mobile phone and among them 85% reported the phone they owned was a smartphone (Emanuel, 2013). The same study also showed that 74% of students had been agreed to using their mobile phone during lectures. Furthermore, a nation-wide survey that included 3000 post-secondary students from 1179 institutions realized that approximately 98% of students owned a mobile computer and among them 87% for laptop and 11% for net book (Grajek, 2011). Furthermore, 81% of respondents reported feeling these devices were useful for their educational pursuits. Lastly, tablet is also becoming more popular amongst undergraduate students which had been found by a study of 1206 undergraduates from differing institutions that 25% of participants owned a tablet, up from 7% in the previous two years (Pearson Foundation, 2010, 2012). Moreover, 64% of tablet-owners realized that tablets enabled them to perform better during class (Pearson Foundation, 2012).

Due to the accelerated changes in modern living, education is not become an important to individuals, institutions and society as a whole but every person needs education continuously, especially in the past few decades. Mostly education term is misinterpreted i.e. education has been related to children and the young population, instructed by adults. But the adult population is also interested in the pursuit of knowledge for either personal or professional reasons. Today, adults, as non-traditional students, are also engaged in different activities to continue their education through various forms of learning to attain adequate knowledge in a specific area of study. Some of these forms include self-learning, attendance at seminars, training courses, conferences, workshops, etc. Terminology related to adult education has changed over time, so a new paradigm has been evolved in educational perspectives and teaching practices. 'Continuing education', is a term used in the literature which consists of all learning activities either formal or informal, by which individuals try to upgrade their knowledge, attitude and competencies (Jarvis, 1995; Smith, 2005; Stone, 1986). At present a new term known as 'lifelong learning' indicates a shift from education to learning and it incorporates learning from every aspect of our lives like social relationships, environment, society and culture (Field, 2006; Tight, 2002). There is a lot of difference between adults and other types of students, since adults have more life experience and most of them have already attained the standard education. They are usually inspired from the latest trends used by society and hence, try to learn them to have balance in society. They also need new training and skills for advancement in their profession and career or to satisfy job requirements which are all built on their past learning

experience and practice (Knowles, Holton, & Swanson, 1998). On the other hand, as life becomes more and more complex and technical, different education forms and models have to be developed to enhance the education process in modern society. During the last decade, technological developments have introduced world-wide collaboration through social networking, virtualization of resources and participants through cloud computing, videoconferencing, on-line/off-line e-learning, etc. into the learning process (Brady, Holcomb, & Smith, 2010; Garrison, 2011; Lawson, Comber, Gage, & Cullum-Hanshaw, 2010; Longworth, 2013). Distance education has created new opportunities for information and knowledge transfer, separating the teacher as a source of information, and facilitates the students for time and space problems.

II. MOBILE DEVICE USAGE BY STUDENTS IN INSTITUTIONS

Mostly recent research focuses on the use of mobile devices during lectures, rather than using them during labs and/or seminars. There is a big difference in class size between lectures, labs, and seminars. Lab sessions and seminars have fewer students than lectures. Also labs and seminars are often structured with less focus on passive content reception and more on active, participatory learning. So by nature and objectives labs, seminars and lectures are inherently different and findings regarding the nature of mobile device use in one context will not be easily applied to another. Furthermore, research has also identified another problem with the type of use of mobile devices during lecture (Fried, 2008; Hembrooke & Gay, 2003). For these reasons, this discussion focuses on the use of different mobile devices in large lecture-style classes for different activities.

Unstructured Laptop Use

Unstructured laptop use is a student-directed use of laptop computers in lectures where the teacher largely ignores the use of such technology while delivering course content (often in a traditional lecture-style format) as if laptops were not present in the classroom. Individual student is given the freedom to determine for themselves what constitutes appropriate and inappropriate on laptop use without imposing any constraints. Kay and Lauricella (2011) reported that student show more participation and keen interest in courses when they are permitted to use some mobile device accomplish specific tasks during a lecture or some learning activity. However, they also found that unstructured laptop use was correlated with increased off-task use of technology while reducing on-task use. Kay and Lauricella (2011) established that unstructured laptop use is a poor alternative to incorporating laptops into the classroom. Similarly, Fried (2008) compared laptop users to non-laptop users in terms of distractibility and learning outcomes. His study concludes that students using laptops

were more distracted than those who did not, and that users also scored low while measures of lecture understanding had been evaluated. The study also found that students with unstructured use of laptops had received lower overall course grades even when factors previously identified as correlated to grades were controlled e.g., attendance. Also, Hembrooke & Gay (2003) found that students using unstructured laptops performed significantly worse on tests of recognition and recall after a traditionally delivered lecture than the non-laptop control group. From above three studies, it is concluded that the use of an unstructured laptop format was associated with lower performance than either a structured (Kay & Lauricella, 2011) or laptop-free format (Fried, 2008; Hembrooke & Gay, 2003).

It is reasonable to assume that the use of other mobile devices such as smart phones, cell phones, and tablets in unstructured way would give same results since the instructor delivers the lecture as if these devices are not present and ignores their use. So, this paradigm of unstructured mobile device use gives freedom to students of not only how their laptops are used during lectures, but also how their smart phones, cell phones and tablets are used as well. Due to this common practice, it is important to understand the effect unstructured mobile device use has on student engagement with academic material during lectures.

Mobile Device Use During Lectures

Recent Studies has showed that mobile technology in the classroom was evolving with 93% of students bringing at least one mobile device to one or more lectures each week, and 43.6% bringing at least one mobile device to every lecture (device options included smartphone, laptop, cell phone, and tablet). Though students brought an average of 1.4 devices to the last lecture attended, not all students brought mobile devices to class. 12.2% of students claimed not to have used any devices during the last lecture attended, and 7.0% of students reported they never bring any devices to class with them. Smartphones were the most commonly carried and used device; 64.8% of respondents used a smartphone during their last lecture. Additionally, 33.3% said they bring a smartphone to every class and 69.4% said they bring a smartphone to class at least once a week. Only 30.9% reported never bringing a smartphone to class. Tablets were the least common de-vice. Only 9.4% of respondents reported tablet usage during the last class and 90.2% said they never bring a tablet to class. Figure 1 shows the proportion of students who reported using each device for academic compared to non-academic use. Table 1 provides a finer grained breakdown of usage by activity. The three most commonly reported uses for mobile devices were text messaging (72.7%), taking notes (62.5%) and social networking (45.9%).

Table 1: Student Device Use By Activity (Witecki, G., & Nonnecke, B. ,2015).

Activity Grey= Unrelated to Course Goals Bold= High/Low	% of All Students (Any Device)	% of Laptop Users	% of Tablet Users	% of Smartphone Users	% of Cellphone Users
(1) SMS/Text Messaging	**72.7%**	-	-	**89.9%**	**70.0%**
(2) Taking Notes	62.5%	**85.1%**	38.8%	1.7%	1.4%
(3) Social Networking (Including Facebook, Twitter, etc)	45.9%	56.5%	25.9%	44.4%	6.6%
(4) Email	42.5%	58.9%	37.6%	31.9%	1.9%
(5) Reading the Course Outline or Course Notes Posted on the Course Website	39.5%	80.3%	**40.0%**	4.1%	**<1%**
(6) Surfing the Internet	23.2%	33.1%	18.8%	13.0%	1.4%
(7) Reading Material Related to the Course Other than the Outline or Notes	23.1%	42.9%	28.2%	4.8%	**< 1%**

Adult Education & Technology

Videoconferencing-based educational systems are treated as best solution as it provides tremendous convenience and flexibility for adult students. These systems act as a bridge between the teacher as a source of information and the students. Such interactive learning activities can meet the demands of adult students since they closely resemble face-to-face educational environments and can make students feel like participants rather than isolates even they are far distance apart (Lawson et al., 2010; Murphy, Rodríguez-Manzanares, & Barbour, 2011). Knowles (1980) has developed a theory of 'andragogy' for any form of adult learning in contrast to 'pedagogy'. The andragogical model, as conceived by Knowles, was based on four crucial assumptions of adult learning: (1) self-concept is an assumption that adults do not depend on others to attain something and prefer self-directedness; (2) their experience helps a lot in guiding them their learning activities; (3) they are internally motivated to learn and attain expertise in those subjects that have immediate relevance to their job or personal life; and (4) orientation to learning which indicates a shift from content-oriented towards problem-centred learning. Additionally, motivation to learn was added later as fifth assumption, since he had recognized that adults respond better to internal versus external motivators.

Over the years, the Internet has evolved as the latest highways through which institutions can offer both credit and noncredit distance education courses, by using a variety of asynchronous (two-way communication involving time delay between transmission and receipt) and synchronous (interactive communication) activities. In theory of transactional distance, Moore (1997) hypothesized that, in the hands of progressive teachers, teleconferencing reduce distance for learners as well as make them autonomous. Other researchers have also identified videoconferencing as a new paradigm of online learning environment through interaction and communication that was previously unavailable (Gill, Parker, & Richardson, 2005; Lawson et al., 2010; Taylor, 2009; Y. Wang & Chen, 2007).

There is no difference in facilities for adults and young population to achieve distance education. Still, differences may arise due to their internal nature i.e. due to different motivating factors, preferences, strategies towards learning, already accumulated information and life experience, which adults tend to transfer into their learning situations (Eyitayo, 2013; Knowles et al., 1998; Merriam & Caffarella, 1991; Richardson, 2013). Therefore it is important to understand adult students and their subjective experience before providing them the learning environment. According to Moore and Kearsley (1996), "most distance education students are adults between the ages of 25 and 50. So, distance education is always preferable by adults. Based on adult learning theories, Cercone (2008) examined the characteristics of adult learners and provided an analysis of how these characteristics influence the design of an online learning environment. But still, empirical research that provides guidelines for educational development while predicting adult students' behavior and overall experience from different distance learning environments is almost nonexistent.

On the other hand, researchers have explored the social aspect and used the theory of reasoned actions (TRA) (Ajzen & Fishbein, 1980) to provide information for users' acceptance of modern technologies. Having in mind the lack of literature that explores adult students' behavior, if we approach adult students the same as any distance education practitioner and reuse the variables of technology acceptance models aligned with adult learning theories, we can provide results that explain their nature and subjective experience. Gong, Yang, Huang and Su (2009) have defined a QoE model that focused on the relation-ship between the technical and QoE parameters that consisted of five factors: availability, usability, integrality, retainability and instantaneousness. Still, despite these isolated efforts to define QoE models, many issues regarding identification of influencing factors in distance learning environments remain unanswered and require significantly more research (Malinovski, T., Vasileva-Stojanovska, T., Jovevski, D., Vasileva, M., & Trajkovik, V. 2015).

III. CONCLUSIONS

Since laptop-using and non-using students did not show a difference in activities like to apply course material to life outside the classroom, participating in discussions during lectures, and self-efficacy on evaluations like users of smartphones, it is possible that there s correlation between laptop usage and student's skills engagement. Skills engagement is measured by frequency of engaging in course activities such as taking notes and paying attention in class. The negative correlation between engagement and laptop use was due to maximum time utilization on course unrelated activities, thus decreasing the amount of time spent on activities such as taking notes and paying attention in lectures. Moreover, if a distinction between related and unrelated usage could effectively be made, laptop users genuinely engaged in lecture material and using their laptop to learn may have had a moderating effect on the current results. It is possible, using a laptop strictly for taking notes or other course-related activities may show no difference in engagement, or perhaps even a higher level of engagement as compared to students who do not use laptops.

Tablet use showed an insignificant correlation with overall engagement and performance. This is due to the fact that performance engagement is not strictly related to a student's objective success measures, but also to students' self-efficacy i.e. regarding his ability to achieve desired goals and his perception of how they met those goals from a grade perspective. In other words, it is entirely possible to have excellent grades and low performance engagement, e.g., if a student is unhappy with their own success or doesn't believe they can achieve those grades in future.

Cell phone use has not significantly related with a reduction in overall course engagement as the majority of students did not use a cell phone during class. It is due to the fact that their functionality is more limited than smartphones and are, for the most of time, they are incapable of accessing the Internet. Cell phones may have been brought to class primarily as a communications device for calling for help in an emergency on the way to or from class.

Mostly, the adult population engages in different lifelong learning activities which include self-directed learning, lectures, conferences, seminars, work-shops, etc. They differ a lot in nature than young students as they have different life experiences. They have more motivation for learning than traditional students involved in standard state educational programs for primary/secondary schools, universities, post-graduate studies, etc. But due to limitation of resources and possibilities in terms of time, space and money, adult students can be considered as a special group that mostly prefer advantages of distance learning solutions. It also provides relevant input for the stakeholders of distance education institutions to understand that students' experience is vitally important to the educational process and has to be considered as a relevant factor for their future development plan and proper positioning in the infrastructure of distance learning area.

REFERENCES

[1] Brady, K. P., Holcomb, L. B., & Smith, B. V. (2010). The use of alternative social networking sites in higher educational settings: A case study of the e-learning benefits of Ning in education. *Journal of In-teractive Online Learning, 9*(2), 151-170.

[2] Cercone, K. (2008). Characteristics of adult learners with implications for online learning design, *AACE Journal, 16*(2), 137-159.

[3] Emanuel, R. (2013). The American college student cell phone survey. *College Student Journal, 47*(1).

[4] Eyitayo, O. (2013). Using adult learning principles as a framework for learning ICT skills needed for re-search projects. *Journal of Information Technology Education: Innovations in Practice, 12*(1), 73-89. Retrieved from http://www.jite.org/documents/Vol12/JITEv12IIPp073-089Eyitayo1163.pdf

[5] Field, J. (2006). *Lifelong learning and the new educational order.* Stoke-on-Trent, UK: Trentham Books.

[6] Fried, C. B. (2008). In-class laptop use and its effects on student learning. *Computers & education, 50*(3), 906 -914.

[7] Garrison, D. R. (2011). E-learning in the 21st century: A framework for research and practice. London: Taylor & Francis.

[8] Gong, Y., Yang, F., Huang, L., & Su, S. (2009). Model-based approach to measuring quality of experience. In *Emerging Network Intelligence, 2009 First International Conference on* (pp. 29-32). IEEE.

[9] Gill, D., Parker, C., & Richardson, J. (2005). Twelve tips for teaching using videoconferencing. *Medical Teacher, 27*(7), 573-577.

[10] Grajek, S. (2011). *The current state of college students and technology 2011.* Presentation at the 2011 EDUCAUSE Center for Applied Research Symposium, Chicago, IL, July 29, 2011. Available from http://www.educause.edu/ecar

[11] Hembrooke, H., & Gay, G. (2003). The laptop and the lecture: The effects of multitasking in learning environments. *Journal of Computing in Higher Education, 15*(1), 46 -64.

[12] Jarvis, P. (1995). Adult and continuing education: Theory and practice. London: Routledge.

[13] Kay, R. & Lauricella, S. (2011). Unstructured vs. structured use of laptops in higher education. *journal of Information Technology Education: Innovations in Practice, 10*, 33-42. Retrieved from http://www.jite.org/documents/Vol10/JITEv10IIPp033-042Kay840.pdf

[14] Knowles, M. S. (1980). The modern practice of adult education: From pedagogy to andragogy. New York: Cambridge Books.

[15] Knowles, M. S., Holton, E. F., & Swanson, R. A. (1998). The adult learner: The definitive classic in adult education and human resource development. Houston, TX: Gulf Publishing.

[16] Lawson, T., Comber, C., Gage, J., & Cullum-Hanshaw, A. (2010). Images of the future for education? Vid-eoconferencing: A literature review. *Technology, Pedagogy and Education, 19*(3), 295-314.

[17] Longworth, N. (2013). Lifelong learning in action: Transforming education in the 21st century. London: Routledge.

[18] Malinovski, T., Vasileva-Stojanovska, T., Jovevski, D., Vasileva, M., & Trajkovik, V. (2015). Adult students' perceptions in distance education learning environments based on a videoconferencing platform – QoE analysis. *Jour-nal of Information Technology Education: Research, 14,* 1-19. Retrieved from http://www.jite.org/documents/Vol14/JITEv14ResearchP001-019Malinovski0565.pdf

[19] Merriam, S. B., & Caffarella, R. S. (1991). *Learning in adulthood. A comprehensive guide.* San Francisco: Jossey-Bass.

[20] Moore, M. G. (1997). Theory of transactional distance. In D. Keegan (Ed.). *Theoretical principles of dis-tance education* (pp. 22-38), New York: Routledge.

[21] Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view.* Belmont, CA: Wadsworth.

[22] Murphy, E., Rodríguez-Manzanares, M. A., & Barbour, M. (2011). Asynchronous and synchronous online teaching: Perspectives of Canadian high school distance education teachers. *British Journal of Educational Technology, 42*(4), 583-591.

[23] Pearson Foundation. (2010). *Survey on students and tablets.* Retrieved December 12, 2011 from http://pearsonfoundation.org/downloads/PF_Tablet_Survey_Summary.pdf

[24] Pearson Foundation. (2012). *Survey on students and tablets 2012*. Retrieved from http://www.pearsonfoundation.org/ downloads/PF_Tablet_Survey_Summary_2012.pdf

[25] Richardson, J. T. (2013). Approaches to studying across the adult life span: Evidence from distance educa-tion. *Learning and Individual Differences, 26*, 74-80.

[26] Smith, R. O. (2005). Working with difference in online collaborative groups. *Adult Education Quarterly, 55*(3), 182-199.

[27] Stone, E. W. (1986). The growth of continuing education. *Library Trends, 34*(3), 489-513.

[28] Taylor, T. (2009). Video conferencing: An effective solution to long distance student placement support? *Widening Participation and Lifelong Learning, 11*(3), 44-48.

[29] Tight, M. (2002). Key concepts in adult education and training. London: Routledge.

[30] Tinio, V.L. (2002). ICT in Education: UN Development Programme. (Retrieved from http:www.eprmers.org on December 2009)

[31] Wang, Y., & Chen, N. S. (2007). Online synchronous language learning: SLMS over the Internet. *Innovate, 3*(3), 1-7.

[32] Witecki, G., & Nonnecke, B. (2015). Engagement in digital lecture halls: A study of student course engagement and mobile device use during lecture. *Journal of Information Technology Education: Research, 14,* 73-90. Retrieved from http://www.jite.org/documents/ Vol14/JITEv14ResearchP073-090Witecki0720.pdf

[33] J. Breckling, Ed., *The Analysis of Directional Time Series: Applications to Wind Speed and Direction*, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.

[34] S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, "A novel ultrathin elevated channel low-temperature poly-Si TFT," *IEEE Electron Device Lett.*, vol. 20, pp. 569–571, Nov. 1999.

[35] M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in *Proc. ECOC'00*, 2000, paper 11.3.4, p. 109.

[36] R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, "High-speed digital-to-RF converter," U.S. Patent 5 668 842, Sept. 16, 1997.

[37] (2002) The IEEE website. [Online]. Available: http://www.ieee.org/

[38] M. Shell. (2002) IEEEtran homepage on CTAN. [Online]. Available: http://www.ctan.org/tex-archive/macros/latex/ contrib/ supported /IEEEtran/

[39] *FLEXChip Signal Processor (MC68175/D)*, Motorola, 1996.

[40] "PDCA12-70 data sheet," Opto Speed SA, Mezzovico, Switzerland.

[41] A. Karnik, "Performance of TCP congestion control with rate feedback: TCP/ABR and rate adaptive TCP/IP," M. Eng. thesis, Indian Institute of Science, Bangalore, India, Jan. 1999.

[42] J. Padhye, V. Firoiu, and D. Towsley, "A stochastic model of TCP Reno congestion avoidance and control," Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep. 99-02, 1999.

[43] *Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification*, IEEE Std. 802.11, 1997.

[48] Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.