

Tablets in the Classroom? Effective or a Distractive Engagement?

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ABSTRACT

Today, social changes have made education inevitable and has been made possible at any time and place to the learner. The change in generation, challenges young and mature learners to cope up with the rapid developments and new technologies evolving from time to time. Change is difficult: it either leads to distraction or engagement. New Learning Management Systems (LMS) evolve, making it highly essential for teachers and learners to integrate mobile technology into their learning. Convenience, flexibility, engagement, interactivity and mobility are major factors that make learning more attractive to a learner. Though a wireless device in the classroom could threaten to distract student attention, on the positive side it also enhances student engagement. Research shows that mobile computing devices like the iPad are finding their way into classrooms in growing numbers. With schools of higher education permitting learners to be digitally active within the campus, the distribution of mobile technology “has an impact on teaching, learning and the connections between formal and informal learning, work and leisure”. This study summarises previous research and proposes a clear pathway into future research and planning for a New Trend Learning Environment (NTLE) for portable devices. Implementing such a solution is practically viable and should increase engagement and retention rates of learners of the 21st century and beyond. A framework is proposed to develop and implement a Multi-Media Learning System (MMLS) for portable devices to teach tertiary students in the school of Business and IT at WelTec.

Keywords: Tablets, Multi-Media Learning System, Learning System Management, Effective Engagement, Learner Retention, Portable devices, Android development

INTRODUCTION

Changes in technology not only continue to redefine the current opportunities and possibilities for learning and teaching, but also creates new challenges for pedagogy. Research shows that over the last two decades, colleges and universities have adapted and responded to the internet, email, chat, instant messaging and podcasts much more than expected. The term M-learning or Mobile-learning [1], the next development to E-learning has recently made its way into the literature of tertiary education. With the popularity of mobile technologies among tertiary and school students increasing dramatically, the usage of smartphones and tablets for learning is on the increase. Although students still rate laptops as the majority in terms of usage, research [2] shows that there is a gradual and steeper rise in the use of small devices like mobile phones, tablets and E-readers among tertiary education learners. Convenience, flexibility, engagement and interactivity has been a reason for usage of such devices not only for recreational, but also for educational purposes. More and more applications in the open-source and freeware market will encourage users to adopt such devices for learning. On the positive side, the possibilities offered by modern technology, like the evolution and fast spread of mobile devices and applications, also shows up new opportunities and new challenges to the current education system. With M-learning becoming popular more positive support is achieved for development of newer systems. Collaborative learning provides flexibly accessible learning experiences for both educators and students who are integrated anytime and anywhere beyond a controlled learning space. Strength of digital technology like digital media methods, web

streaming, high resolution displays, portable storage and wireless bring flexibility, functionality, convenience, simplicity, speed, affordability and economic benefits to the end user.

1. TECHNOLOGY ENABLED DISTRACTION OR OPPORTUNITY

The path of technology integration in education is lined with disruptions on one side and opportunities on the other. Though findings “reinforce the importance of anticipating and thinking carefully about the use of laptops and other devices in the classroom” [3], such usage has become highly inevitable and essential within a modern day context. Technology teams work to bring useful technology into teaching, all with good intentions, only to encounter unavoidable side effects such as distraction and disruption in the classroom. The challenges loom large in classrooms with wireless connections, especially when universities give students ubiquitous Internet access and sometimes even the devices for such access. For example, Mobile phones are considered distracting because of problems with ringing during class, cheating, or multitasking, and the camera that comes with many phones can raise privacy issues as well. A recent study [4] on the relationship between undergraduates’ reported levels of “media multi-tasking” or performing multiple, simultaneous activities in different media, including print, television, computer-based video, music, text messaging, instant messaging, web-surfing and email. On measuring their performance in relation to attention towards cognitive tasks, it was reported that “undergraduates who were identified as “heavy media multi-taskers” were significantly more susceptible to distractions than were those who were identified as “light media multi-taskers” [4].

Technology-enabled distraction is a problem that no educator can afford to ignore as ubiquitous and mobile learning environments take a commonplace. Some teachers may use prohibitive methods to prevent or restrict use of technology such as deny permission to students to take computers or mobile phones into classrooms because of the problems of distraction and disruption. However, instead of banning laptops, educators can turn off wireless connections, allowing students to use their laptops to take notes and not much more. Wireless devices in the classroom threaten to distract student attention, however we should also reconsider the opportunities it can offer for student engagement.

A study conducted at the University of Michigan Centre for Research on Learning and teaching (CRLT) examined how in-class use of laptops affect student perceptions of their attentiveness, engagement, and learning [2]. One of the cohorts used laptops on their own with web based tools integrated into the courseware to support learning and teaching. The other cohort used laptops; however for this group, there were no web based tools, nor integration of courseware using technology provided. The levels of engagement at the end of the study revealed “Students enrolled in courses in which they used technology tools on their laptops in class reported higher levels of engagement and learning than students in courses in which the instructor allowed laptops but did not integrate them into instruction” [2].

2. RESTRICTION VS. DISTRACTION AS AN OPPORTUNITY

Despite the distractive nature of the mobile technology currently available, it does not seem likely that laptops, wireless connections, and various kinds of wireless access devices (such as smart phones, podcast players, PDAs, pocket PCs, tablet PCs) will disappear from

universities. It is much likely that their numbers could increase, with universities and tertiary institutions already adopting campus-wide mobile learning programs. Bring your own device (BYOD) is sown as a seed in the mind-set of children in intermediate and high schools. Mobile phones and laptops have increasingly become commodity products and are easily available. Students are increasingly comfortable using wireless devices to organize their academic work, personal lives, and eventually their professional activities once they graduate into the workforce. We have actually reached the point of no return in usage of such technology. Additionally, a “confrontational or restrictive policy might create a "Teacher versus Technology" perception that will not do teachers much good, hurting student-teacher relations and in some cases faculty reputation” [3].

While mobile device usage could directly impact student attentiveness and multitasking ability, a study by Fried shows that the effects of laptops in learning has shown an increase in academic aptitude [5]. He found a significant, negative relationship between in-class laptop use and course grade. Follow-up correlational analysis also revealed that higher levels of laptop use were associated with lower student-reported levels of attention, lecture clarity, and understanding of the course material. “Active engagement even with a distractive toolset could produce positive results in student learning” [6]. Yrjö Engeström uses an "extended activity theory" [7] framework as an analysis scheme for tool-mediated social activities. In this framework, the unit of analysis is not a particular tool but the entire ‘activity’ involving the tool, subject, object, outcome, rule, community, and division of labour, as shown in Figure 1.

The main unit of analysis is the activity system which is “object oriented, collective and culturally mediated” [8].

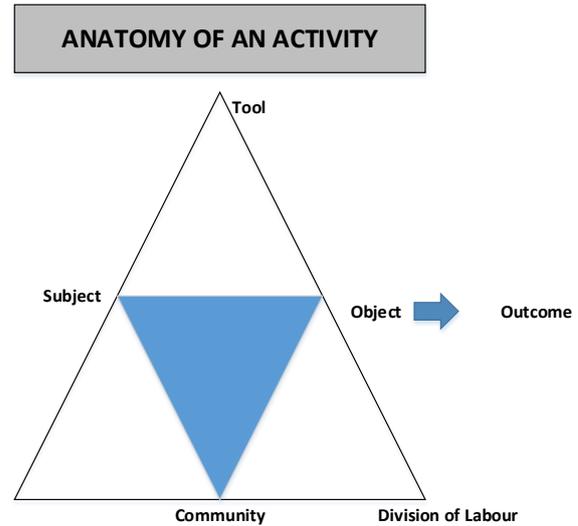


Figure 1: Yrjö Engeström’s extended activity theory model

While the subject of the ‘Activity System’ is the individual or group whose viewpoint is adopted, Object "refers to the 'raw material' or 'problem space' at which the activity is directed and which is moulded or transformed into outcomes with the help of "physical and symbolic, external and internal tools" [7]. It precedes and motivates the activity. Tools mediate the object of the activity. Tools take part in the transformation of the object into an outcome, which can be desired or unexpected. They can enable or constrain activity. Community refers to the participants of an activity system, who share the same object. The division of labour involves the division of tasks and roles among members of the community and the divisions of power and status.

There are several ways to improve a tool-mediated activity. In the case of classroom teaching with computers or other mobile access devices, a focus on tools has been one of the main restrictive methods pursued. Instead, educators should look at other factors in the model, for instance, the rules to use in the classroom to guide appropriate use, community efforts to brainstorm productive uses of technology, divisions of labour among faculty and technology staff, new teaching methods to engage students (subject), and adaptation of

course materials to better deliver content for digital natives (object). We will first explore the influence of mobile devices among a particular sect of students at WelTec (Wellington Institute of Technology), before suggesting a proposal for active engagement.

3. M- LEARNING: A NEW PERSPECTIVE IN TERTIARY EDUCATION

Using this framework as a launch pad in thinking, M-learning or mobile learning will be more productive to deploy in the future by allowing the use of computers or mobile devices in the classroom while keeping distracting effects to a minimum. The term which is the next development or an extension of E-learning, has recently made its way into the literature of tertiary education. M-learning refers to the advantages afforded by mobile technologies such as the latest generation of mobile telephones and tablet computers. Such technologies have the potential to fundamentally change the ways that learning and teaching are carried out, greatly favouring constructivist and collaborative approaches to learning, and flexible and adaptive approaches to teaching. “Mobile computing devices like the iPad are finding their way into elementary school classrooms in growing numbers” [9]. In a recent research on the impact of technology on learning, Laurier asked “How are teachers using iPads to teach and how students are using it to learn? What was the impact of this use of iPads as classroom tools on students’ learning?” First, they found searching for information easier and broader. Second, students valued the ease of access and portability of the devices. And finally, using the iPads as tools was enjoyable, resulting in students’ engagement and motivation. “It makes learning more fun.” [9]

Previous research at WelTec [10] indicated that students show wide interest in the use of digital and mobile devices for course related communication. There has been a wide spread

usage and shift in attitude from office or lab computers to using their own personal digital personal equipment like laptops, tablets and smart phones for accessing course materials and communicating with the course tutor. Figure 2 shows the engagement of students using various tools when given the opportunity to use.

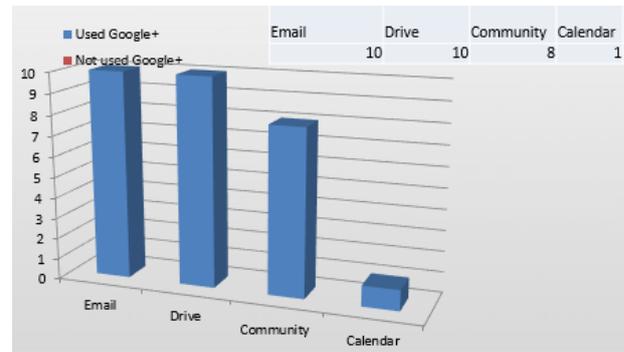


Figure 2: Use of digital communication in a classroom environment [10].

A cohort of students who were given the opportunity of interacting and communicating digitally throughout the course were compared with another earlier cohort of students who had the facility to use them but they were not integrated into the course work.

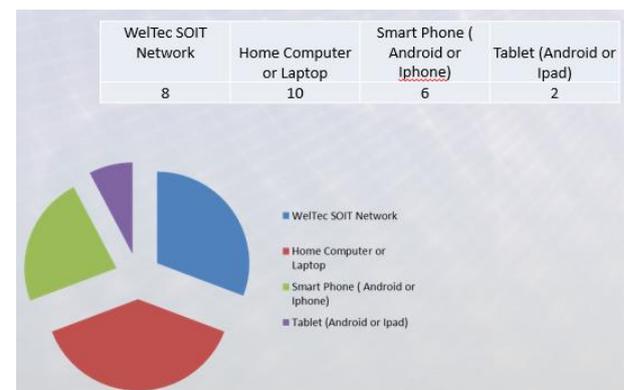


Figure 3: School owned device or BYOD [10]

Interestingly the results showed that the students were fully prepared to be engaged or be adaptable to the M-learning concept. Google+ was used as a benchmarking source to study student engagement in the classroom. A variety of tools within the environment were used. The

results were collated from 50 samples from a Human Computer Interaction classroom; the data was collected in the form of a questionnaire at the end of the course and the results were summarized using Microsoft Excel. A scale of 1:5 was used to simplify the graphs.

Results showed that there was a high number of students participating in the community, which showed their active engagement and sense of participation for active and effective learning. There was a high positive trend from book based learning to active learning. Also the high usage of emails and cloud resources proved an active classroom should reflect in improved student performance. Another similar study was conducted with the same cohort to investigate the response of tertiary students' dependency on "school owned devices" and "Bring your own Devices" (BYOD). Figure 3, shows that a vast majority of students preferred to use their own devices compared to ones already available at the institution.

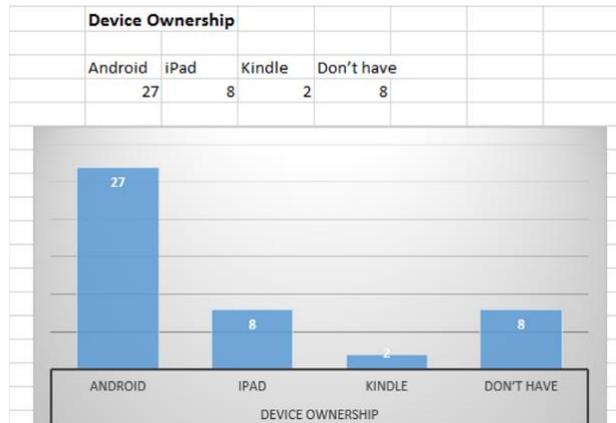
Yrjö Engeström's extended activity theory model proves true here considering the current scenario. When evaluative results were examined between this cohort and an earlier cohort that had similar demographics, it was found that the group that used BYOD and digital communication performed much better than the earlier cohort. Student withdrawals decreased by 4.64% and completions increased by 5.61%. The number of high grade achievers considerably increased in this cohort.

4. USAGE VS ACADEMIA

A recent study was conducted at WelTec with information provided by students studying "Human computer interaction" in one of their tutorial exercises. A class of 52 with an average participation rate of 45 was sampled for the study.

Respondents were asked "Based on your personal opinion and experience, what mobile devices do college students have for accessing and/or engaging with digital content?"

The trend shows that 60% used or preferred to use an Android device, 19% used or preferred to



use iPad devices, a small number (0.044%) kindle and those who did not have to 17.7 %.

Figure 4: Preference of device for M-Learning

Figure 4 shows that a majority of students owned Android devices compared to iPad. Further discussion showed that cost, flexibility and programmability were major factors behind the choice of Android devices compared to others.

Respondents were asked "How do higher education students use mobile technologies (devices and apps) for academic purposes?"

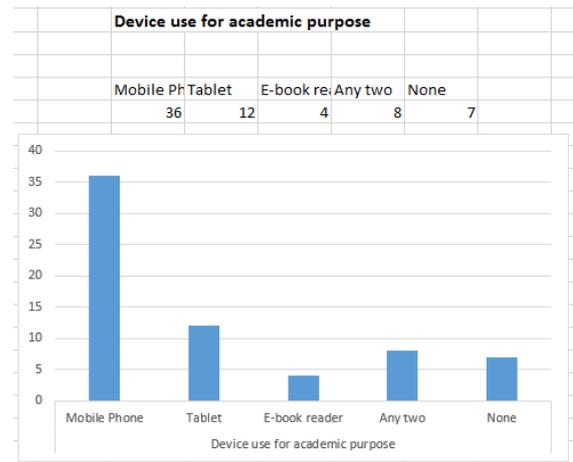


Figure 5: Use of Mobile devices for higher learning

Figure 5 shows some summative results. 80% used or preferred to use mobile phones, 26.6% used or preferred to use tablets, a small number

(8.8%) used E-book readers, and a small percentage used more than two devices while 15% reported as using none.

Significantly, there was a decreasing trend in using tablets for academia, while mobile phones were used commonly for browsing, and searching for information when a laptop or computer was not available.

5. OPPORTUNITY AND CURRENT RESEARCH - NEW TREND LEARNING ENVIRONMENT

A UI study was conducted with Level 4 students in their tertiary education to understand the influence of Interface types and preferred screen sizes. Results suggest that the type of device makes a big difference for academic use. Though the findings are inconsistent with the findings of the ECAR study [1] which emphasises that tablets would emerge as a potentially powerful mobile device in academia, it appears that there has risen a major shift in human perception of size of digital mobile devices within the last couple of years. However, the future could hold a compromise solution in-between a smart mobile phone and a tablet. Further, there is surely a gap between students owning mobile devices and actually using them for academic purposes. However, there is an opportunity here is to facilitate and integrate mobile technologies into the curriculum.

The current project focuses on an application development for a MMLS for portable platforms. One such approach would be a MMLS for mobile media. This project would be an opportunity to integrate mobile technologies and devices with a learning management system called ‘*New Trend Learning Environment*’ (NTLE). This would enable tutors to create and support a dynamic learning environment and as a result, students will avail learning materials irrespective of their presence in the physical classroom. One of the

advantages in the system would be that it is customisable and can be used to integrate technological and pedagogical features into a well-developed virtual learning environment. Students would be able to share resources, take online tests, access their grades, and upload assignments, collaborate with class mates and instructor, and have easy access to course materials. M-learning is becoming one of the fast developing areas in the field of E-education and there are number of researches that support its acceptance to teach tertiary education students [11]. The following research problems will be investigated as part of this project:

- a) How effective is M-learning in the context of promoting learning in different learning communities within New Zealand society?
- b) What would be the impact of mobile learning when it is introduced as an extension of face to face learning and online learning methods?
- c) What are the outcomes when introducing different blends of learning? (e.g., F2F, E-Learn and M-Learn).

The project will be implemented in various stages from initial template and prototype design to the actual development and testing for Android and iOS platforms. The research model to develop NTLE is shown in Figure 6. An approach to implement M-learning using mobile devices is illustrated in Table 1.

The table depicts the way interaction differs among the learning communities. As in the table, the interaction of all four groups are specific. The interaction variation and preferences between various groups of learners poses a strong challenge in the design of such a system as the impact of introducing M-learning on top of an existing F2F learning or an E-learning methods.

Table 1: Interaction Variations among the groups

Data Set	Face to Face (F2F)Interaction	Online Interaction
A1	√	√
A2	X	√
A3	X	√
A4	X	X

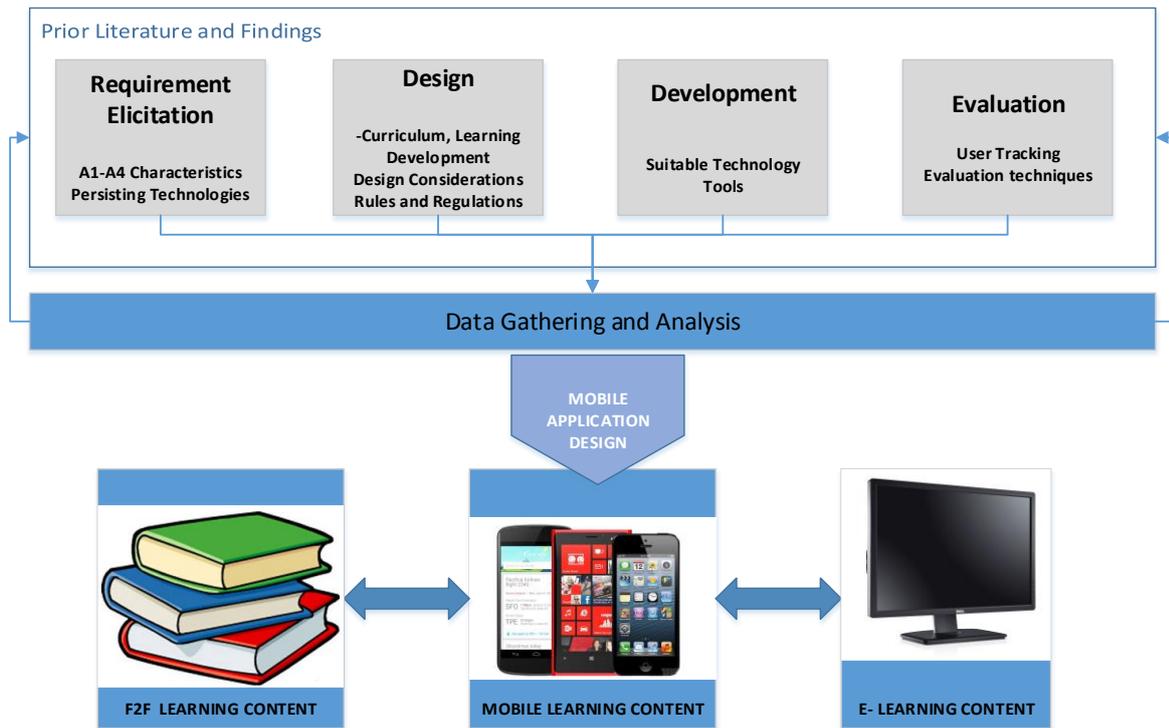


Figure 6: A suggestive framework for the development of NTLE

It would be interesting to observe how the new mobile learning methodology would impact their current learning style and attitude towards learning. The test target group would be divided into four different data sets based on their interaction and exposure to virtual learning environments. Here is a sample of the four different communities possible:

- a) Students who are already in a F2F tertiary environment identified as A1,
- b) School leavers who are not currently in a F2F tertiary environment, but have the mutual interest with respect to studies and expectation in higher education identified as A2,
- c) School leavers who are not attending any F2F programmes at the tertiary level, but have an interest to undertake a programme online, identified as A3 and
- d) School leavers who are not attending nor planning to attend any F2F programmes identified as A4.

The research method used will be “design based approach” [12], since it has been found as one of the appropriate research methods in exploring possibilities for creating novel learning and teaching environments. The main development phases in this project will be Requirement, Elicitation, Design, development and Evaluation. The user groups will be selected from specific programmes in Levels 4-6, School of Information Technology at WelTec and a people group yet to enter into tertiary education.

Currently, the project is under the development phase. Use cases and Use case diagrams are under development. Sooner, Story boards and wireframes would be under development once the E-R diagrams are finalised and relationships established. Discussion on the Implementation phase and further updated results of the project would be presented in subsequent journals and conferences of relevance and interest.

6. CONCLUSION

Mobile learning in New Zealand higher education is on the rise. Students use their mobile devices mostly for self-directed informal learning rather than in the formal academic context. However it is challenging to get an accurate picture of academic use. It is time for a ‘New Trend Learning Environment’. As the use of mobile technologies are growing dramatically in the field of teaching and learning, several mobile learning initiatives are underway targeting different aspects and different target groups. But most of the initiatives promote a business model in addition to the aim of providing a feasible learning solution. Our study differentiates by providing an M-learning solution based on existing F2F and/or an E-learning curriculum for undergraduates, which tries to identify the effectiveness of M-learning in these learning communities [13].

Firstly, it would be an awesome challenge to promote opportunities to increase student access to mobile tablet devices, such as through increased library loans and campus discount programs from manufacturers. Secondly, wide range of applications for dedicated use of students for searching, data manipulation, mind mapping could be identified in the near future. Thirdly, NTLE will pave way for a virtual classroom much different from E-learning experience to an M-learning experience.

In summary, use of computers or mobile devices in the classroom by harnessing their powers while keeping distracting effects to a minimum should bring positive values and increase productivity and retention rate among tertiary learners.

REFERENCES

[1] Smith S.D and Caruso J.B, “The ECAR study of undergraduate students and information

technology,” *EDUCAUSE, Center for applied research*, 2010.

- [2] Z. Erping, K. Mathew, D. Charles and B. Inger, “Use of Laptops in the Classroom: Research and best practices,” Center for research on Learning and Teaching, University of Michigan, 2011.
- [3] B. Fisher and G. Frey, “Research on In-Class use of Laptops and other devices: Effects on Student’s learning and Attention,” Washington University in St. Louis, Washington, 2014.
- [4] E. Phir, C. Nass and A. Wagner, “Cognitive learning in media multitaskers,” *Proceedings of the national academy of sciences*, vol. 106(37), pp. 15583-15587, 2009.
- [5] C. Fried, “In-class laptop use and its effects on student learning,” *Computers & Education*, vol. 50, no. 3, pp. 906-914, 2008.
- [6] B. Fang, “From Distraction to Engagement : Wireless devices in the classroom,” 2009.
- [7] M. Elizabeth and A. Maria, “Using Activity Theory and Its Principle of Contradictions to Guide Research in Educational Technology,” *Australasian Journal of Educational Technology*, vol. 24, no. 4, pp. 442-457, 2008.
- [8] Y. Engeström and R. Miettinen, “Introduction,” in *Perspectives on activity theory*, Cambridge, Cambridge University Press., 1999, pp. 1-18.
- [9] Laurier, “21st century learning : Ipads in the elementary classroom,” *Inspiring lives*, 2013.
- [10] S. Sudhakar, “Learning made interactive and effective with Google+™,” in *Making Connections*,, 2013.
- [11] R. J and et.al., “iLearning : The future of higher education? Student’s perceptions on learning with mobile tablets,” *Journal of the*

- scholarship of Teaching and Learning*, vol. Vol 12, no. 2, pp. 1-26, June 2012.
- [12] The Design-Based Research Collective., "Design-Based Research: An Emerging," *Educational Researcher*, 2003.
- [13] S. Kanbul and H. Alamaki, "Mobile learning in teacher training," *Journal of Computer assisted learning*, vol. 19, no. 3, pp. 165-175, 2003.