

# UNDERSTANDING NEW WAYS OF LEARNING IN THE 21<sup>ST</sup> CENTURY: A PRELIMINARY STUDY INTO MOBILE TECHNOLOGIES

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## ABSTRACT

In this paper, we describe a theoretical framework and design of a study of mobile technologies in a first year university course, where students use mobile phones, or “smartphones” as cognitive tools. The paper describes a broader study into the use of mobile technologies with authentic learning environments, and then outlines a plan for an investigation into the nature of use of the devices in the completion of an authentic task.

## KEYWORDS

mobile learning, mLearning, science education, PDA, mobile phone

## 1. INTRODUCTION

With the rapid development of hand-held computer technologies, associated with the parallel development in wireless communications, in the first decade of the 21<sup>st</sup> century, the ready availability and uptake of devices such as mobile phones, personal digital assistants (PDAs), mobile media players and more recently smartphones (a hybrid of the functionality of a personal digital assistant and a mobile phone), have created an unprecedented change in the way people communicate, socialise and entertain themselves. Time saving and productivity features of these devices have impacted on the way businesses and institutions operate and the manner in which people organise their daily lives.

However, in this paper we argue that despite the fact that they are frequently used for convenience and communication, little use has been made of these convenient and ubiquitous tools in ways that facilitate and enhance higher order thinking. Further, only minimal research has been conducted into the use of these third generation technologies for learning in higher education. In pursuing this theme, we describe an exploratory study into the use of ‘Smartphones’, that is part of a larger study on mobile learning.

Mobile learning can be defined in a very broad sense as any form of teaching or learning that happens when a learner is interacting with mobile hand-held devices such as PDAs, mobile phones and laptops (*M-learning*, 2006; Wood, 2003). While it has accurately been described as “... an emergent paradigm in a state of intense development...” (O’Malley et al., 2005) few universities have adopted widespread m-learning technologies, and in those that have, it is arguable that few are using them in pedagogically appropriate ways. For example, consider the widespread and rapid adoption of podcasts, not as an inventive way to expand the range of resources available to students, but as vehicles for the more convenient distribution of conventional lectures.

Despite the potential of mobile technologies to be used as powerful cognitive tools (Jonassen & Reeves, 1996) within a more constructivist approach to teaching and learning, their current use appears to be

predominantly within a didactic, teacher-centred paradigm. This trend in the use of mobile devices is following a typical pattern where educators revert to established pedagogies as they come to terms with the affordances of new technologies, referred to by Mioduser et al. (1999, p. 758) as “one step forward for the technology, two steps back for the pedagogy”.

The purpose of this paper is to present an overview of a design for a preliminary study, to be conducted in the first semester of 2007, into the use and educational potential of an m-learning tool by a group of pre-service teachers taking a compulsory Information and Communication Technologies class as part of their training.

## 2. COGNITIVE TOOLS AND LEARNING TASKS

Learning tasks should, as far as possible, be embedded in the target context and require the kind of thinking that would be done in real life (Lave & Wenger, 1991; Brown, Collins & Duguid, 1989). In developing a theoretical framework for this project the concepts of *situated cognition* and *authentic learning* (Herrington & Oliver, 2000; Herrington & Herrington, 2006) are used as the foundation where the learning requires social interaction and collaboration. The application of knowledge to everyday problems requires consideration of the context in which the problem arises since a suitable response takes much of its meaning from the situation being presented. The work of Jonassen and Reeves (1996), who explored the theoretical parameters of technology as cognitive tools, has also been used, describing them as “...reflection tools that amplify, extend, and even reorganise human mental powers to help learners construct their own realities and solve challenging tasks. However, the enormous potential of cognitive tools can only be realized within a constructivist framework for learning” (p.699). This point has also been argued by Ferry, Hedberg and Harper (1999) who pointed out that the context of use of cognitive tools is critical to their effectiveness.

With cognitive tools, Jonassen (1994) contended :

The technologies are taken away from the specialists and given to the learner to use as media for representing and expressing what they know. Learners function as designers using the technology as tools for analyzing the world, accessing information, interpreting and organizing their personal knowledge, and representing what they know to others. (p. 1)

Jonassen & Reeves (1996) summarised the research into the use of cognitive tools and identified the following key principles in the context of multimedia design:

- Cognitive tools have the greatest effectiveness when applied to a constructivist learning environment;
- Cognitive tools empower learners to design their own representations of knowledge rather than absorbing knowledge representations of others;
- Tasks for the application of cognitive tools should be situated in authentic contexts.

Several research studies and projects have examined the educational potential of m-learning from an identified theoretical perspective (O'Malley et al, 2005; Fishman et al, 2001). The underlying theme drawn from this body of work is that guidelines are needed to effectively utilise m-learning technologies in higher education settings. Further, Peters' (2005) research has demonstrated that the delay in introducing m-learning can be attributed to a lack of institutional capacity to develop materials and provide ICT support rather than the reluctance of learners to engage with this third generation of learning technologies.

In this paper, we describe a plan for research into the use of mobile devices (specifically *Smartphones* and its loaded programs) as cognitive tools. The proposed work is one study in a larger project of over ten implementations, where mobile technologies are used in higher education to promote problem-solving and higher order thinking within authentic learning environments. Specifically the project aims to:

1. Investigate the potential uses or “affordances” of personal mobile devices within higher education;
2. Implement the use of m-technologies with an authentic task in a series of learning activities in a range of subject areas;
3. Develop pedagogies appropriate to the use of m-technologies within an authentic learning environment;
4. Describe, categorise & disseminate resultant pedagogies & professional development activities to a wider audience.

### 3. THE STUDY

In a report on the future of mobile technologies Anderson (2005) states: “Within the market place the rising dominance of converged smartphone devices continues as, in parallel, the share of the ‘pure’ PDA device declines”. In this study each student will be issued with a Palm Treo 680 Smartphone – containing email & messaging functionality, web access, MP3 player & VGA camera. Software components include Word, Excel, Powerpoint and PDF support.

This initial study will draw from a cohort of undergraduate pre-service secondary school teachers from the University of Wollongong and will follow an action learning approach. Volunteers will be called from an introductory information and communications technology class that is a core subject for both the Bachelor of Mathematics Education and Bachelor of Science Education courses offered by the Faculty of Education.

The ICT subject includes a task where student learn presentation software, such as PowerPoint, and use it to make a presentation to a group such as children in mathematics or science classes, parents or teachers. In the study, students will be engaged in completing a multimedia authoring task as part of their assessment for the subject and will be asked to use the smartphone to assist in the development of their project. Students will be given the following task:

In this assignment, you will work with a partner to explore the different ways that presentation software is used, and can be used, in classroom settings, and then prepare your own innovative presentation to share with the class.

You and a colleague operate a consultancy service specialising in Mathematics and Science education and training. Your firm has been contracted to deliver a series of training courses for a group of beginning teachers on one of the following topics:

- Mathematics is everywhere
- Science is everywhere

The smartphones will be introduced to the task, and students will use them as cognitive tools to enable them to engage more deeply with the content, and to use the phones to enhance the communication and production aspects of the presentation. For example, students will be able to use the camera for visual images and video to include in their presentations; they will be able to use the voice memo function for interviews with experts or stakeholders; and they will be able to use the documents function to upload advance organizers and heuristics for developing higher order thinking and problem solving skills, as well as more functional documents such as guidelines for using PowerPoint, or task requirements. They will be able to use texting functions of the phone for communication, and utilise the storage capacity of the device for storing and transferring the PowerPoint file.

This exploratory study will focus on learner experiences with the tool in the context of developing an authentic learning environment. Additional support for the development of the task and use of smartphone will be available on the subject website. The study will examine ways in which information related to the assigned task was accessed and interpreted, what use learners made of the smartphone and whether the use of the support website had an impact on the quality of the assignment presented. Data will be collected through student interviews, completion of a questionnaire, student diaries, and a record of artefacts on the smartphone.

### 4. CONCLUSION

Mobile technologies and the concept of m-learning continue to evolve as advances in wireless technologies rush to meet the demand of consumers for faster, more effective tools to communicate, socialise and inform. It is our aim in this study to also explore whether these devices are the cognitive tools of choice for university students, and how they use them to extend and enhance their thinking and learning.

Derry and Lajoie (1993) have argued “the appropriate role for a computer system is not that of a teacher/expert, but rather, that of a mind-extension cognitive tool” (p.5). One of the challenges for practitioners in the higher education sector is to develop pedagogies that enhance the possibility and effectiveness of anywhere, anytime learning. It is possible that mobile technologies can achieve this with

even more effect than computers have done over the past two decades. This research largely remains to be done.

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