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## **Incorporating mobile technologies within constructivist-based curriculum resources**

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## CHAPTER 6

# Incorporating mobile technologies within constructivist-based curriculum resources

Anthony Herrington

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### Abstract:

*In the context of an introductory postgraduate subject on ICT in education the aim of this research was to evaluate postgraduate education students' abilities to develop appropriate pedagogical strategies for the use of mobile technologies in constructivist learning environments. The postgraduate students were all working in educational settings. The results indicate that the affordances of mobile devices can be embedded in constructivist based curriculum resources especially in tasks that involve students learning as they are mobile such as in fieldwork and excursions. The devices also appear well suited to be used in tasks that involve connectedness with other technologies such as web 2.0 and learning management systems.*

### Introduction

The aim of this research was to investigate the educational potential of incorporating mobile technologies in the postgraduate student design of curriculum resources that adopted a constructivist perspective on learning. The rapid advancement in the use of educational technologies has occurred in parallel with notions on learning. It is recognized that adult learners particularly those enrolled in postgraduate courses will have ready access to current technologies and a motivation to learn (Mason, 2006); it is not clear, however, how well equipped these students are at utilising these technologies in educational environments that reflect current theories of learning.

A recent survey of postgraduate student use of mobile technologies suggests that although ownership of the devices is quite high, their use for personal and student centred learning is limited, indicating a need for educators to provide initial support and guidance (Pettit & Kukulska-Hulme, 2007).

A critical understanding of pedagogy is necessary for those studying education; and constructivism and its various off shoots continues to be the predominant theory of learning. Honebein (1996, p.11-12) suggests seven approaches necessary to create constructivist learning environments:

1. Provide experience with the knowledge construction process
2. Provide experience in and appreciation for multiple perspectives
3. Embed learning in realistic and relevant context
4. Encourage ownership and voice in the learning process
5. Embed learning in social experience
6. Encourage the use of multiple modes of representation
7. Encourage self-awareness of the knowledge construction process

The approach taken in this study was to engage postgraduate students in a constructivist learning environment where they would learn about both the theory of constructivism and the use of mobile devices in learning. Mobile technologies appear to offer many affordances in such contexts (Patten, Arnedillo Sanchez & Tangney, 2006) and are rapidly becoming part of mainstream education (New Media Consortium & Educause, 2008).

Students were set a task that was flexible enough to be relevant to their work place, where they would develop curriculum resources that required the use of mobile technologies by their own students.

## **Context of the study**

The curriculum resource task was part of the assessment of a postgraduate subject in ICT in Education titled *Introduction to technology in education*. The subject was designed to:

- Develop students' theoretical and practical skills in designing, developing, and evaluating teaching and learning environments using a variety of instructional systems, particularly using information technologies.
- Review the research into learning and instructional design of information technology based systems.
- Review areas for the development of information technology in education and training such as interactive multimedia and alternative delivery systems.

Students could access the subject through face to face class sessions held fortnightly over a thirteen week semester and or could flexibly access the subject through a learning management system site which provided subject readings, resources and communication through threaded discussion boards.

The subject contained three separate assignments. The first assignment asked students to describe how technology is used in a context relevant to either their learning or teaching or both, explain what and how technologies are used and discuss some of the significant issues that arise in the use of technology in education. The second assignment, which formed the basis for this research, required students to create a curriculum resource using mobile devices that adopted a constructivist perspective. A third assignment required students to create a web site to present research around a current topic involving technology in education such as online communities of practice.

The research was carried out with a class of 21 students coming from a variety of technological, educational and cultural backgrounds each with the intention of entering or furthering their careers as educational designers, teachers or trainers in the school, university, vocational education, or adult and community education sectors. The students were a mix of domestic and international students from a range of professions, many of whom were school teachers, nurse educators, TAFE teachers and recent IT graduates.

## Research questions

The research focused on the following questions:

- How do teachers/trainers develop curriculum resources that make use of mobile technologies within constructivist learning environments?
- How are the affordances of mobile technologies used in the curriculum resources? What uses were made of the mobile technologies that would have been difficult or impossible without them?
- What pedagogical strategies were required to assist the teachers/trainers use of mobile technologies as cognitive tools for their curriculum resources?

## Method

Students were required to engage in the subject readings on topics that included theories of learning, instructional design approaches, and mobile technologies and complete the following assignment task:

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### The task

#### Designing a curriculum resource

Using a constructivist perspective the students were required to design a resource for teachers/trainers that exploited the affordances of mobile technologies. In the curriculum resource, they were to provide the following:

- A rationale for using mobile technologies
- Aims and learning outcomes
- Outline of a challenging activity for learners
- Guidelines for teachers/trainers
- Additional teacher/student resources
- Outline of assessment

A voluntary workshop was organised to help students become familiar with a constructivist approach to learning using a mobile devices. The workshop showed students how to use a smartphone and various other web based technologies to create a digital narrative (McGreen & Arnedillo Sanchez, 2005). This involved a problem solving activity where students collaboratively used the smartphone to collect digital media (pictures, video and audio) combining them to create a video digital story that is then shared with their colleagues.

#### Introductory activity

Students were introduced to the activity where they were shown an example of a digital narrative created by the author. Students were then grouped in pairs and asked to think up a story where they could create a 2-3 minute video using prompts selected from a provided 'bucket' of children's figurines and toys. Students were asked to complete a brief story board prior to shooting any of the scenes. Pictures and videos were then taken to represent the story and they were downloaded to computers and imported into iMovie where

students used voice overs and imported iTunes to create the digital narrative.

The session concluded with presentations of each story and a discussion of the affordances of the smartphone and characteristics of constructivist learning environments. These ideas were supplemented with readings available on the subject LMS site.

The students already had access to the smartphone some weeks before the assignment was due for implementation and submission. The idea here was to let students become aware of a particular mobile technology and what it was capable of doing following a short presentation given by the lecturer. Students had the option of using their own sim cards and using the device as their regular mobile phone.

### **The survey**

Following the completion of the subject and after grades had been finalised, all students were asked to participate in the research and complete an email survey on the assignment task with these questions:

- Can you describe your intended use of mobile technologies in your curriculum resource?
- What would be the advantages of using mobile technologies?
- What would be the disadvantages or challenges of using such devices?
- How would you prepare teacher/trainers for the use the devices in your curriculum resource?
- How would you prepare students for the use the devices in your curriculum resource?
- Did you feel sufficiently prepared to create curriculum resources using mobile technologies?
- What were the most difficult aspects of creating the curriculum resource?
- What were the most positive aspects of the task?
- What other pedagogical uses can you think of for mobile technologies?
- What advice would you give to other teacher/trainers wishing to implement activities that use mobile technologies?
- What principles of good use can you suggest that have emerged out of your use of mobile technologies during the course of the activity?

Each student's curriculum resource was viewed and analysed.

## **Results**

The results of the survey and observations of the final products will be considered in relation to each of the research questions:

### **How do teachers/trainers develop curriculum resources that make use of mobile technologies within constructivist learning environments?**

As would be expected from any assessment task a wide range of abilities was in evidence. Generally most of the students had come to grips with the set readings on constructivism and were able to provide

sound rationales for using mobile technologies to support the main tenets of constructivist learning environments. The arguments for using mobile technologies were also well appreciated. Interestingly, most of the students chose to base their curriculum resource on the use of smartphones possibly due to the experience of having one lent to them in the subject. Nevertheless, many were willing to go beyond the single device and describe activities gleaned from the literature where mobile devices could be linked to groupware such as learning management systems and interactive whiteboards. However, some thoughtful arguments were given about not using smartphones based on cost and low ownership of the device amongst their own students.

The nature of the tasks that were described, although justified in terms of current learning theory, did not necessarily exploit the affordances of the device or the notion of mobile learning suited to learners that are mobile. For example one student provided mathematical word problems for his primary grade children to solve that clearly involved, higher order thinking, collaboration between pairs of students, communication, justification and reflection on outcomes all of which made sense from a mathematics education perspective. However, the recommended use of the smartphone was to simulate a calculator, determining an arithmetic answer, conveying this to a classmate and blogging a reflection around the method and solution. In reality, of course, any experienced mathematics teacher would simply use a calculator and then engage the students in a meaningful discussion. The postgraduate student is aware of constructivist approaches, aware of the functionality of the mobile device but what seems to be lacking is an appreciation of its affordances and the context in which it could be used most effectively. On the other hand, tasks that reflected the affordances of the devices for mobile learning can be seen in the examples that follow.

**How are the affordances of mobile technologies used in the curriculum resources? What uses were made of the mobile technologies that would have been difficult or impossible without them?**

The tasks developed by the students highlighted particular affordances of mobile technologies especially where learners themselves were mobile in their work or study environment. One student described a task where new graduate nurses were required to use smartphones to develop collaboratively an assessment framework for cancer patients based on their spontaneous postings as they made ward visits. Postings were made to a web-based portal where wikis and blogs were utilised. Interestingly, the student had gone beyond the requirements of the assessment task and actually implemented the learning environment. Another student planned the use of laptops as recording devices for his year 10 students to record interviews with Vietnam War veterans. The interviews would then be posted to a website for further student analysis. Both of these tasks were justified in relation to learning theory and used the functionality of the devices in conjunction with web 2.0 technologies.

Fieldwork and excursions were seen as particular contexts in which the affordances for mobile technologies could be exploited. Gathering data in the form of pictures, videos and sound recordings and note taking all appeared valuable activities that supported constructivist-based activities set in contexts outside the classroom and lecture

theatre. The proposed use of these data to enable creative presentation formats such as iMovie and Powerpoint again went beyond the functionality of a single device.

The time flexibility of mobile learning was seen as a particular affordance for non traditional workers as one student commented: ‘The use of mobile technology means that access to learning can be around the clock and does not require face to face facilitation ... this allows for shift workers and non-traditional or casual employees to have access to relevant materials.’

The examples reflect theoretical notions of mobile learning where mobile learning occurs within the convergence of mobile devices and mobile learners. The key assumptions are that learners are mobile — learning across space, time and content; that learning incorporates both informal and formal contexts; and that learning involves knowledge that is socially constructed through personal and shared technologies (Sharples, Taylor & Vavoula, 2007).

**What pedagogical strategies were required to assist the teachers/trainers use of mobile technologies as cognitive tools for their curriculum resources?**

Most students believed that the devices required little direct teaching as most people already owned one. Gaining familiarity by ‘playing around’ with the device seemed to be a common approach. Being aware that students often know more about the technology caused one student to advise facilitators to ‘recognise that students will probably know more and utilising their expertise in mentoring and leading.’ Nevertheless, the use of mobile technologies in teaching and learning still warrants the facilitator to keep abreast of the latest developments as one classroom teacher noted: ‘the teacher does have to keep on reading, researching and trying new equipment which will enthuse and engage the student.’

A number of students observed the difficulty in accessing smartphones and other mobile devices for their students and were unsure about the cost of using the communication aspects of the devices. *Who pays?* seems a common concern. Additionally, infrastructure such as wireless networking may not be available in many workplaces. Making use of technologies already owned by the students and making mobile learning activities optional appear to be practical approaches for overcoming these concerns.

## Conclusion

Providing students with a complex curriculum task involving mobile technologies set in the context of their classroom or workplace was a daunting but rewarding task for most students. As shown by one student’s comment ‘Considering that this was a task that scared me when I read it in the [subject] outline during the first week of session, it was probably the one I ended up enjoying the most.’ The tasks that were created by students reflected a sound understanding of constructivism, in particular, authentic learning, as well as the technical aspects of the mobile devices, however, the affordances of the devices in terms of mobile learning were not always in evidence.

The affordances were clearly visible when the devices were used in environments where the learners were mobile such as hospital wards,

field trips and excursions. The devices lacked credibility when their suggested use was simply to mirror other, better-suited technologies such as calculators. The potential for affordances were recognised but the realities of cost, non ubiquitous ownership and the lack of supporting infrastructure meant that some tasks may only be ‘good in theory’.

Blending mobile technologies with other technologies provides additional affordances. Capturing media using a mobile device, then co creating and sharing content through wikis, blogs and learning management systems characterises the notion of produsers coined by Bruns (2005). Bruns argues that emerging generations are ‘no longer producers or consumers, publishers or audiences, but both at the same time’.

Developing curriculum resources is an authentic task for teachers and trainers. Integrating mobile technologies in the resource requires consideration of a number of issues that include an understanding of theories of learning – constructivist, authentic and mobile as well as the enabling aspects or affordances of mobile technologies that support such learning. Suitably combined, the results can provide challenging and motivating environments in which both teachers and students can potentially achieve significant learning outcomes.

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