
Mobilising learning: intentional disruption – harnessing the potential of social software tools in higher education using wireless mobile devices

Thomas Cochrane

Centre for Teaching and Learning Innovation,
Unitec, New Zealand
E-mail: tcochrane@unitec.ac.nz

Abstract: This paper introduces a research project that explores the integration of Web2 and wireless mobile devices (WMDs) in tertiary education. It discusses the results of the first mobile learning trial undertaken as part of the research. The paper argues that WMDs can be used to intentionally create disruptive learning environments that facilitate a social constructivist approach to teaching and learning.

Keywords: mobile; social software; Web2.

Reference to this paper should be made as follows: Cochrane, T. (xxxx) ‘Mobilising learning: intentional disruption – harnessing the potential of social software tools in higher education using wireless mobile devices’, *Int. J. Mobile Learning and Organisation*, Vol. x, No. x, pp.xx–xx.

Biographical notes: Thomas Cochrane is an Academic Advisor (e-learning and learning technologies) with Unitec (March 2004 to present). His role at Unitec includes providing support for e-learning and learning technologies for Unitec teaching staff, and pushing the boundaries of educational technology for enhancing teaching and learning at Unitec. His research interests include mobile learning, Web2 and communities of practice. Currently, he is implementing mobile learning trials for his PhD thesis ‘Mobilising learning: The potential impact of wireless mobile computing on teaching and learning in higher education in New Zealand. Harnessing the potential of social software tools using wireless mobile devices’.

1 Background to the research

Mobile learning, as defined in this paper, involves the use of wireless-enabled mobile digital devices (wireless mobile devices or WMDs) within and between pedagogically designed learning environments or contexts. It is the potential for mobile learning to bridge pedagogically designed learning contexts, facilitate learner-generated contexts, and content (both personal and collaborative), while providing personalisation and ubiquitous social connectedness, which sets it apart from more traditional learning environments. Laurillard’s (2007) definition of mobile learning incorporates the critical pedagogical design input of the teacher: “Mlearning, being the digital support of adaptive, investigative, communicative, collaborative, and productive learning activities

in remote locations, proposes a wide variety of environments in which the teacher can operate.”

The use of WMDs as part of the teaching and learning environment requires changes in pedagogy and integration into the teaching and learning processes. The researcher is an Academic Advisor at the Centre for Teaching & Learning Innovation at Unitec (CTLI), and is investigating innovative ways of integrating wireless technologies into teaching and learning at Unitec to support diverse learning styles.

The research project involves a series of reflective action research trials using WMDs to harness the potential of current and emerging social constructivist e-learning tools (e.g. Moodle, Blogs, Wikis, PodCasting). This ‘Social Software’, interactive collaborative software, is one of the key features of what has been termed ‘Web2’ (O’Reilly, 2005). Web2 is defined by its end-user-enabling characteristics, including

- moving beyond content delivery to personal publishing
- ease of use
- interactivity
- collaboration and sharing
- customisation.

The research project is based on explicit social constructivist pedagogy (Bijker et al., 1987; Lave and Wenger, 1991; Vygotsky, 1978; Wenger et al., 2002) and aims to develop a strategic implementation plan for incorporating WMDs into tertiary education in New Zealand, within sound pedagogical guidelines. The underlying social constructivist tools are not bound to any single WMD technology, or specific learning context, and therefore the outcomes/strategies/pedagogies identified by the research will be generalisable and transferable.

Disruptive technologies are those technologies that challenge established systems and thinking, requiring change, and are thus viewed by many as a threat to the *status quo*. Disruptive technologies democratise education environments challenging the established power relations between teachers and students. Mishra et al. (2007) argue that “appropriate use of technology in teaching requires the thoughtful integration of content, pedagogy, and technology.”

“The addition of a new technology reconstructs the dynamic equilibrium between all three elements forcing instructors to develop new representations of content and new pedagogical strategies that exploit the affordances (and overcome the constraints) of this new medium. Similarly, changing pedagogical strategies (say moving from a lecture to a discussion format) necessarily requires rethinking the manner in which content is represented, as well as the technologies used to support it.” (Mishra et al., 2007)

The introduction of WMDs in education requires changes in pedagogical strategies, content (reformatted for small screens and lower data bandwidths) and contexts (beyond the face-to-face classroom environment). In a social constructivist view of learning, creating a student-centred, self-directed learning environment is seen as necessary for deep learning to occur. Hence, it is postulated herein that WMDs are disruptive technologies that are useful in challenging established pedagogies, providing a catalyst to move tertiary education towards social constructivism.

The disruptive nature of mobile devices requires educators to rethink learning environments and assessments in order to integrate the technology into their pedagogical approach. As Laurillard (2007) reinforces, the role of the educator in designing/facilitating effective mobile learning environments is critical.

This disruption is not limited to the role of the educator, but also to students' workflow and perceptions of education. For many students, the facilitation of anytime anywhere learning and the use of their social devices will be met with feelings of intrusion and resistance. However, some students will find a new sense of empowerment and connectedness in this new educational environment. Both of these reactions are illustrated in the following mobile learning trial.

AU:
Please
check
whether
the short
running title
introduc
correct.



1.1 Previous m-learning research

Although wireless and mobile computing is still in its infancy in the New Zealand tertiary education scene (Chan, 2006, 2007; Cochrane, 2005, 2006c, 2007a,b,c; Mellow, 2005), there has been a flurry of m-learning research and pilot studies from the UK and USA in the last couple of years. m-Learning and Web2 technologies have been identified as emerging tools to enhance teaching and learning (Anderson, 2007; Becta, 2007; McFarlane et al., 2007; McLoughlin and Lee, 2008; New Media Consortium, 2007, 2008; Sharples et al., 2007; Traxler, 2007; Trinder et al., 2008) but are not usually explicitly linked together. The increase in m-learning-focused conferences (MLearn, Handheld Learning), research projects and briefing papers from organisations such as JISC, and articles in educational journals such as *Educause* and *JCAL* demonstrate an increase in interest in m-learning. However, most of these studies have been relatively short-term pilot studies, lacking rigour in evaluation and epistemological underpinnings.

The field of mobile learning is at present characterized by a proliferation of pilots and trials that allow mobile technologies to be tested out in a variety of learning contexts. The sustained deployment of mobile learning will depend on the quality of these pilots and trials, which includes evaluation methodology and reporting ... The vast majority of pilots and trials in our sample had no explicit or apparent educational or epistemological foundations. (Traxler and Kukulsa-Hulme, 2005)

Larger mobile learning projects have had specific focuses, rather than developing pedagogical strategies for tertiary education in general. For example, 'm-learning project' extended over 4 years, focusing on retention of at-risk learners by using cell phone technologies (Attewell, 2005). Most studies have also focused on content delivery and the personal digital assistant capabilities of mobile devices rather than leveraging collaborative learning.

Content delivery to mobile devices may well have a useful place in mlearning, however, there is an imperative to move from a view of e- and mlearning as solely delivery mechanisms for content ... Handheld devices are emerging as one of the most promising technologies for supporting learning and particularly collaborative learning scenarios. (Hoppe et al., 2003)

A recent mobile learning project (Trafford, 2005) investigated the use of mobile devices for blogging and ing a virtual learning environment. However the mobile devices (Palm OS PDAs)  were not wireless capable, relying upon desktop computers for synchronisation to update the students' blogs.

AU:
Please
provide the
expansion of
PDAs

There is a wealth of research into the use of mobile devices in education that can be utilised for future research. For example, JISC (2005a) have produced a guide to implementing mobile learning within a tertiary institution, and user evaluation surveys for implementation trials, and a manager's framework for implementing WMDs in higher education (JISC, 2005b). These resources were used to inform the design of the mobile trial reported in this paper.

1.2 Mobile trials

This paper reports on the progress of several qualitative action research learning trials being run to investigate the impact of WMDs on teaching and learning in higher education. The potential of mobile devices integrated with a campus wireless network can facilitate the use of e-learning tools to enhance tutor-student and student-student communication, collaboration, reflection and critique. Student productivity will be enhanced by the provision of a ubiquitous computing environment. This will involve several consecutive trials/case studies with interested schools/programmes at Unitec, including

- Landscape architecture and mobile learning (2007).
- Product design and mobile student blogs (2008).

The researcher is taking a key support and guiding role (the 'Technology Steward' (Wenger et al., 2005) in the implementation of the trials supporting the school-based lecturers. These lecturers will provide the first port of call for student support in the use of wireless mobile computing within their course.

1.3 Research questions

The research questions reflect the researcher's goal of enhancing students' learning environments with tools that facilitate a social constructivist pedagogy. The choice and integration of technology into a learning environment should firstly be based on sound pedagogical foundations. The underlying foundation chosen for the following examples is social constructivism, facilitating a student-centred learning environment. Communication (student to student, student to teacher and student to resources, e.g. Laurillard's conversational model of learning) and student content creation were identified as key elements in establishing a social constructivist learning environment. Mobile Web2 technologies were then identified as potential tools to facilitate this. Web2 social software provides a close fit with the tenants of social constructivism, providing easy-to-use, interactive, collaborative content creation and sharing tools that are accessible worldwide in an online environment that can enhance both face-to-face and distance learning. The research questions are designed to test these assumptions.

- 1 What are the key factors in integrating WMDs within tertiary education courses?
- 2 What challenges/advantages to established pedagogies do these disruptive technologies present?
- 3 To what extent can these WMDs be utilized to support learner interactivity, collaboration, communication, reflection and interest, and thus provide pedagogically rich learning environments that engage and motivate the learner?

To what extent can WMDs be used to harness the potential of current and emerging social constructivist e-learning tools?

Data gathering consists of

- 1 pre-trial surveys of lecturers and students to establish current practice and expertise
- 2 post-trial surveys and focus groups to measure the impact of the wireless mobile computing environment, and the implementation of the guidelines
- 3 lecturer and student reflections via their own blogs during the trial, thus using the technology that is an integral part of the trials to capture data on participants' progression.

1.4 Mobile pedagogies

Pedagogical approaches to teaching and learning environments range from teacher-centred (instructivism) to student-centred collaboration (social constructivism). Traditional tertiary education has followed an instructivist pedagogy. However, increasingly school leavers are entering tertiary education with content creation skills honed from their immersion in digitally facilitated social network sites (Boyd and Ellison, 2007). They have been nick-named the 'net-generation' and 'digital natives' (Oblinger and Oblinger, 2005; Prensky, 2005). These learners have also been named 'generation C', the content creation generation. As Bruns (2007) argues, this is not necessarily age related, but "a loose but significant grouping of participants who (on average, and perhaps implicitly rather than explicitly) share a set of common aims and practices." While this portrayal of today's school leavers immersed in Web2 use has been challenged (Kennedy et al., 2007), it is in general their willingness (and in many cases preference) to adopt new technology (JISC, 2007) that sets them apart from previous generations of learners. There is potential to engage and guide these learners in education by leveraging Web2 tools within collaborative, technologically rich social constructivist environments.

While Web2 tools are characterised by user-generated content and social networking, mobile devices add the extra dimension of user-generated contexts. "The intrinsic nature of mobile technologies is to offer digitally-facilitated site-specific learning, which is motivating because of the degree of ownership and control" (Laurillard, 2007, p.157).

A pedagogical framework for implementing social software tools via WMDs can be developed by drawing on concepts from constructivism (Bruner, 1966; Piaget, 1973), social constructivism (Vygotsky, 1978), communities of practice (Wenger, 2005), a conversational model of learning (Laurillard, 2001) and the social construction of technology (Bijker, 1995). Thus, a mobile (m-learning) pedagogical model will focus on enhancing communication and collaboration within a dynamic learning environment, and will be student centred.

The main focus of this project is on the support and enhancement of both the face-to-face and off-campus teaching and learning contexts by using the mobile wireless devices as a means to leverage the potential of current and emerging collaborative and reflective e-learning tools (e.g. Blogs, Wikis, RSS (Really Simple Syndication, or Rich Site Summary), instant messaging, PodCasting, social book marking). The e-learning activities developed to make use of the WMDs in the various trials will focus on the use of social software tools. The WMD's wireless connectivity and data-gathering abilities

(e.g. photoblogging, video recording, voice recording, and text input) allow for bridging the on- and off-campus learning contexts, facilitating ‘real-world learning.’

The learning outcomes for students include

- developing critical reflective skills
- facilitating group communication
- developing an online e-portfolio
- developing a potentially worldwide peer support and critique network
- learning how to maximise technology to enhance the learning environment across multiple contexts.

2 Trial 1: diploma landscape design

2.1 Overview

The trial began in February 2007, with diploma landscape design students implementing the use of Blogs, online image sharing, basic e-portfolios and RSS aggregation to create a collaborative team-based project design for the Ellerslie International Flower Show (November 2007). With research funding made available in July 2007, students were provided with Nokia N80 smartphones to post to their Blogs and upload photos and videos to their online e-portfolios via 3G or WiFi networks. This provided students with a flexible collaborative and context-sensitive e-learning environment with which to document their flower show projects. This has proven very useful, as much of the project involves sourcing materials, ideas and plants from a wide variety of locations that are off campus, and beyond the formal learning environment. It is this flexibility and context awareness in which mobile wireless devices enhance learning. The project is investigating implications for learner support, and pedagogical changes that these disruptive technologies introduce.

2.2 Course outline and tutor support

The driving motivation behind the project was the course tutor’s wish to spice-up the existing course using learning technologies, but also needing some help to do so.

In my Diploma programme we need more flexibility, we have a lot of students who want to come in at odd hours and are working, and this technology stuff should offer my students a lot. However I’m scared of it. I don’t want to just dive in. In the past I’ve always hung back because I always think there’s going to be bugs in the system. (Course tutor before the start of the project 2006)

This realisation led to the tutor taking part in a Community of Practice investigating Web2 technologies and their potential in education (Cochrane, 2006a,b; Cochrane and Kligyte, 2007). This project then became a way to implement the new pedagogical strategies they had learnt. Research into intentional communities of practice had also highlighted the role of a ‘technology steward’ (Wenger et al., 2005) to guide a group in successfully integrating technology. The researcher, thus, took on the role of the ‘technology steward’ for the trial, supporting the course tutor and students.

2.3 Project outline

The aim of the course is to allow students to develop an area of specific interest outside the scope of other formal courses within the programme. There is no formal lecture schedule for this project. The area of specialisation involved a negotiated research project *or* field study *or* design project. The core of the project had previously been the production of a traditional paper-based portfolio illustrating the students' design and development process. The bulk of the project is undertaken outside of the formal face-to-face campus setting, with students gathering design materials and ideas from various remote sites. The trial was a combined project between the course tutor, CTLI and the course students. Working with the researcher, the course tutor redesigned the course (see the full course outline in Appendix 1) to use various e-learning tools to enhance students Ellerslie Flower Show projects, including

- 1 a reflective Blog
- 2 commenting on each others Blogs
- 3 an online photo album
- 4 discussion Forums and File Sharing via Moodle (Dougiamis, 2005)
- 5 a smartphone to access the above.

The smartphone was used to upload content (photos, videos and text) to each user's online blog host via a mobile-formatted web interface, or via e-mail, or alternatively using third-party mobile applications such as Shozu (PDAEssentials, 2007) downloaded and installed on the phones. Blog posts and comments could be read easily using the built-in web browser on the smartphone as the blog hosts were chosen because they provided mobile-friendly versions of their interfaces. Participants were encouraged to subscribe to each other's blog RSS feeds using Google Reader (Google, 2006), which also has a mobile-friendly version. Additionally, the blog hosts automatically sent notifications and summaries of comments via e-mail (participants were shown how to set up e-mail and various supporting applications on their smartphones). However, commenting on other participants' blog posts was achieved by using internet-connected laptop or desktop computers. Moodle was accessible for viewing course tutorial media and web links using the smartphones built-in web browser, which did a good job of automatically reformatting Moodle (without any specific mobile modification) for a small screen.

2.4 Trial participants

The students for the trial were selected by the course tutor. The course is an optional negotiated project that students elect to participate in, and their selection is finalised on their presentation of a concept proposal for a garden exhibition at the annual Ellerslie International Flower Show. The students were all second year diploma landscape design students. There were a total of eight students forming three groups/teams. The students completed an initial project survey to establish their previous experience with mobile and Web2 technologies. Surprisingly, not all students had access to either a desktop or laptop computer at home. None of the students owned a PDA or a smartphone, neither did all of the students own their own cell phone. None of the students had previous experience of

subscribing to blogs or owning their own blog, or of a range of Web2 services. Only three students had previously used instant messaging. Their ages ranged from 18 to 49 years, with an average age of 30 years, and a gender mix of three male and five female students. This challenged the assumptions of the ‘net generation’ and made the technology support structures built into the trial very important for its success.


2.5 *Blogging*

The core activity of the project was the setup and development of students’ Blogs as reflective journals on their flower show design process. Drawing on experiences from previous student blogging projects in 2006, Wordpress (Automattic Inc., 2007) was chosen as the online blog host on the basis of its configurability, speed of access and option of a mobile Web2 interface. Students found Wordpress easy to set up; however, not a lot of interaction between student blogs occurred.

2.6 *Moodle and technology support*

The project was supported via the Moodle (Dougiamis, 2005) learning management system (LMS). Three technology workshop sessions introduced students to creating and configuring their Blogs, Flickr (<http://www.flickr.com>) and Google Reader (<http://reader.google.com>) accounts. Supporting notes, links, discussion forums and tutorials were hosted on Unitec’s Moodle server. This approach allowed the ‘technology steward’ to remain in contact and offer online support while in Sydney during April and May of 2007.

2.7 *Introduction of VOX*

The project was reevaluated at the end of semester 1, 2007. At this point, students were expected to have decided upon their team project design concepts, and in the following semester to implement the designs, including sourcing materials and fund-raising to cover the project costs. The course tutor wanted to explore moving  d blogs to using an e-portfolio to enable collection of rich media documenting the build process. The Vox software (Six Apart Ltd, 2007b) was chosen as a suitable free online-hosted e-portfolio system. Vox supported the project by providing the following features:

- allowing collections of rich media (photos, video, audio, text, documents) to be uploaded from both mobile devices and PCs and shared
- providing a customisable Blog, RSS feeds and links to a variety of popular Web2 services (e.g. YouTube, Flickr)
- providing mobile Web2 integration, including a Vox client (Six Apart Ltd, 2007a) for the Symbian S60 operating system, Windows Mobile and Palm OS mobile devices
- providing an online community via definable Vox ‘neighbours’ and a weekly neighbourhood activity update e-mail notification
- providing tools to import Wordpress blog posts into the Vox blog so students would not lose their previous Wordpress investment.

AU:
In the sentence
“The course
...” please
check if the
use of the
phrase “build
process” is
correct.”

Vox included a selection of online tools including aspects of social networking without the usual clutter found on the more popular social networking sites (e.g. MySpace and Beebo).

2.8 Introduction of mobile blogging (mo-blogging) using Nokia N80

The unique element of this project was the incorporation of mobile blogging (mo-blogging) and the investigation of the benefits of WMDs to enhance the learning environment. Two previous trials in 2006 had used Palm TX PDAs. These PDAs have WiFi access but no cell phone connectivity and no built-in camera. Feedback from students indicated their preference for wider wireless connectivity than WiFi and for the inclusion of a built-in camera in the mobile device.

During the reevaluation of the project, the Innovation and Development Fund funding was finalised, providing the trial with the funds to purchase a class set of suitable smartphones. Of the currently available smartphones, the Nokia N80 (Nokia, 2007) was the most cost-effective solution that fulfilled the requirements identified for the project. The N80s were purchased through a parallel importer, configured for the Unitec WiFi network and supplied with a pre-paid Vodafone network SIM card for mobile voice and data. The Nokia N80 includes the following specifications:

- WiFi and 3G connectivity
- 3MP camera
- 512MB memory card
- compact size
- high-resolution screen
- access to a wide range of Symbian S60 mobile applications, including a Vox and Flickr client
- Nokia cell phone market share is 40% of worldwide cell phone market (O'Brien, 2008) and 56% of the worldwide smartphone market (Fabris, 2007).

Students were required to sign acceptable use forms for the N80s, including taking liability for returning the units at the end of the trial.

Several technology sessions were run for students, and the course tutor covered the use of Vox and setup and mo-blogging via the N80. Students were shown how to blog and upload photos and video from their smartphone to Vox and Flickr and via Shozu (a mo-blogging service <http://www.shozu.com>) to their Wordpress blog if they preferred. Students shared their blog URL's with each other and were encouraged to read and comment on each other's blogs. Unfortunately, these sessions were poorly attended by one of the three student project teams.

2.9 Ellerslie gold

The culmination of the project was the judging of the student teams' garden designs at the Ellerslie International Flower Show in November 2007. This was a huge success, with all three teams winning a gold award for each of their gardens (Koubaridis, 2007).

3 Mobile research results

3.1 *Disruptive pedagogical implications*

There were three student groups (teams) involved in the trial. Of these, two groups engaged with the mobile technology aspect of the trial and the move to Vox, while one group chose not to. This led to a stark contrast in feedback on the usefulness of mobile technology in supporting education between the engagers and non-engagers. Discussions with students during the technology sessions and the end-of-trial student survey indicated that the engagers responded enthusiastically regarding the ability of mobile devices to enhance education experiences, while the non-engagers responded strongly in the negative. There was no obvious demographic reason for this contrast.

However, the non-engaging group were characterised by

- reluctant bloggers
- attended less than 50% of the technology support sessions
- did not attend the technology sessions introducing the smartphone and mo-blogging
- either forgot to carry the smartphone with them or forgot to keep it charged—it did not become part of their social experience
- change adverse—they preferred to keep their Wordpress blogs going rather than move to Vox when it was introduced midway through the project
- exhibited little online community building, i.e. they made no comments on each other's Blogs, or the other group's Blogs
- a preference for using their own mobile phone and separate digital camera.

While initial setup support was required for students moving from Wordpress to Vox, the increased level of collaboration exhibited by the increase in comments on each other's Vox blogs compared to Wordpress comments made the move worthwhile.

The contrasting response from participants is not unusual, as is illustrated by a similar response from non-engaging students within a mobile learning smartphone trial conducted by Cook et al. (2007). What is needed are strategies for early identification and scaffolding for such learners. This will be explored in the design of the next mobile learning trial.

3.2 *Blog analysis*

Student Blogs were monitored by the course tutor and the researcher via RSS feeds subscribed using either Google reader or NetNewsWire lite. Students were encouraged to subscribe to each other's Blogs via Google reader, and to interact by making regular comments on each other's blogs. Counts were made of the number of student posts and comments and types of media used on their Blogs.

The frequency of Blog posts and comments increased significantly after the introduction of Vox and the N80s. This can be accredited to the way Vox facilitated a group work environment via its 'neighbourhood' feature. Students who used Vox assigned each other as Vox neighbours and were automatically provided with e-mail notifications of comments on their Vox Blog and new posts on neighbour Vox Blogs.

Vox also sends out a weekly e-mail news notification with a summary of Vox neighbourhood activity. Unlike Wordpress, students were not reliant on checking RSS feeds to keep track of one another's Vox blogs. This was significant as previous trials have indicated students take time to integrate RSS subscribing and reading into their daily routine. The introduction of Vox also coincided with the implementation of the Nokia N80 camera phones and the beginning of the busiest period of the project. However, a direct comparison between Vox and Wordpress usage was made possible by one group refusing to move from Wordpress to Vox usage. Two students also continued their Wordpress Blog alongside their new Vox Blog and e-portfolio.

The ability to upload photos more readily to their Vox Blogs from the N80 was popular among most of the students. Mobile Blog posts were typically short on words and consisted mainly of photo posts that were later edited on PCs to include longer text messages.

Students who preferred to continue with their Wordpress Blogs tended to post less frequently, but longer posts, and did not comment on each other's Blogs.

Students enjoyed customising their Blog layouts, with several uploading a custom banner representing a sketch or CAD drawing of their garden designs. Most students also linked their Flickr photos and embedded YouTube videos into their Blog posts. Several students' uploaded short videos they recorded using the Nokia N80 to their Blogs. These included 'fun' social videos of the participants, as well as videos of project construction processes.

3.3 Use of mobile technology

Below is an example of one of the student's thoughts regarding the introduction of the N80 to the project.

Today at tech class I learnt how to blog and check emails from the telephone. I am feeling very pleased with myself and also lucky to have such a patient teacher as Thom. But this is where it gets really good. While checking my emails with the newly acquired skills I saw I'd had a reply from a possible sponsor I'd approached. This is both exciting and scary all in the one go. I've called this project an adventure before, and it certainly has not disappointed us on that level. (student blog post)

For the majority of the students, the N80 became an integral part of their social life and a tool for capturing project events and activities wherever they were. Three students expressed interest in purchasing the smartphone at the end of the trial, and one student purchased the SIM card used during the trial.

Thanks so much for the N80s! They have been fantastic. In fact I have become quite attached to mine and would like to purchase one—it would be great for my new job. (student e-mail feedback)

The N80 was fantastic, easy to use and had every feature you could think of needing and more. I am definitely going to invest in buying one for future use as with work it will be easy to stay in contact with people, check emails etc. (student survey feedback)

Students valued the camera, ability to upload to their Blog, txt and phone call functions of the smartphone the highest. The cost of 3G data meant that most students either waited until they were on the Unitec campus for WiFi upload access or uploaded their photos

and videos from the smartphone to their PC via USB and then uploaded the files to their Blogs. One student had a WiFi broadband internet connection at home that they used with the N80.

‘Other’ usage contexts included cafes such as Starbucks where there is WiFi access available.

3.4 End-of-trial survey results

The implications of the end-of-trial surveys are detailed in the discussion section below.

3.5 Focus group feedback

Students valued the ability of their Blogs to provide a dynamic link between their projects and their friends, family and project sponsors. They also highly valued the photo capabilities of the smartphone and its basic communication functions (txt and voice calls). One student’s mother learnt how to txt during the project to send encouraging messages during long project hours on site. Students requested that the smartphones be made available earlier in the trial next time.

One student summed up their experience of the mobile project as

I enjoyed taking photos—blogging them was so much easier and faster than using a digital camera and PC.

I also appreciated being able to link up to the local wireless network so that I didn’t have to pay Vodafone extra money.

It was faster to use the phone to check my email, than it would be to start up a computer, connect to the Internet and get the messages that way. (Diploma Landscape Design student, 2007)

Participants rated the mobile technology highly effective in increasing communication between students, and between students and tutors. However, they saw the mobile technology as a complement to their communication with their tutor rather than a replacement of face-to-face meetings.

A common theme emerged regarding the essential nature of the technology sessions for supporting the setup of the mobile devices. The students and tutor also wanted more time for exploring the full potential of the smartphone. The integrated nature of the phone communication and recording capabilities was perceived as making access to information easy.

In response to the question “In what situations would the WMDs be most effective?” one student replied, “As a mobile computer—instead of a laptop, and as a communication tool for a team who are in different places at the time, too busy to meet, to transfer information, pictures, documents etc ...”

4 Discussion

The project was built upon the partnership established between the tutor and the researcher/technology steward during a community of practice investigating the use of educational technology in 2006 and subsequent mo-blogging trial using Palm WiFi-capable PDAs. Thus, the tutor was prepared for the issues regarding disruptions to

pedagogy and the continuing changes surrounding mobile and Web2 technologies. This allowed the project to undergo appropriate reevaluation and subsequent modification during its life cycle.

Once I learnt how to use the technology I then moved on to be able to work with the students. I modified an elective exercise that we didn't formally teach, but was an opportunity for students to put their studies into practice by creating a design for the Ellerslie Flower Show. We decided to make it a course, that doesn't have to have content, but a process, synthesizing all aspects of their Landscape Design course and we can bring in all these learning technologies to support it, including blogs, wikis, and an eportfolio instead of presenting it the traditional way. So in 2006 we trialed it and have built on the idea since then. Thom helped us along the way with this ... The Community of Practice that was fostered and the new skills that the students gained in the e-world were fantastic and contributed to them doing so well. It's been a great success and we get savvier every year continuing to experiment with new technologies. Students are feeling more satisfied with the capabilities of the tools they are using and I'm going to keep learning too! (Course tutor, 2007)

AU:
Please
check the use
of the word
“trialed” in
the sentence
“So ...”
06

Due to several factors, the mobile part of the project in 2007 was implemented at the start of the busiest time of the project for the students. This led to two distinct reactions: two groups that embraced the smartphones, and one group that did not.

The non-engaging group did prioritise attending the mobile tutorials. Because the non-engaging group missed the critical mobile setup and mo-blogging technology support sessions, they struggled to learn how to operate the smartphone on their own, and preferred to use their own simple non-smartphones for txting and phone calls. This group was offered additional technology support sessions for smartphone configuring and mo-blogging; however, they attended the sessions unprepared, either without their smartphone or with it uncharged. The group members were also offered individual technical assistance but did not take up the offer. They stated they were too busy to learn how to use the smartphone. Their use of the smartphones was limited to experimenting at home with them.

In contrast, the other two student groups enthusiastically attended the mobile technology support sessions, coming prepared with their smartphones. This engaging group used their smartphone everywhere they went and enabled them to turn any context into a learning context. They generally found the N80 easy and fun to use. However, help in the initial setup of the smartphone (in particular, its wireless connectivity setup) was considered essential.

The N80's key effectiveness was seen in its ability to be used as a communication and event-recording device. The N80 was used extensively for documenting processes and events via its built-in camera. Thus, the smartphone's communication capabilities were valued most highly, followed closely by its photoblogging capability. The ability to send and receive e-mail remotely was also highly rated by students. Additional time was required to explore other potential uses of the smartphone. This will be addressed in the next trial.

Student's experience of group work was positively enhanced by the use of Blogs and mo-blogging. Communication, a sense of community, quality, convenience and access to learning were all perceived to be enhanced by the use of the N80. There was general support for further use of mobile devices in other courses as a result of their experience, except by the non-engaging team.

Students rated the cost of the smartphone as their key issue in its potential purchase. This was followed by the quality of the built-in camera, then the smartphone's size (students preferred small phones), the inclusion of WiFi (offsetting the cost of 3G data connectivity) and the ease of mo-blogging. Students commented they would have blogged more from the N80 if the cost of 3G data was lower, as WiFi coverage was mostly limited to that provided on campus.

Significantly those students with the least computer skills at the start of the project became the most avid bloggers (producing the most Blog posts and comments) in both the 2006 and 2007 trials. They have found the experience empowering and the support of other students and the technology steward invaluable. One such student's journey can be illustrated by Blog posts from the beginning and the end of the project:

Tech class with Thom has presented me with a whole new array of stuff to learn about. It comes in the form of a very snappy telephone that, when driven correctly, can do some very cool things, such as, linking to email, my bloggy space and the usual text and telephone. There is more it can do but until I learn how it remains a mystery to this little black duck. Would liked to have used some of it in my post today, but because I'm not at UNITEC the cost of doing so is tooo much. I do think the technology is amazing but the \$ cost is also pretty out there. Thom has set it up so as to allay these costs as long as we are in the campus grounds and this will work well after the semester break. I am keen to master at least some of it as Thom is such a nice bloke and I'd like to honor his efforts to teach me. I hope to get the chance to link up with some of my more techno savvy classmates and master at least a couple of things before we see Thom next Wednesday. (Diploma Landscape Design Student 2007—beginning of project)

This project has been eye-opening. Discovering a great venue for expression, and sharing with friends and family. (Diploma Landscape Design Student 2007—end of project)

Some students were concerned with the privacy issues of making their posts and media available on the internet. These issues were discussed during the technology sessions, and students were alerted to the implications of posting and hosting material online.

The research trial has been informed by previous mobile research trials undertaken at Unitec in 2006. In particular, the choice of online and mobile technologies was based on feedback from these previous trials. The underlying pedagogical model driving the learning design has been social constructivism. The research trial has used an action research methodology. This enabled the researcher and course tutor to continually reevaluate the project and adjust the tools used as was necessary for the project as it developed. The project was supported using a trial installation of the Moodle LMS, with the course outline and aims clearly stated. These aims were reevaluated regularly during the trial in meetings between the course tutor and the researcher/technology steward. The project has been a development process for both the tutor and the researcher. It is based in a new and changing field of educational research, and as such is breaking new ground in tertiary education teaching and learning research.

The clear focus of the project was to facilitate students in developing critically reflective research skills. The students were assessed on their project portfolio (including their Blog reflections) developed throughout the project.

The project included a student survey at the beginning and end of the project, as well as a focus group for feedback at the end of the project. This will enable comparison with previous and following mobile Web2 trials.

4.1 Implications for the research questions

This trial has highlighted the following issues relevant to the research questions:

- 1 What are the key factors in integrating WMDs within tertiary education courses?
 - Good pedagogical design of contextual learning environments is essential – this will be developed more explicitly in following trials.
 - Tutor professional development and technology support is critical.
 - An ethos of the educational use of mobile web2 technologies needs to be developed within the teaching and learning environment.
 - Technology support for students is critical and must be integrated early into the course.
 - Student preferences must be considered when choosing appropriate WMDs.
 - The excessive cost of 3G mobile connectivity is a major deterrent, producing a reliance on free WiFi data access.
 - Time is needed to develop skills in the use of the technologies for both students and tutor.
- 2 What challenges/advantages to established pedagogies do these disruptive technologies present?
 - The research trials so far indicate that.
 - A context spanning social constructivist learning environment is facilitated.
 - Teachers require a new pedagogical toolkit to capitalise on this environment—following trials will look more closely at the facilitation of student–tutor interaction.
 - Students require explicit scaffolding in this environment (‘net generation’ skills cannot be assumed).
 - Following trials will investigate this further through the type and quality of group interactions facilitated by WMD blogging and integration into the delivery of complete courses rather than a select project within a larger course.
- 3 To what extent can these WMDs be utilized to support learner interactivity, collaboration, communication, reflection and interest, and thus provide pedagogically rich learning environments that engage and motivate the learner? To what extent can WMDs be used to harness the potential of current and emerging social constructivist e-learning tools?
 - The capabilities of affordable smartphones are constantly increasing, as is the availability of free mobile Web2 services. These can be matched to create highly collaborative and motivating learning environments.

5 Conclusions

This trial has illustrated the transformation of a traditionally facilitated learning environment (paper-based portfolio) to one based on a social constructivist pedagogy using mobile and Web2 technologies (a collaborative mobile-facilitated e-portfolio). The mo-blogging trial has built upon the experiences and insights gained from previous trials in 2006, and provides valuable insights for the next trial in 2008. As previously reported (Cochrane, 2007c), this trial has illustrated that appropriate tutor professional development and technology support allow the integration of educational technology beyond the domain of early adopter techno geek educators. This intentional Community of Practice support model will continue to be developed in following trials. An action research approach to the project-enabled aspects of the trial to be reevaluated and reworked during the trial, leading to better alignment of the trial with the project goals. The educational benefits of social software, in particular blogging, have been discussed. The alignment of mobile technologies with social constructivist pedagogy and new learner preferences provides the potential for the development of collaborative learning communities, enhancing student–student and student–tutor communication and interaction. However ‘net generation’ skills cannot be assumed, and appropriate support structures must be established. The trial highlights the disruptive nature of mobile technology in education, where most students and the course tutor embraced the potential that it afforded, while a small group of students chose not to engage. In general, mo-blogging coupled with social software tools potentially provide the basis for enhancing teaching and learning in virtually any discipline, and across multiple learning contexts, providing an environment that stimulates reflection, critique, collaboration and user-generated content (i.e. a social constructivist environment). Future trials will build on this foundation. While the core activity of each trial will be the creation and maintenance of a reflective Blog or e-portfolio as part of a course group project, the WMD can be used to enhance almost any aspect of a course. The next trials will investigate integrating the use of WMDs and social software across an entire course, rather than just a project within a course.

The next trials will use the WMD and computers for the following activities (based on supporting a social constructivist pedagogy):

- a reflective Blog (Vox.com)
- an e-portfolio (Vox.com)
- E-mail (GMail)
- RSS (Newsgator.com)
- shared calendars (Google Calendars)
- image blogging (Flickr)
- video blogging (YouTube)
- Podcasting
- instant messaging and Skype
- shared bookmarks (Upcode and Moodle)

- accessing the course management system (Moodle or Blackboard)
- document reading (Word, Excel, Powerpoint, PDF using QuickOffice and Google Docs).

To facilitate greater student reflection, the issue of ease of text entry on WMDs will be addressed. Finally, the issue of off-campus wireless connectivity will be tackled by providing students with a 1GB per month 3G mobile data plan. Building on this trial, three mobile trials are underway for 2008 in three different learning contexts and using three different WMDs. The results of these trials will be published at the end of the 2008 academic year.

References

- Anderson, P. (2007) *What is Web 2.0? Ideas, Technologies and Implications for Education*. Available at: http://www.jisc.ac.uk/whatwedo/services/services_techwatch/techwatch/techwatch_ic_reports2005_published.aspx.
- Attewell, J. (2005) 'From research and development to mobile learning: tools for education and training providers and their learners', *Paper Presented at the mLearn 2005*, Cape Town, 18–25 October.
- Automattic Inc. (2007) *Wordpress.Com. 2007*. Available at: <http://wordpress.com/about/>.
- Becta. (2007) *Emerging Technologies for Learning: Volume 2 (2007)*. Available at: http://partners.becta.org.uk/index.php?section=rh&catcode=_re_rp_ap_03&rid=11380.
- Bijker, W. (1995) *Of Bicycles, Bakelites, and Bulbs. Toward a Theory of Sociotechnical Change*. Cambridge: MIT Press.
- Bijker, W., Hughes, T. and Pinch, T. (1987) (Eds) *Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. Cambridge: MIT Press.
- Boyd, D.M. and Ellison, N.B. (2007) 'Social network sites: definition, history, and scholarship', *Journal of Computer-Mediated Communication*, Vol. 13, No. 1.
- Bruner, J. (1966) *Toward a Theory of Instruction*. Cambridge: Belknap Press of Harvard University.
- Bruns, A. (2007) 'Beyond difference: reconfiguring education for the user-led age', *Paper presented at the ICE3: Ideas in Cyberspace Education: Digital Difference*, Ross Priory, Loch Lomond, 21–23 March.
- Chan, S. (2006) 'Mlearning for workbased apprentices: a report on trials undertaken to set up mobile portfolios', *Paper presented at the MLearn2006—the 5th World Conference on Mobile Learning*, Banff, Canada, 22–25 October.
- Chan, S. (2007) 'Mlearning and the workplace learner: integrating mlearning eportfolios with moodle', *Paper presented at the Conference on Mobile Learning technologies and Applications (MOLTA)*, Massey University, Auckland, New Zealand, 19 February.
- Cochrane, T. (2005) 'Mobilising learning: a primer for utilising wireless palm devices to facilitate a collaborative learning environment', *Paper Presented at the 22nd ASCILITE Conference: Maintaining the Momentum?* Brisbane, 4–7 December.
- Cochrane, T. (2006a) *Dummies2delight Intro Video*. Available at: http://www.youtube.com/watch?v=jn0HBikF_U.
- Cochrane, T. (2006b) *Dummies2delight Symposium Presentation Video*. Available at: http://www.youtube.com/watch?v=kUuJ-gW_vuc.
- Cochrane, T. (2006c) 'Learning with wireless mobile devices and social software', *Paper presented at the 23rd ASCILITE Conference: Who's Learning? Whose Technology?* The University of Sydney, Sydney, 3–6 December.

AU:
In reference
Boyd and
Ellison
(2007), please
provide the
page range.



- Cochrane, T. (2007a) 'Mobile blogging: a guide for educators', Paper Presented at the MLearn 2007—Making the Connections 6th International Conference on Mobile Learning, Melbourne, 16–19 October.
- Cochrane, T. (2007b) 'Mobile web2 pedagogies', *Paper Presented at the Conference on Mobile Learning Technologies and Applications (MOLTA)*, Massey University, Auckland, New Zealand, 19 February.
- Cochrane, T. (2007c). 'Moving mobile mainstream: using communities of practice to develop educational technology literacy in tertiary academics', *Paper Presented at the Mlearn 2007—Making the Connections 6th International Conference on Mobile Learning*, Melbourne, 16–17 October.
- Cochrane, T. and Kligyte, G. (2007) 'Dummies2delight: using communities of practice to develop educational technology literacy in tertiary academics', *Paper Presented at the JISC Online Conference: Innovating eLearning*, 11–14 June.
- Cook, J., Bradley, C., Lance, J., Smith, C. and Haynes, R. (2007) 'Generating learner contexts with mobile devices', in N. Pachler (Ed.), *Mobile Learning: Towards a Research Agenda*. London: WLE Centre, Institute of Education, pp.33–54.
- Dougiamis, M. (2005) *Moodle*. Available at: <http://moodle.org>.
- Fabris, N. (2007) Nokia Leading Smartphone Market with 56%, while Symbian's Share of os Market is Set to Fall. Available at: <http://www.abiresearch.com/abiprdisplay.jsp?pressid=826>.
- Google. (2006) *Google Mobile Services*. Available at: <http://mobile.google.com>.
- Hoppe, H.U., Joiner, R., Milrad, M. and Sharples, M. (2003) 'Guest editorial: wireless and mobile technologies in education', *Journal of Computer Assisted Learning*, Vol. 19, No. 3, pp.255–259.
- JISC. (2005a) Innovative Practice with e-Learning: A Good Practice Guide to Embedding Mobile and Wireless Technologies into Everyday Practice. Available at: http://www.jisc.ac.uk/eli_practice.html.
- JISC. (2005b) Innovative Practice with e-Learning: A Manager's Planning Tool for Use of Mobile and Wireless Technologies. Available at: http://www.jisc.ac.uk/elearning_innovation.html.
- JISC. (2007) *In Their Own Words: Exploring the Learner's Perspective on e-Learning* (Internet). Bristol: Higher Education Funding Council for England.
- Kennedy, G., Dalgarno, B., Gray, K., Judd, T., Waycott, J., Bennett, S., et al. (2007) 'The net generation are not big users of web 2.0 technologies: preliminary findings', *Paper Presented at the Ascilite 2007*, Singapore, 3–5 December.
- Koubaridis, A. (2007, 14 November) 'Sustainability turns out a winner' *New Zealand Herald*.
- Laurillard, D. (2001). *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology* (2nd ed.). London: Routledge.
- Laurillard, D. (2007) 'Pedagogical forms of mobile learning: framing research questions', in N. Pachler (Ed.), *Mobile Learning: Towards a Research Agenda*. London: WLE Centre, Institute of Education, pp.33–54.
- Lave, J. and Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- McFarlane, A., Roche, N. and Triggs, P. (2007) *Mobile Learning: Research Findings*. University of Bristol.
- McLoughlin, C. and Lee, M.J.W. (2008) 'Future learning landscapes: transforming pedagogy through social software', *Innovate: Journal of Online Education*, Vol. 4, No. 5.
- Mellow, P. (2005) 'The media generation: maximise learning by getting mobile', *Paper Presented at the 22nd ASCILITE Conference: Balance, Fidelity, Mobility. Maintaining the Momentum?* Brisbane, 4–7 December.
- Mishra, P., Koehler, M.J. and Zhao, Y. (2007) (Eds) *Faculty Development by Design: Integrating Technology in Higher Education*. Charlotte: Information Age Publishing.

AU:
In reference
Kennedy
et al. (2007),
please
provide the
names of all
the authors.

AU:
In reference
McLoughlin
and Lee
(2008), please
provide the
page range.

- New Media Consortium (2007) 'The horizon report: 2007 edition', *The Horizon Report*, 2007. Available at: <http://www.nmc.org/horizon/2007/report>.
- New Media Consortium (2008) 'The horizon report: 2008 edition', *The Horizon Report*. Available at: http://horizon.nmc.org/wiki/Main_Page.
- Nokia (2007) *Nokia Nseries*. Available at: <http://www.nseries.com/index.html>.
- Oblinger, D. and Oblinger, J. (2005) 'Is it age or it? First steps towards understanding the net generation', in D. Oblinger and J. Oblinger (Eds), *Educating the Net Generation*: Educause, pp.10–29.
- O'Brien, K. (2008) *Nokia Increases Profit and Market Share*. Available at: <http://www.nytimes.com/2008/01/25/technology/25nokia.html>.
- O'Reilly, T. (2005) *What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software*. Available at: <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>.
- PDAEssentials (2007) 'Mobile web 2.0', *PDAEssentials*, Vol. 59, pp.40–44.
- Piaget, J. (1973) *To Understand Is to Invent*. New York: Viking Press.
- Prensky, M. (2005) 'Engage me or enrage me: what today's learners demand', *Educause Review*, Vol. 40, No. 5, pp.60–65.
- Sharples, M., Milrad, M., Sanchez, I.A. and Vavoula, G. (2007) 'Mobile learning: small devices, big issues', in N. Balacheff, S. Ludvigsen, T. de Jong, A. Lazonder, S. Barnes and L. Montandon (Eds), *Technology Enhanced Learning: Principles and Products*, pp.20.
- Six Apart Ltd. (2007a) *Typepad mobile*. Available at: <http://get.typepad.com/>.
- Six Apart Ltd. (2007b) *Vox*. 2007. Available at: <http://www.vox.com>.
- Trafford, P. (2005) 'Mobile blogs, personal reflections and learning environments', *Ariadne*, Vol. 44, No. 9.
- Traxler, J. (2007) 'Defining, discussing, and evaluating mobile learning: the moving finger writes and having writ', *International Review of Research in Open and Distance Learning*, Vol. 8, No. 2, p.12.
- Traxler, J. and Kukulsa-Hulme, A. (2005) 'Evaluating mobile learning: reflections on current practice', Paper presented at *the mLearn 2005*, Cape Town, 18–25 October.
- Trinder, K., Guiller, J., Marggarian, N., Littlejohn, A. and Nicol, D. (2008) *Learning from Digital Natives: Bridging Formal and Informal Learning*. Glasgow Caledonian University: The Higher Education Academy.
- Vygotsky, L. (1978) *Mind in Society*. Cambridge, MA: Harvard University Press.
- Wenger, E. (2005) *Communities of Practice: a Brief Introduction*. Available at: <http://www.ewenger.com/theory/index.htm>.
- Wenger, E., McDermott, R. and Snyder, W. (2002) *Cultivating Communities of Practice: A Guide to Managing Knowledge*. Boston: Harvard Business School Press.
- Wenger, E., White, N., Smith, J. and spa, K.R. (2005) *Technology for Communities*. Available at: <http://technologyforcommunities.com/>.

AU:
In reference
Oblinger and
Oblinger
(2005), please
provide the
name of the
publisher.

AU:
In reference
Sharples et al.
(2007), please
provide the
name and
city of
publisher.

AU:
In reference
Trafford
(2005), please
provide the
page range.

Appendix

Project outline

LPSC5996 NEGOTIATED STUDY (18 credits)

Aim:

To allow students to develop an area of specific interest outside the scope of other courses within the programme. The area of specialisation will involve a negotiated research project or field study *or* design project.

Exhibition garden design option

Learning outcomes:

- to design a exhibition garden for Ellerslie Flower Show
- to develop a time line for the project
- to prepare a budget for the exhibition garden
- to prepare a strategy for marketing the design team to the public
- to procure sponsorship for a range materials
- to prepare construction drawings
- to complete the exhibition garden (construction not assessed)

These learning outcomes will be assessed by way of a portfolio of evidence to include

- conceptual drawings
- design statement
- design concept plan, elevations and/or cross sections and model
- project timeline
- project budget – model available
- marketing plan
- construction drawings
- sponsorship proposal and records
- photos of the completed garden
- individual analysis of the completed garden and drawings in design terms, from student's perspective including level of success, strengths, weaknesses.

The portfolio will include the use of the following tools:

- a reflective Blog (<http://wordpress.com>)
- commenting on each other's Blogs
- an online e-portfolio (<http://www.vox.com>)

- discussion forums and file/document sharing via Moodle (<http://moodle.unitec.ac.nz/>)
- wireless smartphones to access the above.

You are expected to make at least weekly updates to your Blog and e-portfolio, and regularly comment (critique/reflect/discuss) on each other's blog postings. You must also regularly check the diploma landscape design project section on Moodle for project news.

Criteria for acceptance into this course option includes

- 1 proven capacity for independence
- 2 strength in design
- 3 evidence of group process planning for project.

Each student will need to meet with the programme staff to present a proposal to demonstrate personal and project suitability for the course.