

# Mobile Web 2.0: Bridging Learning Contexts

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## ABSTRACT

Blogs, wikis, podcasting, and a host of free, easy to use web 2.0 social software provide opportunities for creating social constructivist learning environments focusing upon student-centred learning and end-user content creation and sharing. Building on this foundation, mobile web 2.0 has emerged as a viable teaching and learning environment, particularly with the advent of the iPhone (Nicknamed “the Jesus phone”) and iPod Touch. Today’s wifi enabled smartphones provide a ubiquitous connection to mobile web 2.0 social software and the ability to view, create, edit and upload user generated web 2.0 content. This chapter explores the potential of wireless mobile devices and web 2.0 (social software) to create social constructivist learning environments that bridge multiple learning contexts.

The chapter provides an overview of current literature in the field, and discusses the pedagogical design of six example mobile web 2.0 trials undertaken during 2007 and 2008 as part of research into the potential of mobile web 2.0 to enhance tertiary education. The trials were based in three different courses and illustrate the application and integration of mobile web 2.0 to bridge a range of learning contexts. The chapter argues that wireless mobile devices can be used to intentionally create disruptive learning environments that facilitate a social constructivist approach to teaching and learning.

**Keywords:** mLearning, Web 2.0, Mobile, Social constructivism, education

## INTRODUCTION

This chapter is based upon the experiences gathered from six mobile learning (mlearning) trials beginning in 2007 and continuing throughout 2008. After an introductory trial in 2007 (Cochrane, 2008c), five small (each involving between 6 and 10 students and their lecturers) mlearning projects were implemented and evaluated during 2008 (Cochrane, 2008a). Feedback from the 2008 mobile projects was very enthusiastic:

*It isn’t ‘easy’ working in this way but it is immensely valuable and exciting. I think that it would be very hard go back to traditional teaching only methods now I have begun to use blogging and mobile blogging (Third year Bachelor Product Design lecturer).*

*I really, really enjoyed the process, it was great. The things I liked were being able to be completely mobile, and having access to the Internet – you know, if I was lost or if I needed to find someone, or I needed to ring a business. I could go on the Internet, Google their website, look up their opening hours, things like that... (Bachelor Product Design student)*

Compilations of 2008 student and staff VODcasts (Online video recordings) are available on YouTube:

1. Bachelor Product Design Year 1 [http://www.youtube.com/watch?v=8QUfw9\\_sFmo](http://www.youtube.com/watch?v=8QUfw9_sFmo)
2. Bachelor Product Design Year 2 <http://www.youtube.com/watch?v=6jwAFXBZA0>
3. Bachelor Product Design Year 3 (and Lecturers) <http://www.youtube.com/watch?v=8Eh5ktXMji8>
4. Diploma Contemporary Music <http://nz.youtube.com/watch?v=0It5XUfvOjQ>
5. Diploma Landscape Architecture <http://nz.youtube.com/watch?v=c8IZSVtaMmM>

The focus of using mobile web 2.0 technologies (described below) is to harness easy to use, mobile friendly tools that students can use to create their own content and learning contexts, guided by their lecturers and supported by their peers, beyond the limitations of institutional systems. Recent mlearning projects based at the University of Wollongong (Herrington *et al.*, 2008) follow a similar pedagogical and staff professional development approach to that utilised in this research project, but do not explicitly link web 2.0 tools with mlearning as this project does.

## Defining Mobile Learning

Definitions of mobile learning have focused initially upon the mobility of the devices and more recently the mobility of the learners. Sharples proposes a form of Laurillard's conversational framework (Laurillard, 2001), excluding the teacher, to define mobile learning by its contextual and informal learning characteristics. "The processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies" (Sharples *et al.*, 2006). However, a key element in the conversational framework is the dialogue between teacher & student. In contrast to Sharples *et al* (2006), Laurillard (2007) emphasizes the teacher's input in mobile environments through good pedagogic design that facilitates continuity between the face to face and remote peer learning contexts. Her 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" (Laurillard, 2007).

Wali *et al* (2008) take 'context crossing' as the basis for their conceptualisation of mlearning. They use Activity Theory to define mlearning. The resultant definition is extremely broad: "learning that occurs as a result of pursuing learning activities that are directed towards achieving some objective in multiple contexts (physical and social)" (Wali *et al.*, 2008) p45. Wali *et al* believe "definitions of mobile learning should cover conventional devices as well as any other technology" – they want to get away from a technology focus within the definition of mlearning, to a focus upon the 'continuity of learning activities in different contexts'. However, non wireless devices cannot bridge communication across multiple 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, that sets it apart from more

traditional learning environments. Mobile learning, as defined in this chapter, involves the use of wireless enabled mobile digital devices (Wireless Mobile Devices or WMD's) within and between pedagogically designed learning environments or contexts. From an activity theory perspective, WMD's are the tools that mediate a wide range of learning activities and facilitate collaborative learning environments (Uden, 2007).

## Context Bridging

Recent research into mlearning has highlighted the context 'awareness' of mobile devices, and the ability to 'span' learning contexts. However, what is unique about WMDs for mlearning is their ability to BRIDGE contexts (Vavoula, 2007) – i.e. to provide ubiquitous connectivity independent of the context of use, thus linking multiple contexts into the learning environment, continuing learning 'conversations' via social presence and communication technologies.

Mlearning can support and enhance both the face to face and off campus teaching and learning contexts by using the wireless mobile devices as a means to leverage the potential of current and emerging collaborative and reflective e-learning tools (e.g. blogs, wikis, RSS, instant messaging, podcasting, social book marking, etc...). These are often called social software or web 2.0 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". In particular, the context bridging and media recording capabilities of today's smartphones make them ideal tools for mobile blogging. Smartphones allow a user to send text, photos, video and audio directly from the site of recording to the users online Blog. An example of the potential of mobile blogging is the rise of citizen journalism (Cameron, 2006; Elmendorp, 2007; Fulton, 2007; Skoeps, 2007). Collaboration and communication with peers and tutors can be maintained in any context using WMDs with a variety of communication technologies (email, online LMS, Instant Messaging, audio and video conferencing, SMS, MMS, mobile phone calls etc...).

## BACKGROUND

### Why Mobile?

*The convergence of ubiquitous broadband, portable devices, and tiny computers has changed our concept of what a phone is meant to be. A pocket-sized connection to the digital world, the mobile phone keeps us in touch with our families, friends, and colleagues by more than just voice. Our phones are address books, file storage devices, cameras, video recorders, wayfinders, and hand-held portals to the Internet—and they don't stop there. The ubiquity of mobile phones, combined with their many capabilities, makes them an ideal platform for educational content and activities. We are only just beginning to take advantage of the possibilities they will offer. (New Media Consortium, 2007)*

Today's mobile phones are powerful computers. The catch phrase of Nokia's current add campaign for its N-Series smartphones is: "It's what computers have become" (Nokia, 2007). Its rise to ubiquity is described as a

*...stealthy but rapid shift from a telephony device towards a portable, personal media hub that enables an increasing range of personalised and customised communication, entertainment,*

*relationship management and service functions. Its reach is pervasively global and trans-cultural, possibly more so than any other media form including the internet and world wide web (Cameron, 2006).*

The largest growth area of Internet usage is mobile access. “‘Mobile, mobile, mobile,’ were the words of Google chief executive Eric Schmidt recently when asked what technologies are most intriguing to the computer Web search leader” (Wakabayashi & Auchard, 2007). Marc Prensky remarks: “What can you learn from a cell phone? Almost anything!” (Prensky, 2005b).

## **Pedagogy and today's learners**

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 & Ellison, 2007). They have been nick-named the ‘net-generation’ and ‘digital natives’ (Oblinger & Oblinger, 2005; Prensky, 2005a). These learners have also been named ‘generation C’, the content creation generation. As Bruns argues (2007), 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 web 2.0 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 web 2.0 tools within collaborative, technologically rich social constructivist environments.

*E-learning is not an experiment. It has moved into the mainstream of higher education and is beginning to be recognized as a strategic asset... The challenge for institutions is to adopt what is, in the short term, a disruptive technology, in such a way that it enhances core values while positioning the institution for the demand and opportunity of innovative technology (Garrison & Anderson, 2003).*

The use of Wireless Mobile Devices (WMDs) as part of the teaching and learning environment requires changes in pedagogy and integration into the teaching and learning processes. Changes in pedagogical strategies, content (reformatted for small screens and lower data bandwidths), and contexts (beyond the face-to-face classroom environment) are required. 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).*

Mobile devices coupled with wireless networks have been described as ‘disruptive technologies’ (Sharples, 2000, 2001, 2005; Stead, 2006), and so have the web 2.0 social software tools that have developed (Blogs, Wikis, podcasting, vodcasting, online photo blogging etc...) (Alexander, 2004, 2006; Fielder, 2004; Lamb, 2004). 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. Their disruptive nature forces a rethink of pedagogical strategies and relationships in education.

A pedagogical framework for implementing social software tools via wireless mobile devices 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 (mlearning) pedagogical model will focus upon enhancing communication and collaboration within a dynamic learning environment, and will be student-centred. 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.

## **Web 2.0**

Web 2.0 is a recently coined term (O'Reilly, 2005) referring to a new wave of Internet tools and usage. Kress and Pachler describe web 2.0 as a “fundamental shift in agency from broadcast to content generation, a decentralization of resource provision and, ... an enhanced organization and categorization of content with an emphasis on ‘deeplinking’” (Kress & Pachler, 2007). 'Social Software' (interactive collaborative software) is one of the key features of 'Web 2.0'. Examples of current and emerging social software tools include Blogs, Wikis, RSS, instant messaging, podcasting, social book marking, etc... (Farmer, 2004; Glogoff, 2005; Kaplan-Leiserson, 2004). The key characteristics of social software fit well with the pedagogies described above, enabling a natural and relatively simple approach to creating collaborative learning communities.

Web 2.0 is about:

1. Moving beyond CONTENT
2. Ease of use
3. Interactivity
4. Collaboration & sharing
5. Customisation
6. Personal Publishing
7. Exploiting multiple communication channels

The educational implications of web 2.0 social software are the source of recent interest (Alexander, 2006; Alexander *et al.*, 2006; Anderson, 2007; Becta, 2006, 2007; Bryant, 2006; New Media Consortium, 2007). Many educators have harnessed web 2.0 tools for creating engaging student-centred learning environments. This appropriation of web 2.0 tools within a social constructivist pedagogy facilitates what has been termed “pedagogy 2.0”.

*Pedagogy 2.0 integrates Web 2.0 tools that support knowledge sharing, peer-to-peer networking, and access to a global audience with socioconstructivist learning approaches to facilitate greater learner autonomy, agency, and personalization (McLoughlin & Lee, 2008).*

Building on this foundation, Wireless Mobile Devices coupled with open-source Social Software tools potentially provide the basis for enhancing teaching and learning in virtually any discipline, providing an environment that stimulates reflection, critique, collaboration, and user generated content – i.e. a social constructivist environment.

## **Mobile Pedagogies**

Approaches to mobile learning can be categorised within three broad approaches (Stead & Colley, 2008):

1. Shallow or supplementary learning: Typically, these may be SMS prompts, School-generated podcasts, and mobile games. They are good as a supplement to other activities.
2. Focused learning: Typically these resemble a mobile-friendly version of classic “e-learning”, with targeted nuggets of learning that can be engaged with while on the move - possibly context aware.
3. Deep learning: Deep learners are immersed in a mix of mobile technologies, as creators or originators as well as the more common consumers of mobile media, following a constructivist model.

This chapter focuses on the third approach by using a mix of mobile web 2.0.0 tools. While web 2.0 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) p157)

The majority of today’s learners can be described as:

- Technically literate
- Multitasking
- Collaborative
- Connected

To engage these learners a lot of thought must be given as to how their preferred means of communicating can be integrated into the teaching and learning environment. Mobile devices are inherently social, enabling rich social interaction, and have the potential for enhancing group work and communication within educational settings. In general today’s younger tertiary learners are constantly connected to their social networks via their wireless mobile devices. A 2006 survey of Australian students born since 1980 indicated - 95% owned mobile phones, 73% owned MP3 players or iPods, 23% had their own games console and 15% had a personal digital assistant (Litchfield *et al.*, 2007). Their preferred method of communication is text messaging (65% (Cameron, 2006)), followed by instant messaging (New Zealand Herald, 2006). A recent ECAR survey of 27,846 students at 103 USA higher education institutions indicated 84.1% of students use instant messaging daily while 81% use social networks daily (Caruso & Salaway, 2007).

In comparison, many of today’s lecturers may be unfamiliar or uncomfortable with the use of the tools described above (Blogs, wiki’s, RSS, instant messaging etc...). Before lecturers can

implement mobile learning they require understanding and experience of a range of foundational learning technologies. Most mobile learning trials involve only a small number of lecturers, who are already techno-savvy enough to be confident incorporating mlearning. To move mobile learning into the mainstream of an institution requires a strategy for up-skilling academics in integrating technology into their pedagogies (Kukulska-Hulme & Pettit, 2007; Moser, 2007).

### **Intentional Disruption**

The disruptive nature of Web 2.0 and mobile technologies facilitates a move from instructivist pedagogies to social constructivist pedagogies. The personal, social networking, and context awareness of mobile devices democratise power relationships and are best suited to open learning environments. 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 reinforces (2007), 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 have been experienced during the mobile trials at Unitec referenced later in this chapter.

### **Supporting Mobile Learning**

The disruptive nature of mobile learning requires significant pedagogical support. One approach to facilitate this is the development of academic peer group support guided by a teaching and learning professional, i.e. a Community Of Practice (Cochrane, 2007b; Cochrane & Kligyte, 2007), investigating the use of Web 2.0 social software tools and then mobile learning in education guided by a 'technology steward' (Wenger et al., 2005). This Community of Practice also provides a model for academics to use in their own student classes as they later integrate social software and mobile technologies into their courses. However, it must be noted that nurturing successful intentional Communities of Practice requires significant effort (Langelier, 2005; Wenger et al., 2002). In the following research project, the author has taken on the role of the technology steward to guide academic staff and their students using an intentional Community of Practice model. This has proven to be a key strategy in the success of the mobile learning trials. Academics who have participated in COPs feel better prepared for today's technology adept learners.

## **MLEARNING CASE STUDIES**

This section illustrates social constructivist learning environments facilitated via WMDs and social software with several qualitative action research learning trials being run to investigate the impact of WMDs on teaching and learning in higher education. The anticipated learning outcomes of these trials for students are:

- Developing critical reflective skills
- Facilitating group communication
- Developing an online eportfolio

- Developing a potentially world-wide peer support and critique network
- Learning how to maximise technology to enhance the learning environment across multiple contexts

## **Methodology and Participants**

The research is qualitative using a participatory action research methodology to build upon lessons learnt in each successive trial, and to allow flexibility and critical reflection leading to appropriate trial redesign within each trial. The researcher is interested in bringing about positive change within the teaching and learning environment. Yoland (Wadsworth, 1998) identifies the key characteristics of 'participatory action research': the researcher is a participant, the researcher is the main research instrument, it is cyclical in nature, involves action followed by reflection followed by informed action, and is concerned with producing change. This change is ongoing throughout the process, and the research is interested in input from participants/stakeholders. Teaching staff (9) were invited to be potential participants for the research trials by the researcher, and were all previously participants in communities of practice facilitated by the researcher focusing on the potential of educational technologies to enhance teaching and learning. Each trial was created as the result of collaborative discussions between the researcher and each set of tutors, choosing appropriate mobile devices and project goals to enhance each respective course. Tutors then called for volunteer student participants from each of their courses (a total of 50 students over 8 courses), outlining the scope and participation requirements. All participants were provided with the chosen mobile device, wifi access on campus, and a variety of 3G data accounts for use during the period of each trial. Students and staff were surveyed pre-trial to gauge their previous experience of the mobile web 2.0 tools. They were also provided with outlines of the research, an acceptable use policy and ethics consent forms. An intentional community of practice was then established for each trial, consisting of the researcher (technology steward), the course tutors, and the student participants. Each community of practice aimed to meet regularly and formed the basis for scaffolding the use of the technology and the integration into each courses curriculum. Survey instruments and focus group discussions gathered feedback from all participants mid and post trial. The first trial (Diploma Landscape Design 2007) provided a basis for informing the second trials in 2008. The three 2008 trials were being conducted in parallel with one another, and issues raised by one trial were then identified and used to modify the other two trials, providing an inter-connected action research environment.

## **Research Questions:**

1. What are the key factors in integrating Wireless Mobile Devices (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?
4. 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.

The survey tool and focus group questions can be viewed in the appendix. Additionally each trial has used the mid semester and end of semester breaks to provide opportunities for reflection on the progress of each trial, gather formative feedback from participating students and staff, and brainstorming with the tutors on how to better integrate the technologies into each courses curriculum. Students and tutors have been encouraged to create summary VODcasts (video blogs) providing critical reflection on the trial at these points. These VODcasts, along with the wide variety of media students have uploaded to their blogs, have provided rich media for later analysis and reflection.

## **Communities of Practice**

The tutors involved in the trials have previously been involved in the development of academic peer support groups guided by a teaching and learning professional, i.e. an intentional Community Of Practice (Cochrane, 2007b; Cochrane & Kligyte, 2007), investigating the use of Web 2.0 social software tools and then mobile learning in education. This Community of Practice also provides a model for academics to use in their own student classes as they later integrate social software and mobile technologies into their courses. The project is guided and supported by weekly “technology sessions” facilitated by a ‘technology steward’ (Wenger et al., 2005) who is the researcher and an Academic Advisor in elearning and learning technologies in the Centre for Teaching and Learning Innovation (CTLI) at Unitec. The projects are collaborative projects between the ‘technology steward’, the course tutors, and the students on the course. While still in early days, the uptake throughout the institution of COPs for educational technology is encouraging. Staff who previously struggled with integrating technology into their pedagogical approaches are now implementing mobile learning projects with students, and thus we are seeing the awareness and uptake of mobile technologies in tertiary learning increase at Unitec (A tertiary education Polytechnic institution). Key to the models success is its flexibility: recognizing that every COP formed is unique, requires negotiable content, motivational goals, and appropriate access to resources. Every COP will require a different approach for nurturing and motivation.

## **Scaffolding the Learning**

As part of the role of the ‘technology steward’ for the trials the researcher has also taken on developing the technical and learning support for the trials. This has involved the investigation and purchase of appropriate smartphones and folding Bluetooth keyboards for the smartphones. The best option for providing voice and data connectivity for the trial participants (within the project budget) was investigated with Vodafone New Zealand. The smartphones were pre-configured with the wireless settings and software appropriate for the trial (e.g. Vox client, GMail client, Shozu client, Google Mobile and Moodle shortcuts etc...). Tutorial courses have been created for each trial within the Learning Management System (LMS) used by the course (either Moodle or Blackboard). Demonstration tutorials have been created using screen captures of the

smartphones accessing the various web 2.0 tools utilized and embedded as interactive slideshows within the LMS. Support has been provided for the course tutors in the form of pre-trial tutorials on using the smartphone and web 2.0 tools. Finally the core support element of the trials is a weekly ‘community of practice’ investigating the use and integration of the smartphones and web 2.0 tools involving: the technology steward, the course tutors, and the students. Each trial ‘learning community’ is also supported by the ‘neighbourhood’ social networking feature of Vox, and the use of instant messaging for facilitating communication and a sense of social presence.

## Pedagogical Design

The core activity of each trial is the creation and maintenance of a reflective Blog as part of a course group project. Additionally a variety of mobile friendly web 2.0 tools are used in conjunction with the smartphone. The trials investigate how the smartphone can be used to enhance almost any aspect of the course. The project uses the smartphone within a wide range of activities (see the following diagram, Fig 1, and table 1 that attempt to illustrate the alignment of these activities with the projects underlying social constructivist pedagogy. There is an interactive online version available at <http://ltxserver.unitec.ac.nz/~thom/mobileweb2concept2.htm>):

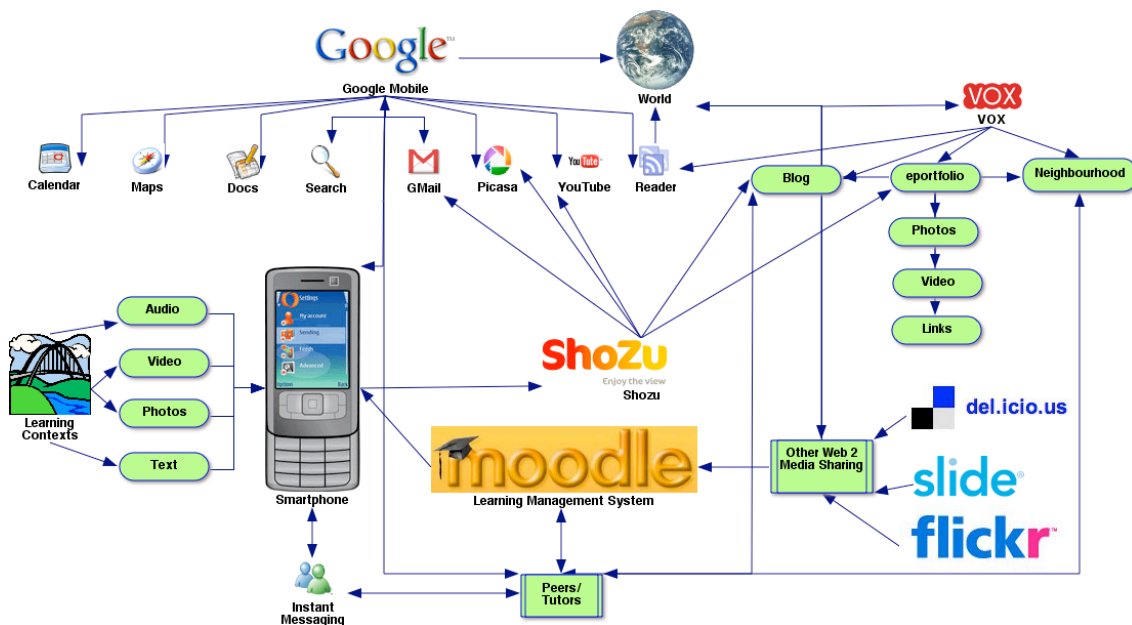


Fig 1. Mobile Web 2.0 Concept Map.

The trials are exploring how a mix of mobile web 2.0 tools can enhance the student’s learning throughout their whole course.

*Table 1a. Table of trial activities aligned to social constructivist pedagogical outcomes.*

Activity	Overview	Pedagogical outcomes
A reflective Blog	A blog post (including media) can be uploaded directly to VOX using the Vox client on Nokia smartphones, or Shozu ( <a href="http://www.shozu.com">http://www.shozu.com</a> ), or emailed to VOX <a href="mailto:xxxxxx@moblog.vox.com">xxxxxx@moblog.vox.com</a>	Developing critical and reflective thinking
An eportfolio	VOX ( <a href="http://www.vox.com">http://www.vox.com</a> ) includes media sharing (video, audio, documents, images, links...) and linking (YouTube, Flickr etc...) as well as social networking.	Collaborative sharing of media and peer critique also forms the basis for a career portfolio.
Email	GMail ( <a href="http://gmail.com">http://gmail.com</a> ) provides a free email account that can be used on almost any Internet capable device. A GMail account also opens free access to all other Google web services. The Google Java application optimises GMail for phones.	Communication and collaboration
RSS	RSS enables subscribing and tracking/sharing of online activity. It provides a link between all your web 2.0 media sites. Google reader ( <a href="http://reader.google.com">http://reader.google.com</a> ) is a great web based RSS reader, while Newsgator ( <a href="http://www.newsgator.com">http://www.newsgator.com</a> ) also provides RSS clients for synchronisation via PC, Mac or mobile.	Collaboration
Shared Calendars	Google Calendars ( <a href="http://calendar.google.com">http://calendar.google.com</a> ) can be shared between groups of people via invitation. Google Calendars use an open format that provides interoperability between many calendar systems – e.g. iCal on Mac OSX	Time scheduling and collaboration of activities
Image Blogging	Dedicated image sharing repositories such as Flickr and picasaweb offer more interactive features than Vox's image repository, and are linkable to Vox and other Blogging systems. Direct mobile upload to Flickr can be achieved via either the Vox client, or email. Picasaweb mobile is supported via Shozu destination uploads.	Event, data and resource capturing and collaboration. Creativity.
Video Blogging	YouTube ( <a href="http://www.youtube.com">http://www.youtube.com</a> ) is currently the most popular video-sharing site. The mobile version supports viewing of videos online in the mobiles web browser, or via a downloadable Java client for specific phones. Uploading mobile videos to YouTube is achieved via email attachments.	Event, data and resource capturing and collaboration. Creativity.
Shozu	Shozu is a service for linking all your online mobile Blog and Media sites together via either the Shozu client application, or an email sent to <a href="mailto:go@m.shozu.com">go@m.shozu.com</a>	Shozu provides links between all the pedagogies described.
Podcasting	Uploading an audio file to Vox creates a podcast episode that others can subscribe to via an automatically created RSS feed.	Interviews, critiques, reflections, shared collaboration.
Instant Messaging and Skype	Fring ( <a href="http://www.fring.com">http://www.fring.com</a> ) is a free Instant Messaging and Skype client for most mobile phones. It allows messaging between the most popular IM systems. It works best over a WiFi connection, or good 3G connection.	Communication and collaboration

*Table 1b. Table of trial activities aligned to social constructivist pedagogical outcomes.*

Activity	Overview	Pedagogical outcomes
Shared Bookmarks	Delicious ( <a href="http://del.icio.us">http://del.icio.us</a> ) is a social bookmarking site – allowing the creation and sharing of Internet bookmark libraries and searching via tags (descriptive keywords). Mobilicious ( <a href="http://mobilicio.us">http://mobilicio.us</a> ) a mobile optimised version.	Collaboration
LMS	Moodle is a mobile friendly Learning Management System, hosted on a production level Unitec server. Course notes, discussion forums, and various activities can be hosted on Moodle.	Scaffolding and support
Mobile Google	A gateway into the Google Mobile services ( <a href="http://mobile.google.com">http://mobile.google.com</a> ) via the phones web browser. iGoogle ( <a href="http://www.google.com/ig/i">http://www.google.com/ig/i</a> ) is a customisable mobile Google Homepage.	Links to tools that support all of the mentioned pedagogies.
Mobile Codes	Mobile Codes (Datamatrix codes in this case) provide sharing of URLs, text and messages via scanning using the smartphones built-in camera. Codes can be created and downloaded from <a href="http://mobilecodes.nokia.com">http://mobilecodes.nokia.com</a> and scanned using either a compatible scanning application on the mobile phone.	Scaffolding, support, collaboration.
Web Browsing	The Built-in Web Browser is very good, but in some cases Opera Mini may work better, and Opera Mini has several tools built-in (RSS feeds, synchronisation with Opera on a PC etc...)	Research skills
Document Reading & Editing	Google Docs ( <a href="http://docs.google.com">http://docs.google.com</a> ) is Microsoft Word, Excel and PowerPoint compatible. Documents can be uploaded and shared and edited by a group. They are viewable online in a web browser without MS Office. Docs can be created on mobile devices by emailing the document to a private Google Docs address. To edit uploaded documents you need a full PC web browser, or a full version of 'QuickOffice' on your smartphone – a mobile version of MS Office (~ \$60).	Documentation, reflection, critique, description, and collaborative document publishing etc...

Table 2 below outlines the implementation timeline model developed to facilitate the mobile web 2.0 trials. It must be emphasized that experience indicates that this process involves significant time for staff and student development. The timeframe of the trials was designed to firstly familiarise the tutors with the tools and technology before introducing it to their students. Semester one goals of mobile web 2.0 projects are mainly to get tutors and students experimenting and confident with the tools, embedding them into their course workflows, followed by more explicitly targeted pedagogically designed learning experiences in semester two.

*Table 2. Typical Trial Process and Timeline.*

<b>Project Steps</b>	<b>Project Milestones</b>
1. 3 to 6 months pre trial	<ul style="list-style-type: none"> <li>• Establish a Community Of Practice with potential academic staff members, who are committed to working together and exploring the potential of web 2.0 and mobile web 2.0 technologies in teaching and learning.</li> </ul>
2. Pre trial – at end of COP	<ul style="list-style-type: none"> <li>• Brainstorm mobile web 2.0 project goals and course integration with course Tutors, creating or modifying course outlines and assessment activities.</li> </ul>
3. Pre trial	<ul style="list-style-type: none"> <li>• Purchase appropriate mobile smartphone and accessories (e.g. folding Bluetooth keyboard).</li> <li>• Investigate best option for providing voice and data connectivity</li> <li>• Configure the smartphones with software appropriate for the trial (e.g. Vox client, GMail client, Shozu client, Google Mobile and Moodle shortcuts etc...)</li> <li>• Setup LMS (e.g. Moodle) support course for scaffolding students and forming an focus for the weekly ‘technology support’ sessions (Effectively a Community Of Practice involving students, staff and the technology steward)</li> </ul>
4. Pre including students in trial	<ul style="list-style-type: none"> <li>• Provide course tutors with smartphone and tutorials on setup.</li> </ul>
5. Trial setup with students	<ul style="list-style-type: none"> <li>• Blog and Web 2.0 setup session with Students and Staff</li> </ul>
6. Trial official start with students	<ul style="list-style-type: none"> <li>• Provide students with smartphone and begin weekly technology support sessions.</li> </ul>
7. On going, weekly throughout trial	<ul style="list-style-type: none"> <li>• Support students and staff during trial via weekly ‘technology workshops’</li> <li>• Monitor student progress via their Vox Blogs/eportfolios</li> </ul>
8. Mid trial and end of trial	<ul style="list-style-type: none"> <li>• Student and staff surveys</li> <li>• Focus group</li> <li>• Data analysis and report write up.</li> <li>• Re-evaluation of Trial for second semester</li> </ul>
9. During semester break	<ul style="list-style-type: none"> <li>• Use feedback and evaluation to modify Second semester mobile web 2.0 strategies and assessment activities.</li> </ul>
10. On going, weekly throughout second half of trial	<ul style="list-style-type: none"> <li>• Support students and staff during trial via weekly ‘technology workshops’</li> <li>• Monitor student progress via their Vox Blogs/eportfolios</li> </ul>
11. End of trial	<ul style="list-style-type: none"> <li>• Final Data gathering, analysis, and report write up.</li> </ul>

Tables 3 to 8 provide a comparative outline of the six mobile web 2.0 trials conducted during 2007 and 2008. Each trial uses a Learning Management System (LMS) to provide scaffolding and support for both tutors and students (either Blackboard or Moodle). Each project also uses a different ‘smartphone’ device, appropriate to the requirements of the course, and each project has a specific timeline that has been negotiated between the course tutors and the researcher.

*Table 3: Outline of Diploma of Landscape Design 2007 mobile web 2.0 trial.*

<b>Course: Diploma Landscape Design 2007, elective project</b>	
<b>Participants</b>	<ul style="list-style-type: none"> <li>• 8 students (three teams) –The average age of the students is 28 (19 to 49), and the gender mix was 5 female students and 3 male students.</li> <li>• 1 Course Tutor</li> <li>• Technology Steward (Thom Cochrane – CTLI)</li> </ul>
<b>Mobile Technology</b>	Nokia N80 WiFi and 3G smartphone, prepay voice and data SIM
<b>Pedagogical Focus</b>	Design and build a group exhibition garden for the Ellerslie Flower Show
<b>Community of Practice</b>	Focused on beginning and middle of the project, with 4 sessions at the beginning of the trial and 4 sessions mid trial with the introduction of the N80.
<b>Support LMS</b>	Moodle
<b>Deliverables</b>	A reflective blog of the design and build process. (Initially Wordpress, then moved to Vox in July 2007) A portfolio (either electronic using VOX or print-based).
<b>Timeframe</b>	March 2007 to November 2007, with N80 mobile introduced in July 2007.

*Table 4: Outline of Bachelor of Product Design 2008, third year class, mobile web 2.0 trial.*

<b>Course: Bachelor of Product Design, third year class</b>	
<b>Participants</b>	<ul style="list-style-type: none"> <li>• 9 students – The average age of the students is 24 (19 to 33), and all are male students.</li> <li>• 2 Course Tutors</li> <li>• Technology Steward (Thom Cochrane – CTLI)</li> </ul>
<b>Mobile Technology</b>	Nokia N80 WiFi smartphone (upgraded to N95 in Semester2), Bluetooth folding keyboard, 1GB/month 3G data
<b>Pedagogical Focus</b>	Documenting the research and design of three products throughout the year, including working with a client company in small design teams
<b>Community of Practice</b>	Weekly throughout the entire course
<b>Support LMS</b>	Moodle
<b>Deliverables</b>	An online Blog/eportfolio documenting and showcasing your design processes and forming the basis of a collaborative hub with worldwide peers and potential employers/clients.
<b>Timeframe</b>	February 2008 through to November 2008, expanding to the entire course 2009.

*Table 5: Outline of Diploma of Contemporary Music 2008 mobile web 2.0 trial.*

<b>Course: Diploma of Contemporary Music, elective class</b>	
<b>Participants</b>	<ul style="list-style-type: none"> <li>• 11 students – The average age of the students is 22 (17 to 32), and the gender mix is 6 female students and 5 male students.</li> <li>• 2 Course Tutors</li> <li>• Technology Steward (Thom Cochrane – CTLI)</li> </ul>
<b>Mobile Technology</b>	iPod Touch WiFi PDA, upgraded to iPhone with 200MB/month 3G data in Semester2
<b>Pedagogical Focus</b>	A group investigation of the potential of the iPod and iPhone to enhance the Contemporary Music programme
<b>Community of Practice</b>	Weekly throughout the entire course
<b>Support LMS</b>	Blackboard
<b>Deliverables</b>	A regular Blog entry documenting participants experiences A regular PODCast show episode
<b>Timeframe</b>	February 2008 through to November 2008, continuing in 2009.

Table 6: Outline of Diploma of Landscape Design 2008 mobile web 2.0 trial.

<b>Course: Diploma Landscape Design 2008, elective overseas field trip</b>	
<b>Participants</b>	<ul style="list-style-type: none"> <li>6 students – The average age of the students is 55 (42 to 69), and the gender mix is 3 female students and 1 male students.</li> <li>2 Course Tutors</li> <li>Technology Steward (Thom Cochrane – CTLI)</li> </ul>
<b>Mobile Technology</b>	Sonyericsson P1i WiFi smartphone, Bluetooth folding keyboard, 1GB/month 3G data
<b>Community of Practice</b>	Focused on the beginning of the trial with four introductory sessions, then a further four sessions in August/September before the trip to Japan.
<b>Support LMS</b>	Moodle
<b>Pedagogical Focus</b>	Creation of an eportfolio preparing, researching cultural background, and recording and then exhibiting an investigative trip to Japan
<b>Deliverables</b>	A Vox eportfolio and blog.
<b>Timeframe</b>	April 2008 to October 2008

Table 7: Outline of Bachelor of Product Design second year class 2008 mobile project.

<b>Course: Bachelor of Product Design, second year class</b>	
<b>Participants</b>	<ul style="list-style-type: none"> <li>6 students – The average age of the students was 29 (19 to 41), and the gender mix was 3 female students and 3 male students.</li> <li>1 Course Lecturer (Did not participate in the project)</li> <li>Technology Steward (Thom Cochrane – CTLI)</li> </ul>
<b>Mobile Technology</b>	Nokia N95 WiFi smartphone, Bluetooth folding keyboard, 1GB/month 3G data
<b>Pedagogical Focus</b>	An informal group investigation of the potential of mobile technologies and moblogging to enhance the Product design second year programme.
<b>Community of Practice</b>	Weekly throughout the second semester, during students lunch hour.
<b>Support LMS</b>	Moodle
<b>Deliverables</b>	No programme or assessable deliverables required, however a reflective personal regular Blog entry documenting participants' mlearning experiences and enhancing their class project was expected of the participants.
<b>Timeframe</b>	July 2008 through to November 2008.

Table 8: Outline of Bachelor of Product Design first year class 2008 mobile project.

<b>Course: Bachelor of Product Design, first year class</b>	
<b>Participants</b>	<ul style="list-style-type: none"> <li>10 students – The average age of the students was 25 (19 to 39), and the gender mix was 1 female student and 9 male students.</li> <li>1 Course Lecturer</li> <li>Technology Steward (Thom Cochrane – CTLI)</li> </ul>
<b>Mobile Technology</b>	iPhone 3G, 200MB/month 3G data
<b>Pedagogical Focus</b>	Creation of student design teams to research and design a new ergonomic garden trowel. The research was to be documented using a group VOX blog/eportfolio.
<b>Community of Practice</b>	Focused on the Ergonomics paper within the second semester of the course with the first hour of the weekly class devoted to the moblogging project.
<b>Support LMS</b>	Blackboard
<b>Deliverables</b>	An assessed Vox eportfolio and group blog.
<b>Timeframe</b>	August 2008 to November 2008

## **Disruptive pedagogical implications**

The 2007 mobile web 2.0 trial illustrates the disruptive nature of the introduction of these technologies into a learning environment. The project began by using Wordpress as a reflective journal, and then moved to using Vox as a mobile enabled eportfolio in semester two of the project. There were three student groups (teams) involved in the 2007 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. 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). This illustrates the need to develop strategies for early identification and scaffolding for such learners.

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 mobile 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 mid way through the project.
- Exhibited little online community building – i.e. they made no comments on each other's blogs, or the other groups 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. 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 email notifications of comments on their Vox blog and new posts on neighbour Vox blogs. Vox also sends out a weekly email news notification with a summary of Vox neighbourhood activity.

## **Redesigning the 2008 Trials**

Using an action research methodology for the trials provides the flexibility to critique, reflect on, and modify the projects as required. The 2008 trials have built upon the foundation laid by the first mobile trial in 2007 (Cochrane, 2007a, 2008b, 2008c), which found that:

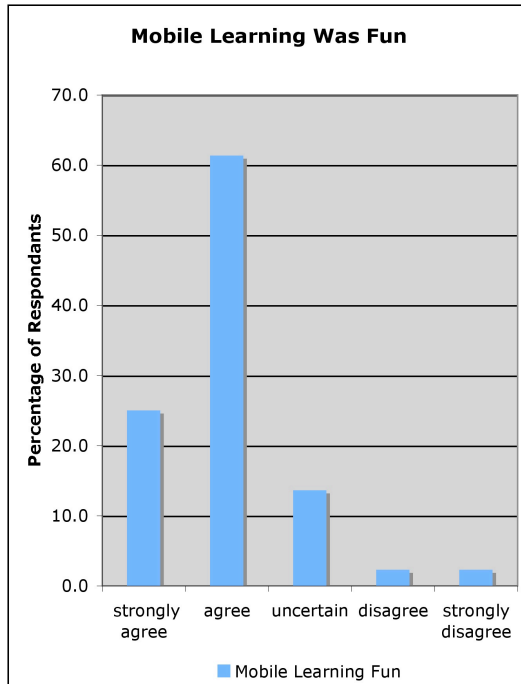
- A context spanning social-constructivist learning environment is facilitated.
- Teachers require a new pedagogical toolkit to capitalise on this environment.
- Students require explicit scaffolding in this environment.



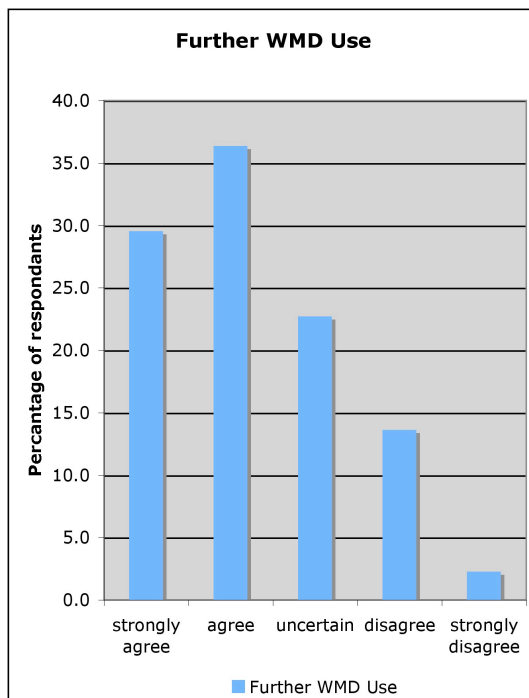
- The capabilities of affordable smartphones are constantly increasing, as is the availability of free mobile web 2.0 services. These can be matched to create highly collaborative and motivating learning environments.
- Good pedagogical design of contextual learning environments is essential.
- Tutor professional development and technology support is critical.
- An ethos of the educational use of mobile web 2.0 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 wireless mobile devices.
- Significant time is required to develop skills in the use of the technologies for both students and tutor

The three 2008 mobile learning trials have produced a variety of results that further illustrate the most significant factors highlighted by the 2007 trial. The amount of support required to initiate and nurture the three groups of students and tutors has been more than was envisioned. Nurturing successful intentional Communities of Practice requires significant time and effort (Langelier, 2005; Wenger et al., 2002). However this has been minimised by having a common design to the three trials that has been developed from the experiences of mobile and web 2.0 projects over the past three years. The partnership between the researcher and the three groups of tutors has been built-up over this period as well - initially through communities of practice investigating the use of educational technology, and now this model is being loosely used to create learning communities consisting of the researcher, tutors, and their students. The challenges include modeling the pedagogical use of the technology to the students, and making the learning outcomes explicit for the students while allowing the flexibility for each group to creatively experiment and develop uniquely.

Staff and student feedback has been extremely positive, with significant gains in student output and engagement noted, and a desire for further use of the technology within their courses. The following graphs illustrative student and staff feedback collated and averaged over the six trial groups.



*Fig2. Survey Feedback.*



*Fig3. Survey Feedback.*

Other schools within the institution are also showing interest – e.g. the School of Screen and Performing Arts, and the School of Architecture. Innovation in programme delivery is a strategic direction for the institution in 2009.



A student decided to use the smartphone's camera to record still images and video podcasts outlining significant steps in the design process of a snow kite harness. This allowed the student to reflect and critique their design using visual media rather than simply creating a text-based online journal. This took place over the six-month period of the product design. Video clips were recorded from the design studio on campus, from testing in the local park, and from test flights during two ski-field trips. The course tutors followed along with the student's blog posts, offering tips and design guidance while on campus, at home, and while attending overseas conferences. The video clips were then later edited and compiled into a ten-minute video overview of the significant design steps over the six-month design process. The compilation video was then uploaded to YouTube and the student's blog for showcasing and sharing.

### **Diploma of Contemporary Music Student 2008**

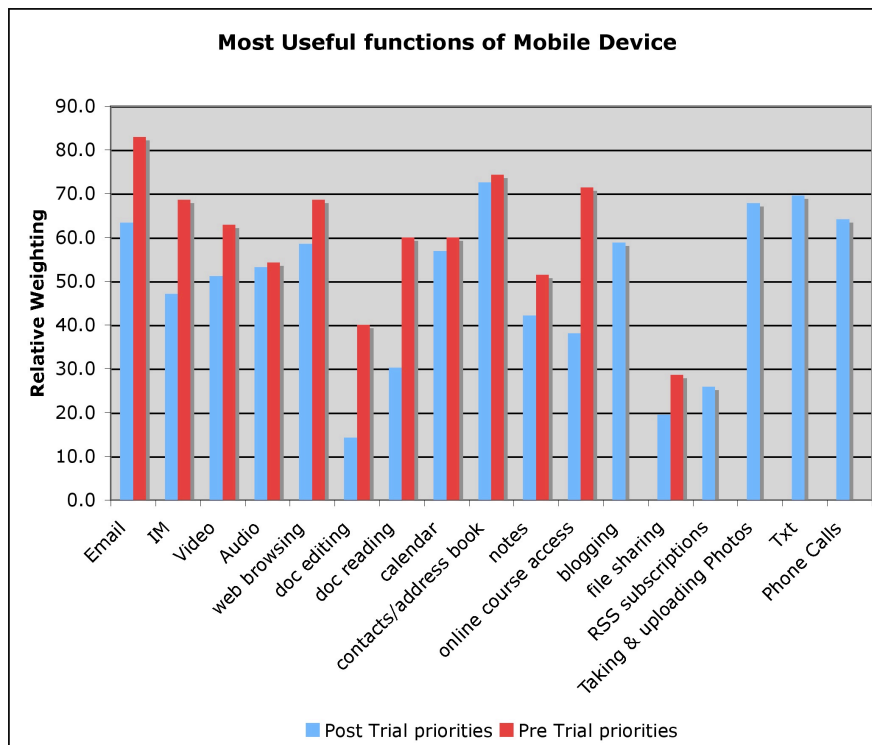
Notifications of student performance venues and times were posted to their blog, informing other students' in their Vox neighbourhood via email or RSS to their iPhones of these upcoming events. A second student videoed the student performing live with their band at the venue, and subsequently the video was uploaded and shared via the student's blog. Email and instant messaging were used on the iPhone for communication between students (for social activities and help with assignments), and between the students and the technology steward (asking for help with software issues), and between the students and course tutors (for clarifying assessment requirements).

### **Diploma of Landscape Architecture Student 2008**

The project focused on a research field trip to Japan, gaining landscape design ideas from Japanese garden designs. A student decided to create a story narrative of the trip, using her smartphone to record still photos and videos of the trip mascot (a garden gnome carried on the trip with them) at each of the field trip destinations, uploading and annotating these on her Blog for relatives back in New Zealand to follow along. This also served as the basis of an eportfolio record of the trip from later analysis with the rest of the students and staff when back in New Zealand. Unfortunately the garden gnome suffered a fatal accident before the end of the trip, interrupting the narrative.

### **Student feedback:**

While initially finding learning the smartphone interface daunting, students integrated their use into their everyday lives. Students particularly valued the ability to capture and record ideas and content using the smartphones multimedia capabilities (Cochrane & Bateman, 2008b). They uploaded significantly more media (Mainly still images) to their online eportfolios than actual blog posts. Several students preferred to VODCast (record and upload a video monologue) rather than post text based reflections on their blogs. Students highly valued the potential for mobile web 2.0 technologies to facilitate formative feedback from their course tutors from almost any location and anytime. Least valued by students was the ability to access various types of course content on the smartphones (see Fig 5.). This is a reflection on the underlying pedagogy chosen for the trials (Social constructivism) where a conscious decision was made to focus on communication, collaboration and user generated content rather than repurpose course content for small screens. However this was also device dependent, with iPhone users rating course content access higher than other mobile device users. In general, students used the smartphones to complement their use of computer laptops.



*Fig5. Student perceptions of most useful mobile functions.*

Students were asked if they would be interested in purchasing their own smartphone as a result of their experiences with the mobile web 2.0 projects. Although a small number of Diploma Landscape Design students rejected the idea of purchasing their own smartphone, BDesign students were unanimous in indicating they would purchase their own smartphone. The most important factors influencing students' own purchase of a smartphone for use in their course were identified as cost, the capability of the built-in camera, the inclusion of wifi connectivity for free internet access on campus, and the ability to integrate the smartphone with their blog for moblogging (see Fig 6.). The Nokia N95 smartphones were perceived as a significant leap forward in speed and capability in comparison to the often 'buggy' N80s. The UIQ3 interface of the sonyericsson P1i smartphones was found to be unintuitive for students.

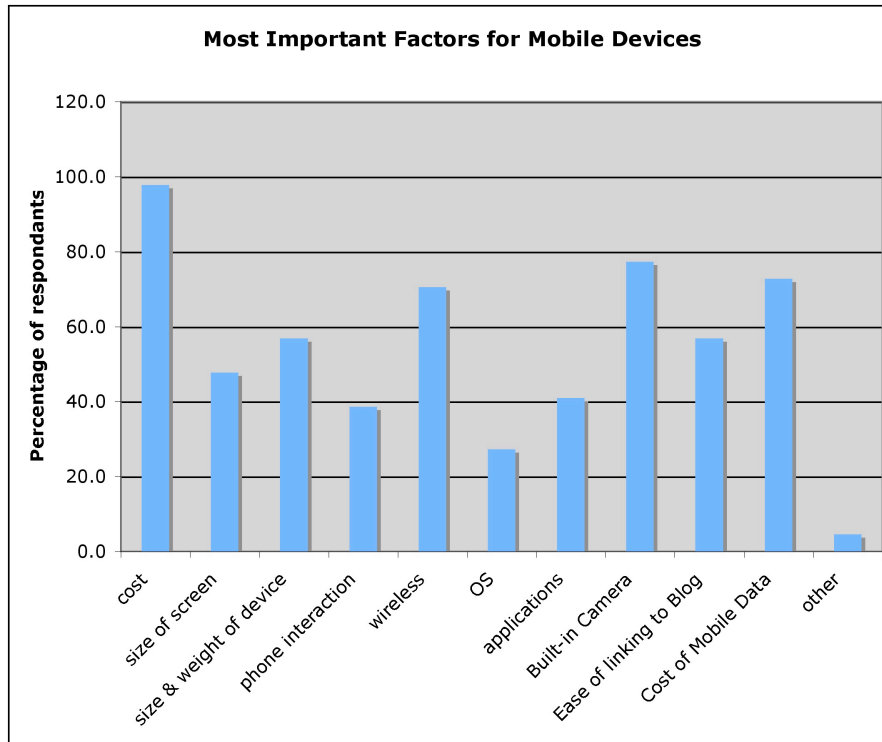


Fig6. Most important factors in considering mobile purchase by students.

When asked in what situations the WMDs were most effective, students replied:

*As a mobile computer – instead of a laptop, and as a communication tool for a team who are in different places all the time, too busy to meet, to transfer information, pictures, documents etc. (Diploma Landscape Design student 2007)*

*Spur of the moment, spotting something inspirational, documenting an idea when a PC is not around. (Bachelor of Product Design student 2008)*

*It's the convenience of the small device, nice and handy fits into the pocket. No matter where I was I could use it, spare time having lunch, toilet, even in the classroom while the teacher wanted some information about a particular person. At school looking for information on the net, leisure times, looking at other classmates' webpage's, blog and YouTube videos etc... (Diploma Contemporary Music student 2008).*

### Staff feedback:

While integration into the courses required significant rethinking of staff pedagogies and assessment procedures, all the staff involved in the trials were very positive at the results (Cochrane & Bateman, 2008a; Cochrane & Cliffin, 2007). However not all teaching staff integrated the use of the mobile web 2.0 tools into their pedagogical toolkits to the same extent.

*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! (Diploma Landscape Design staff 2007)*

*It isn't 'easy' working in this way but it is immensely valuable and exciting. I think that it would be very hard go back to traditional teaching only methods now I have begun to use blogging and mobile blogging. (Bachelor of Product Design staff 2008)*

*Now that I have mastered using WMDs as integrated teaching and learning tools: using up to date technologies to supplement the studio teaching process, I am looking for the next innovation that we can bring to bear on the programme. (Bachelor of Product Design staff 2008)*

When asked in what situations the WMDs were most effective, staff replied:

*Very useful for blogging, as the WMDs increased interactivity. (Diploma Landscape Design staff 2007)*

*As an aid to studio based design projects. WMDs allow staff and students to stay in contact outside of the studio as well as allowing staff to point students to on line resources to aid the learning process. (Bachelor of Product Design staff 2008)*

*WMDs assist when the students are working on live or industry based projects. The clients or companies can easily keep track of the individual students projects thus meaning that when face-to-face meetings do occur, no time is lost getting up to speed. Students seem to take a more professional approach to logging and communicating their projects when they know their client or sponsor company can look at their work at any time. (Bachelor of Product Design staff 2008)*

Teaching staff noted that the introduction of the mobile web 2.0 technologies significantly increased student engagement through the creation of a sense of connectivity and the sense of the embedding of current technology into the learning experience. When the mobile web 2.0 technologies were integrated into the course assessment tutors noted the significant facilitation of flexible teaching and learning environments that were no longer bound to on campus facilities.

*Embedding assessment is fundamental – because of the time involved in producing these eportfolios and blogs you would not get the uptake or seriousness without it being an assessed deliverable.*

*Without the mobile devices (as in 2007) blogging was confined to the studio using laptops, so mobile blogging has changed the nature and engagement level! Key therefore is the provision of the mobile devices. Also staff understanding is fundamental, staff have undertaken a learning process as well. Interestingly we assumed that students would know more about web 2.0 technologies than they have!*

*My teaching approach has changed in that I am now very tolerant of students using technology and not necessarily having to be in the studio as in the past, as they couldn't be interacting with me or other teaching staff. Students are learning on the move and the traditional walls have broken down. My teaching has changed to a balance between being in the studio and reading and marking student blogs. The traditional way of simply being available during the studio sessions has changed to almost being 'on-call' 24/7 because being involved in these blogs becomes quite addictive. Some staff are resistant to this, but using news aggregators is one way to manage this and allows a more flexible working environment. All in all it has been a fantastic experiment. We are looking forward very much to continuing the learning process and seeing how we can reshape the face of studio, art and design education (Bachelor of Product Design staff 2008).*

## **The Future of Mobile Web 2.0**

The mobile web 2.0 trials that this chapter has used to illustrate implementation methodologies have so far used a model of providing a common smartphone for the students within a course. The students and staff involved have been encouraged to use the smartphones as if they owned them for the period of the trials. This approach was used to seed the concept and provide proof of concept results. Following the enthusiastic response from the students and lecturers involved in these trials, internal institutional funding was sought, and approved, for extending these small projects to a major large-scale mlearning project in 2009 involving the use of 250 smartphones, and 200 netbooks. This larger scale project is informed by the experiences of the previous trials and will cover a wider range of courses and learning contexts. However, to create a sustainable model, the goal going forward is to move to a student-owned model, where students purchase a smartphone that meets specifications outlined by the course requirements – much as many institutions require students to purchase a specifically specified laptop computer to ease support requirements. As the cost of appropriate smartphones and 3G data costs drop, the purchase cost may be sustainably subsidized by institutions in lieu of other course related costs that the mobile web 2.0 model replaces.

The five mobile web 2.0 trials referenced highlight the following key issues:

- Mobile web 2.0 technologies challenge instructivist pedagogies and provide a rich basis for flexible social constructivist pedagogies.
- A context spanning social-constructivist learning environment is facilitated.
- Mobile web 2.0 technologies facilitate interaction beyond the traditional student-tutor 'conversation'.
- Student engagement is significantly increased and self and peer critical reflection is facilitated.
- Teachers require a new pedagogical toolkit to capitalise on this environment.
- Students require explicit scaffolding in this environment.



- The capabilities of affordable smartphones are constantly increasing, as is the availability of free mobile web 2.0 services. These can be matched to create highly collaborative and motivating learning environments.
- Good pedagogical design of contextual learning environments is essential and should include assessment weighting for students to value the activities.
- Tutor professional development and technology support is critical.
- An ethos of the educational use of mobile web 2.0 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 wireless mobile devices.
- Significant time is required to develop skills in the use of the technologies for both students and tutors.

## **CONCLUSION**

This chapter introduces and illustrates the potential for mobile web 2.0 technologies to engage students in a variety of learning contexts, and overviews a transferable model for designing and supporting mobile web 2.0 learning environments. As a limited sample case study the findings and conclusions cannot be used to generalise too broadly, but serve as illustrative principles, strategies used, lessons learned and the results achieved that may help to inform future mobile web 2.0 projects in tertiary education. Student and academic staff feedback is used to illustrate the success of this approach. An intentional Community Of Practice model is presented as a way to support and scaffold mobile web 2.0 projects. The symbiotic relationship developed between the academic advisor (technology steward) and the academic teaching staff involved in each of the mobile learning trials overviewed has proven to be a rich environment for harnessing mobile web 2.0 technologies to design social constructivist learning environments for different groups of tertiary students. The disruptive nature of mobile web 2.0 technologies has been presented as a catalyst to move traditional instructivist pedagogies towards social constructivist pedagogies that bridge both on and off campus learning contexts. It is hoped that the insights gained will be useful for academic teaching staff wanting to implement pedagogical innovation, and for professional development staff seeking insights for facilitating academics to integrate mobile web 2.0 technologies into their pedagogies.

## APPENDIX

Table 5. Wireless Mobile Study – end of trial questionnaire (DipLSD2007 Students):

<b>QUESTION: (This is an anonymous questionnaire)</b>	<b>Your Answer: tick or circle most applicable answer/s, or write your answer in the space provided below.</b>					
1. What is your Student ID number?						
2. What is your age?						
3. What is your gender?	Male	Female				
4. What has been your experience of group work facilitated by Blogs and RSS?	Very Good	Good	Not Bad	Neither Good nor Bad	Not Good	Terrible
6. It was easy to use the smartphone (Nokia N80)?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	
7. This mobile learning experience was fun.	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	
8. Based on my experience during this trial, I would use a smartphone in other courses	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	
9. I would be willing to purchase my own smartphone?	Yes	No				
10. Where did you use the Smartphone? Circle all that apply.	a. At home b. At Unitec in class c. At Unitec not in class d. While Travelling e. On site while investigating or building your project f. Other (specify)					
11. In your opinion, does mobile learning increase the quality of learning?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	
12. Mobile blogging helped create a sense of community (group work)?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree	

13. Accessing your course blog was easy using the mobile device?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
14. Mobile learning increases access to education?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
15. Communication and feedback from the course tutor/lecturer were made easier?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
16. Mobile learning is convenient for communication with other students?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
17. Rate the usefulness of the following applications using mobile devices? (0 = no use, 10 = extremely useful).	a. Email b. Instant Messaging c. Video d. Audio e. Web Browsing f. Document editing g. Document Reading h. Calendar i. Contacts/Address book j. Notes k. Accessing online course material l. Blogging m. File sharing n. RSS subscriptions o. Taking and uploading photos p. Txt q. Phone calls				
18. What factors would be most important in deciding upon mobile learning?	<ul style="list-style-type: none"> <li>• Cost of device</li> <li>• Size of the screen</li> <li>• Size &amp; weight of the mobile device</li> <li>• Phone integration</li> <li>• Wireless capability</li> <li>• The operating system: PocketPC, Palm OS, or Symbian</li> <li>• Availability of installable applications</li> <li>• A built-in camera</li> <li>• Ease of linking to your Blog</li> <li>• The cost of mobile data</li> <li>• Other</li> </ul>				

19. Do you have any other comments on the mobile project?	
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### **Questions for discussion**

The main purpose of the focus group is to provide critical reflective feedback on the design and implementation of the learning activities and enhanced communication facilitated by the Wireless Mobile Device (WMD) used in the 'trial'. This feedback will provide valuable insights into the design of the following trial, and forms a critical reflective action research cycle of evaluation.

### **Focus Group Questions:**

1. How would you rate the effectiveness of the WMD (Smartphone) for accessing your/your students' blogs?
2. How user friendly was the interface of the WMD?
3. How would you rate the effectiveness of the WMD for increasing communication:
  - a. Between students
  - b. Between Students and Tutors/lecturers?
4. How useful were the WMDs for accessing course content?
5. Describe how the integration into the course of the WMDs may be improved.
6. (For Tutors) How would you rate the usefulness of the WMDs for your own teaching?
7. What level of interactivity did the WMDs provide?
8. What were the benefits of wireless connectivity?
9. What were the support requirements for the WMDs?
10. What other uses did you find for the WMD?
11. In what situations would the WMDs be most effective?
12. What do you think worked well, and what would you do differently another time?

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