

## **Transforming pedagogy using mobile Web 2.0**

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# TRANSFORMING PEDAGOGY USING MOBILE WEB 2.0

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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 on 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 tool, facilitating engaging learning environments that bridge multiple contexts. Today's dual 3G and wifi-enabled smartphones provide a ubiquitous connection to mobile Web 2.0 social software and the ability to view, create, edit, upload, and share user generated Web 2.0 content. This article outlines how a Product Design course has moved from a traditional face-to-face, studio-based learning environment to one using mobile Web 2.0 technologies to enhance and engage students in a social constructivist learning paradigm.

*Keywords: m-learning; Web 2.0; pedagogy 2.0; social constructivism; product design*

## INTRODUCTION

The term Web 2.0 was coined in 2005 (O'Reilly, 2005) as a way of characterizing the emerging interactive, user-centered Web based tools that were revolutionizing the way the Internet was conceptualized and used. These tools include: blogs, Wikis, image-sharing (e.g., Flickr), video-sharing (e.g., YouTube), podcasting, and so forth. These Web 2.0, or "social software," tools share many synergies with social constructivist learning pedagogies. Therefore many educators have harnessed Web 2.0 tools for creating engaging student-centered 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).

## Mobile Web 2.0

While there have been many attempts to define the unique essence of mobile learning (m-learning), most have either focused on the mobility of the device, the learner, or on the facilitation of informal learning beyond the confines of the classroom

(Kukulsa-Hulme & Traxler, 2005; Laurillard, 2007; Sharples, Milrad, Sanchez, & Vavoula, 2007; Wali, Winters, & Oliver, 2008). Mobile learning, as defined by the authors of this article, involves the use of wireless enabled mobile digital devices (Wireless Mobile Devices or WMDs) within and between pedagogically designed learning environments or contexts. From an activity theory perspective, WMDs are the tools that mediate a wide range of learning activities and facilitate collaborative learning environments (Uden, 2007). M-learning can support and enhance 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 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." 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.

### **Situating the Research**

This section briefly overviews a short history and critique of mobile learning research, indicating the research gaps that this study attempts to fill, and situates the research project within the context of current mobile learning activity. The twenty-first century has seen the consolidation and maturing of m-learning research (Traxler, 2008), while the increase in m-learning-focused conferences (e.g., MLearn, Handheld Learning, mICTe), research projects and briefing papers from organizations like JISC, and articles in educational journals like *Educause*, *JCAL*, and so forth, demonstrate a growing general interest in m-learning. Many early m-learning studies were relatively short-term pilot studies, and lacked rigor in evaluation and epistemological underpinnings (Traxler & Kukulsa-Hulme, 2005), and many studies focus upon content delivery for small screen devices and the personal digital assistant capabilities of mobile devices rather than leveraging the potential of mobile devices for collaborative learning as recommended by Hoppe, Joiner, Milrad, and Sharples (2003). In recent years there has been a flurry of m-learning research and case studies, particularly from the UK. M-learning and Web 2.0 technologies have been identified as emerging tools to enhance teaching and learning (Anderson, 2007; Becta, 2007; Johnson, Levine, & Smith, 2009; McFarlane, Roche, & Triggs, 2007; McLoughlin & Lee, 2008; New Media Consortium, 2007, 2008; Sharples et al., 2007; Traxler, 2007; Trinder, Guiller, Marggaryan, Littlejohn, & Nicol, 2008), but are not usually explicitly linked together. Many recent m-learning research projects have focused on the informal learning environment, and often presuppose "self-motivated learners" like pre-service teachers (Cook, Pachler, & Bradley, 2008). Few studies have yet to explicitly bridge both the formal and informal learning contexts within "main-stream" tertiary education. One exception was the AMULETS (CeLeKT, 2009) project (Advanced Mobile and Ubiquitous Learning Environments for Teachers and Students), which explored "collaboration in context," bridging indoor and outdoor learning experiences using mobile and location aware devices in both secondary and tertiary scenarios.

Several larger mobile learning projects have tended to focus on specific groups of learners, rather than developing pedagogical strategies for tertiary education in general. For example the "m-learning project" extended over four years, focusing

on retention of at risk learners by using cell phone technologies (Attewell, 2005). The RAMBLE (Remote Authoring of Mobile Blogs for Learning Environments) mobile learning project (Trafford, 2005) investigated the use of mobile devices for blogging and accessing a VLE (virtual learning environment). However, the mobile devices (Palm OS PDAs) were not wireless capable, relying on desktop computers for synchronization to update the students' blogs. Corlett, Sharples, Bull, and Chan, (2005) identified wireless connectivity as a key factor in the success of their implementation of a mobile learning organizer. Other examples of large-scale m-learning projects include: MOBILearn (Europe), MobilED (South Africa), and MoLeNET (UK). MoLeNET is possibly the largest m-learning research project undertaken so far. MoLeNET is UK based, focused on FE (Further Education institutions) and funded by the Learning and Skills Council. In its initial phase (2007 to 2008), the MoLeNET project included 32 FE institutions undertaking a variety of m-learning implementations. Now in its third year, MoLeNET has provided 12 million pounds of funded investment in m-learning in the UK to 115 Colleges and 29 Schools, involving around 20,000 learners and 4,000 staff. Many of the MoLeNET projects investigate the affordances of a variety of mobile devices loaned to students for accessing course related content. The MoLeNET project has a robust focus on developing a model of professional development and support for educators, and a rigorous evaluation process.

A list of a range of current m-learning projects can be found on the International Association for Mobile Learning Web site (2008). The listed projects encompass a wide variety of m-learning implementations. M-learning projects with a focus on mobile web 2.0 tools and a social constructivist pedagogy include the work of Chan (2007), the JISC funded MORSE project (Andrew, Hall, & Taylor, 2009), and the m-learning projects at the University of Wollongong (Herrington, 2008; Herrington, Herrington, Mantei, Olney, & Ferry, 2009; Herrington, Mantei, Herrington, Olney, & Ferry, 2008). Chan is investigating the potential of mo-blogging to support work-based learning for apprentice bakery chefs. The MORSE project (November 2008 to October 2010) investigates the use of mobile Web 2.0 tools to support students away from the institution during fieldtrips and work placement (ranging from 1 day to 2 weeks duration up to 15 times per year). The University of Wollongong projects are a series of short-term (6-week-long) mobile learning projects based around the affordances of institutionally loaned Palm Treo smartphones and iPods in a tertiary education department.

## **Pedagogy**

The underpinning pedagogy chosen for the project is social constructivism, focusing upon students on a Product Design course recording and documenting their learning collaboratively across multiple contexts using mobile Web 2.0 tools. Social constructivism can be contrasted with the more instructivist, content-driven pedagogies traditionally implemented in tertiary education. Herrington and Herrington (2007) argue that "the advances in philosophical and practical developments in education have created justifiable conditions for the pedagogical use of mobile technologies" based on newer learning theories that find their roots in social constructivism, such as authentic learning, communities of practice, distributed intelligence, distributed cognition, connectivism, and activity theory. Social constructivism focuses upon students being involved in learning environments as an explorative and social process. In general, education based on social constructivist

pedagogies is interested in enabling students to develop creative, critical thinking, and collaborative skills, rather than focusing upon course content. The underpinning pedagogy of a course will determine how particular tools and technologies are used and integrated within the course. Therefore social constructivist learning environments prepare students for the types of graduate capabilities and characteristics that are required by successful Product Designers. McLoughlin and Lee advocate the exploration of the potential of the alignment of Web 2.0 tools and emerging learning paradigms based loosely upon social constructivism,

the affordances of these technologies, coupled with a paradigm of learning focused on knowledge creation and networking, offer the potential for transformational shifts in teaching and learning practices, whereby learners can access peers, experts, the wider community and digital media in ways that enable reflective, self-directed learning. (2008, p. 649)

Similarly, Herrington has proposed that mobile technologies can facilitate “authentic learning” (Herrington et al., 2008) based on social constructivist pedagogies. Web 2.0 social software provides tools for a learning and teaching environment that facilitates social constructivism beyond the bounds of institutionally managed e-learning systems (e.g., LMSs). Mobile Web 2.0 adds the extra dimension of context awareness, ubiquitous connectivity, and provides access to concept and content capturing tools in students’ hands wherever they are. Thus student engagement, collaboration and empowerment are facilitated. The connections between learning contexts, the WMD, and Web 2.0 social software is illustrated by an interactive mobile Web 2.0 concept map created by the researchers that can be viewed online at:

[http://homepage.mac.com/thom\\_cochrane/MobileWeb2/mobileweb2concept2.htm](http://homepage.mac.com/thom_cochrane/MobileWeb2/mobileweb2concept2.htm).

One of the key drivers for the introduction of m-learning into the course was the development of a flexible, context independent teaching and learning environment. The following is a quote from one of the Product Design lecturers at the start of a Community of Practice investigating the potential of mobile Web 2.0 technologies.

What do I want to get out of this community of practice? The first thing that I would say would be ‘freedom.’ As somebody who has 2 or 3 offices around the campus sharing with other people because I move around the campus a lot, and somebody who works from home and travels around a lot for Unitec—I want to be able to speak with my students and members of staff and basically connect with Unitec and other people and institutions with ease and freedom. So being nomadic and being able to roam around and not have to be in one place to communicate with students on a daily basis is really important. And that is the primary reason for being involved in this community of practice—and I’m really looking forward to what happens (Course lecturer, 2007. <http://www.youtube.com/watch?v=jznHfb8dsvs> ).

A recurring theme throughout the twelve m-learning projects conducted by the researchers from 2006 to 2009 has identified one critical success factor (of several) for integrating mobile Web 2.0 within tertiary education courses as the level of pedagogical integration of the technology into the course criteria and assessment. The case study reported here illustrates this by analysing attempts at the explicit pedagogical integration of m-learning into the course over a period of three years.

Herrington and Herrington's (2007) nine critical success factors in establishing authentic learning environments include:

1. *Authentic contexts* that reflect the way the knowledge will be used in real life
2. *Authentic activities* that are complex, ill-defined problems and investigations
3. *Authentic assessment* that reflects the way knowledge is assessed in real life

Laurillard (2007) also backs this up: "M-learning technologies offer exciting new opportunities for teachers to place learners in challenging active learning environments, making their own contributions, sharing ideas, exploring, investigating, experimenting, discussing, but they cannot be left unguided and unsupported. To get the best from the experience the complexity of the learning design must be rich enough to match those rich environments" (2007, p. 174).

Expected student learning outcomes of the m-learning intervention included:

- Developing critical reflective skills
- Facilitating group communication
- Developing an online e-portfolio
- Developing a potentially world-wide peer support and critique network
- Learning how to maximise technology to enhance the learning environment across multiple contexts

## **Research Methodology**

The research uses a participatory action research methodology. 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 and stakeholders. This allows for the continual development and improvement of the projects based on the feedback from participants at regular points in the projects. These reflective points were focused around the semester breaks, before which participant feedback was gathered via surveys and focus group discussions. Following this the researcher and the course lecturers spent significant time together critiquing the project implementation and modifying it for the following semester period. The use of an intentional community of practice model for supporting the projects created a close relationship between the researcher, the course lecturers, and the students, who were all members and collaborators in the weekly community of practice sessions.

## **Research Questions**

The research summarized herein is part of a wider research project investigating the potential of mobile Web 2.0 for enhancing tertiary education through a series of action research projects in a variety of disciplines. Each project is embedded within a different course and discipline context (Diploma of Contemporary Music, Diploma of

Landscape Design, and Bachelor of Product Design), and each project utilizes a different WMD (smartphones: iPhone, Nokia N95, Sonyericsson P1i, Nokia XpressMusic 5800) with features that are most appropriate to each context. A comparative outline of the four mobile Web 2.0 projects can be found in the MLearn 2008 proceedings (Cochrane, 2008a). The variety of learning contexts covered by the project illustrates the transferability of the project's approach to facilitating and supporting mobile Web 2.0 in tertiary education. This article focuses on the effect of mobile Web 2.0 on the pedagogical development of one of these projects (Third year Bachelor of Product Design), giving the viewpoint of the academic staff involved (Cochrane & Bateman, 2008b).

The wider research questions are:

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 blog is also an online e-portfolio facilitating the collection of rich media resources capturing critical incidents and providing a dynamic journal of student projects and tutor input (both formative and summative).

The survey tool and focus group questions can be viewed in the appendix hosted online on Google Docs at [http://docs.google.com/Doc?id=dchr4rgg\\_5478zdzbwg&hl=en\\_GB](http://docs.google.com/Doc?id=dchr4rgg_5478zdzbwg&hl=en_GB) (Cochrane & Bateman, 2008b). A participatory action research methodology is used, creating a reflective research environment that continually seeks to improve the student learning outcomes based on regular student and tutor feedback.

This article focuses on the aspect of pedagogical transformation by asking the academic staff involved to reflect on four related questions:

1. What potential benefits do you see for mobile Web 2.0 to enhance teaching and learning?
2. Have you (so far) seen increased engagement in the course from students when using this technology?
3. What are the key issues for integrating this technology into your courses?
4. In what ways has (or will) your teaching approach changed by using these tools?

Course tutors were asked to reflect on the impact of mobile Web 2.0 at several points throughout the trial, and used a variety of media to capture their reflections,

including; posts to their blogs, VODcasts (video recordings uploaded to their blogs and YouTube), paper surveys, discussions, and brainstorming with the researcher.

## **BACHELOR OF PRODUCT DESIGN (A CASE STUDY)**

### **Bachelor of Product Design Programme Outline**

The Bachelor of Product Design is a level seven programme of 360 credits over three years of full time study. The programme is offered on a semester basis and aims to produce students who are equipped with theory and practice to contribute to the effective conception and delivery of robust, new ideas. In order to achieve this, students are required to be conceptually active and broadly informed but also sufficiently pragmatic to accept the importance of a thorough and systematic approach to realization. The programme was launched in 2003 and was borne out of a Bachelor of Design which had its roots in a traditional approach to design studio teaching that favored the Atelier Method (2008) or “private method” of instruction where an individual staff member works with a small group of students to progressively train them.

The standard studio environment of one communal space and one timetable is unlikely to offer the best support and learning opportunities for creative students. Design students probably more than other students are known to work at different paces and often redesign their projects just before the assignment is due to be handed in. Some students need to work with music playing whilst others require complete silence. Some students work in the afternoons whilst others prefer the mornings. The introduction of mobile Web 2.0 tools has facilitated significant flexibility for students to choose to work in virtually any context on and off campus.

### **Collaboration**

The complexity of contemporary society is such that individual disciplines can no longer claim exclusive ownership of certain bodies of knowledge or areas of practice. Societies, organizations and individuals are progressively acknowledging the importance of collaborative endeavor. Specialists remain, but require additional knowledge, education and skills to allow them to work effectively as part of interdisciplinary teams.

The structure of the Bachelor of Product Design programme promotes the interconnectivity of core disciplines that are essential in design, development and innovation. The programme encourages students to view design holistically and acknowledge the contribution that the core disciplines make to the process

The Bachelor of Product Design has a structure that is based around the principle of interconnectivity between core disciplines as essential elements of design, development and innovation. Key goals of the programme include: the gathering of knowledge; facilitating and implementing creativity; the development of essential skills including collaboration and communication; and the identification of personal strategies and interests. A social constructivist pedagogy facilitated via mobile Web 2.0 has close synergy and benefits for facilitating this collaboration.

### **Methods of Programme Delivery**

Whereas the first and second year courses are characterized by elective courses, core courses and staff devised projects, the third and final year is predominantly self-directed. Students begin the year by choosing their projects from a set of open

frameworks. The later part of the first semester and all of the second semester is taken up with a self-devised and self-directed “major project.”

One of the distinctive features of the programme is its learning structure that seeks to foster “an environment of self-conscious reflection and analysis to ensure that student’s critical and analytical skills mature appropriately” (Programme Document).

The student’s learning requires the student to speculate, question, and reflect on his or her own and design industries’ practice. This presupposes that design students have the ability to reflect and think critically about what they are doing. Historically students have reflected on their work and documented their reflections via sketches, reports and during tutorials with individual staff members. Importantly, in a bid to improve their own performance, we have noted that design students are becoming more interested in understanding design, however, documenting iterative project developments remains difficult for most undergraduate product design students.

Over the last three years, we have been progressively devising and integrating methods to assist students to gather enough knowledge together to thoroughly reflect on the design processes they employ. A considerable part of designing has to do with integration, combining the needs of all the stakeholders into a design that addresses all aspects of the product. As a result of this, a major task for the tutor then becomes teaching and facilitating the students’ learning of the process of integration.

Teaching staff annually face the problems of facilitating live projects where students work with external clients. We argue that to achieve successful integration within live projects, students must communicate their ideas and developments clearly and regularly with their tutor, client and peers in a student-centered collaboration methodology rather than a traditional instructivist teacher-centered methodology. Communicating clearly to others is a necessary aspect of studying design. But as Stuart Mealing (2000, p. 15) reminds us, even more important (than the need to communicate to others) is the need to be able to communicate clearly to oneself as part of the internal feedback process of problem solving and, in addition, because natural language is a necessary step towards understanding abstract concepts. These are the key drivers for the implementation of pedagogical change within the programme.

To illustrate the implementation of pedagogical changes in the course, the following sections outline the modifications to the third year major assignment between 2006 and 2008. The goal of this assignment is to help students to grasp and understand the complexity of the design process, facilitate social constructivist learning and improve the level of integration within student projects. The full assignment outline is available for viewing in the appendix and on Google Docs (Bateman & Cochrane, 2008), included here is a discussion of the key changes.

## **Pedagogical Change from 2006 to 2008**

### **First Attempts at Pedagogical Change in 2006**

In 2006 a mobile learning trial was implemented within one project of the third year of the Bachelor of Product Design programme using Palm WiFi PDAs and social software such as Blogger.com and instant messaging. There was little course integration, limited buy-in from course tutors, limited campus WiFi coverage, and the results effectively illustrated how not to approach m-learning. At the same time the researcher was developing a Community of Practice (COP) model for educational

technology literacy in tertiary academics (Cochrane & Kligyte, 2007). Product Design course lecturers were invited to form an intentional Community of Practice to investigate the use of Web 2.0 tools within their teaching. This first attempt at establishing a lecturer COP was short lived; however, one lecturer was motivated to explore these ideas further in 2007. While there were no formal changes made to the traditional implementation of the major project in 2006 (see Table 1), reflections on these experiences merged to form the foundational concepts underpinning subsequent implementation and research into mobile learning. The 2006 trials were also used to develop and test the research questions and data collection instruments.

### **Introduction of Web 2.0 Technologies and Tools in 2007**

In 2007 the main third year major project course lecturer integrated the optional use of Web 2.0 tools like blogging (via Wordpress) into the third year course using student-owned laptops and desktops. This integration was achieved with regular technological support from the researcher. Table 2 summarizes the changes to the major assignment in 2007. Significant advantages in moving to this learning environment were envisioned by the lecturer: Research shows us that there are “far more dyslexic Art and Design students than we ever realized” (Hercules, 2001) and that dyslexia raises many issues for studio-based teaching methodologies. By implementing the use of student reflective design journals as living, media-rich blogs it was hoped that these students would be engaged and empowered in their learning. This was achieved by modifying the core assessment of the third year programme that focuses upon three student defined product designs throughout the entire year.

The impact of this pedagogical intervention on the teaching and learning environment are summarized by the lecturer below:

Thinking about what for us as designers and training young designers - what is ‘real world learning’? Real world learning involves team-working, and blogs allow you to work in teams in a way that you can’t work if you don’t use them. We see the use of blogs as a way of being able to stay in touch in a kind of multilane highway – rather than a single stream. It’s something that’s allowed staff to engage with students in a way that doesn’t happen with email and so on. In terms of our profession its absolutely vital that we do this – and I’m keen to sit down with my colleagues and see how we can embed this into the programme rather than in a particular year of the programme – and we can get the students from first, second and third year interfacing with each other and their blogs (Lecturer, July 2007).

This led to the re-establishment of a Product Design lecturer COP investigating the integration of Web 2.0 and mobile Web 2.0 into the course in the second half of 2007. It was hoped that by choosing to utilize a range of mobile Web 2.0 tools and software with the Bachelor of Product Design students along with a range of assessment criteria including PODcasting and VODcasting, those students who underperformed due to literacy problems would find a “natural” way to blog their projects. The lecturer COP was then used as a model for supporting students in a COP that would comprise the researcher as the technology steward (Wenger, White, Smith, & Spa, 2005), the course lecturers, and the students.

## Mobile Web 2.0 Trials in 2008

Starting in February 2008, a more explicit and integrated approach to mobile Web 2.0 within the third year course was established (Table 3). The focus of this trial was the development of group product design teams formed between the students and external client product manufacturers. Students were to develop a commercially viable product for their assigned client. Student blogs and e-portfolios (using <http://www.vox.com>) were used to record and reflect upon their design processes, and were made available to the client for comment and interaction. Two teaching staff and nine randomly selected students were initially supplied with a Nokia N80 WiFi/3G smartphone and folding Bluetooth keyboard (funded from a collaborative e-learning project), which was later upgraded to a Nokia N95 smartphone when additional research funding was obtained. The smartphones were pre-configured for the campus wireless network, and also a custom installation of mobile Web 2.0 applications. Participants were encouraged to personalize the smartphones and use them as if they owned them throughout the year of the course. Ethics consent forms and an acceptable use policy were signed by all participants. Participants were also expected to attend a weekly COP, comprising the researcher, the lecturers, and participating students. Moodle was used as a supporting tool, hosting tutorials and resource links for the use of the smartphones and Web 2.0 software. Moodle was also chosen because it renders well on small mobile screens without modification. Thus a blend of tools was used (see Figure 1). The goal of the integration of the mobile Web 2.0 tools into the course was to bridge the formal (face-to-face) and informal learning environments, allowing for continuation of learning conversations between students and lecturers in multiple contexts. One primary activity included students using the smartphone for recording and uploading evidence of their design process and prototypes to their VOX blog and other online media sites such as YouTube for video. Students were marked on this evidence of the design process and reflection, as well as their critique and reflection on other students' blogs via commenting. The smartphones were also used as a communication tool between students and with teaching staff for immediate feedback via instant messaging, email and RSS subscriptions. Students were responsible for paying for a voice call and text message account but were reimbursed the cost of a 1GB per month 3G data account. WiFi internet access on campus was free of charge.

Feedback from the main course lecturer 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 to go back to traditional teaching only methods now I have begun to use blogging and mobile blogging (Lecturer, June 2008).

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 (Lecturer, August 2008).

The two lecturers involved in the mobile Web 2.0 implementation in 2008 became technology "evangelists" to the rest of the lecturers in the course. Additional internal funding (US\$10,080) to expand the mobile learning trial within the Bachelor of Product Design was successfully obtained for the second semester of 2008. Thus, in that semester, similar voluntary mobile Web 2.0 projects were established in both the first and second year of the course as well.

### **Scaffolding the Learners**

A model for pedagogical and technological support for the integration and implementation of mobile Web 2.0 was developed using an intentional COP model. The projects are guided and supported by weekly "technology sessions" (COPs) facilitated by a "technology steward" (Wenger et al., 2005) who is the researcher and an Academic Advisor in e-learning and learning technologies in the Centre for Teaching and Learning Innovation (CTLI) at Unitec. The project is a collaborative project between the researcher as the "technology steward," the course tutors, and the students on the course. The institution's Learning Management System (LMS) is used to provide scaffolding and support for both tutors and students. Tutors are encouraged to model the use and integration of mobile Web 2.0 in their own daily work-flows and to provide regular formative feedback to students via posts on their blogs and other media. There is an interactive online concept map illustrating this model available at <http://ltxserver.unitec.ac.nz/~thom/MobileWeb2/mobileweb2concept2.htm>. A 10 minute video overview of the project process, including staff and student feedback (focusing on the Bachelor of Product Design trial) can be viewed on YouTube at <http://www.youtube.com/watch?v=8Eh5ktXMji8> (Cochrane, 2008b).

## **DISCUSSION**

The following section provides an overview of some of the teaching staff reflections on the impact of mobile Web 2.0 on the course and the students, and brief examples of student feedback.

### **Lecturer Reflections on the Impact of Mobile Web 2.0**

Product Design Lecturers were asked to provide reflective feedback on the impact of the m-learning interventions on their teaching practice and on their perceptions of the impact upon their students learning and engagement. These reflections were captured

as VODcasts, and as written answers to the following four questions. Their responses are provided in the following sections.

### **What potential benefits do you see for mobile Web 2.0 technologies to enhance teaching and learning?**

The integration of mobile Web 2.0 has facilitated a shift away from the default Atelier “private method” of instruction to a new more fluid and dynamic pedagogical method. This project has deliberately disrupted the timetabled instructivist studio learning that is frequently used and placed the student group in a social constructivist framework.

The chief benefits we have noted are:

1. Increased interaction, problem solving and sharing between students, increased interactivity in general. This has come in the forms of: encouragement, sharing of data and content, passing on of online material and the “hey you should know about this” comments.
2. Increased interaction from external commentators, especially when working on live projects. Clients have been able to track projects in the making and steer students if need be. At final presentations, clients have followed the projects over the duration of the assignment and can comment more closely on the projects’ outcomes and validity.
3. The development of student reflective journals. The blogs have effectively become online reflective rich media journals. Keeping an overview of a design project is difficult. Valuable time is taken up when standing back and assessing the state of the project. Reflecting on project work is difficult as the designer is often engulfed by the project. By introducing blogs to the students and requiring them to blog daily, we have created ‘natural’ times when a brief overview of the design project can be created in a readily accessible and exciting form. This overview can serve to keep the project on track and act as a “call” for comments from peers and staff.
4. Designers often find it difficult to document their processes and methodologies and as a result of this find it hard to remember how they got to the end result. This project has created a “bread crumb” trail that students can go back to both during and after the project to check their working methods (staff can do this with their work too).

### **Have you seen increased engagement in the course from students when using this technology?**

The initial stages of the project saw a drop off in normal project activity as students explored the mobile Web 2.0 tools, including the setting up of the software and hardware and the fun students had exploring the new technology that was available to them. However as the tools became second nature and integrated into the students’ daily work-flows a significant uptake in engagement in the course was observed.

The increased engagement came from:

1. A sense of connectivity that is characterized by the immediate access to the Internet, photo sharing, instant messaging (IM), emailing and the usual voice and text messaging that the smartphones bring. Virtually any space is now transformed into a collaborative learning space. Students often group together looking at online material, send each other files and photos, URLs, and other

digital information. Mobile video blogging has become a favorite activity and is an effective way to get out-of-studio information across in a short space of time.

2. The use of mobile Web 2.0 provided a sense of current technology being embedded into the learning experience. In comparison, even though virtually all students in the third year course have access to their own laptop computers for use in the studio/class room, this is seen as standard these days. This project has facilitated a culture of mutual support, networking, and collaboration among students, which also enhances students' skills in communication with their peers, academics and industry representatives.
3. Evenings see a sharp increase in student posts—often comments on each other's blogs as well as end of day reflective posts.
4. Students' editorial skills have increased due to the constant need to monitor the content of their blogs. A look over almost all of the blogs from the start of the project to today will show significant progression in what the students have learned about editing content and getting ideas across.

### **What are the key issues to successfully integrating this technology into courses?**

1. Assessment and staff participation. We ran a 2007 project that did not carry an assessment weighting and the uptake was lower than for this 2008 project where assessment of the blog was embedded. It makes sense that students want to receive credit for doing something that takes time, focus and commitment.
2. It is vital that staff participate in the blogging process and run their own blogs alongside the student ones. Students want to see that staff are visiting the blogs and commenting on posts as well as offering links to sites where students can pick up information that might assist them with their projects. This doesn't mean staff are required to comment on all posts but reading the blogs is important as students will often ask "So what did you think of my last post then?"
3. This project allowed students to have the smartphones (and Bluetooth folding keyboards) and use them as if they owned the device, and they were also supplied with a 1GB data plan for the duration of the course. This ensured that participants had the tools they needed to work effectively. Therefore programmes need to provide the hardware or make it a compulsory course purchase to enable access.

### **In what way has your teaching approach changed by using this technology and tools?**

1. Breaking down the walls! This encapsulates the thrust of this project.
2. As a result of integrating and assessing mobile blogging technology tools into the programme, I have become far more tolerant of students working from different locations, something the class room/studio model struggles to cope with.
3. Putting time aside to read and comment on the content of each student blog is important and time during working hours needs to be allocated for this. By allocating time during the studio/teaching to work on the student blogs late night work at home can be kept to a minimum.

4. 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.

## **Student Feedback**

### **Blog Analysis 2008**

Students' previous technology experience was established at the start of each m-learning trial via an initial survey. Figure 1 indicates that participants in the three 2008 projects had similar previous experiences of mobile and Web 2.0 technologies. While most participants were to some extent consumers of Web 2.0 media, the majority were not involved in regularly creating Web 2.0 content (e.g., regularly blogging, uploading videos to YouTube, etc.). The Product Design course has established an ethos of student-owned laptops in second and third year; therefore, participant access to wireless laptops was relatively high, and cell phone ownership almost ubiquitous. Instant messaging usage was lower than expected, though this may be more to do with use within a learning context rather than social use.

Although for the majority of students these projects were their first real experience of using Web 2.0 tools in their learning environment, their feedback indicated they have found it an enjoyable experience. They particularly valued the reflective and collaborative nature of blogging and the convenience of mobile blogging. While initially finding learning the various smartphone interfaces daunting, students integrated their use into their everyday lives. Students particularly valued the ability to capture and record ideas and content using the smartphone's multimedia capabilities (Cochrane & Bateman, 2008a). Student mo-blogging (mobile blogging) and content creation (photos, videos, etc.) increased significantly with the introduction of the N95 (June 2008), which was seen as a significant upgrade in performance over the often "buggy" N80 smartphones. A graphical summary of student blog activity is provided in Figure 2. Note that the mid-year break was during July.

Students uploaded significantly more media (mainly still images) to their online e-portfolios than actual blog posts, providing evidence of critical selection of media. Several students preferred to VODCast (record and upload a video monologue) rather than post text based reflections on their blogs. Feedback from students clearly related their desire (and expectation) for regular formative feedback from their tutors on their progress at virtually any time or anyplace. Students also noted the time intensive nature of regular moblogging and peer commenting, but unanimously (in 2008) preferred this approach to producing an essay or other more traditional assessment. Least valued by students was the ability to access course content on the smartphones. 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 re-purpose course content for small screens. Students who owned laptops used the smartphones to complement their use of their laptop computers. In some cases students replaced the use of their laptop for general Web and communication use with their easier to carry smartphone and Bluetooth keyboard.

A graphical representation of the "tag cloud" (descriptive keywords) generated from BDesign students' VOX blog posts during the first semester of 2008 illustrates students' use of mobile learning within their course (Figure 3). The relative size of each tag word indicates its frequency of use.

## **Student Survey**

Students were surveyed at the middle and end of the year to gain feedback on their experiences of the m-learning project. The following graphs (Figures 4–7) indicate student responses to several of these survey questions. Responses indicated that students enjoyed the m-learning integration within their course and were keen to experience further integration of m-learning into their course. The majority of students believed that the use of WMDs increased the quality of their learning experience, and students used the mobile device across a variety of contexts, making connections between these various learning contexts (both formal and informal) both convenient and explicit.

## **Focus Group Feedback**

The feedback from both students and teaching staff on the 2008 mobile Web 2.0 trial within the third year Product Design course has been unanimously positive. Compilations of 2008 student and staff VODcasts (Online video recordings) are available on YouTube:

1. BProduct Design Year 1 (2008)  
[http://www.youtube.com/watch?v=8QUfw9\\_sFmo](http://www.youtube.com/watch?v=8QUfw9_sFmo)
2. BProduct Design Year 2 (2008)  
<http://www.youtube.com/watch?v=6jwAFXBZAz0>
3. BProduct Design Year 3 (and Lecturers, 2008)  
<http://www.youtube.com/watch?v=8Eh5ktXMji8>

Transcriptions of example student focus group feedback and reflections on the impact of the m-learning intervention on their learning are collated below:

### **2008**

The mobile Web 2.0 tools provide students with a flexible, personalizable, and collaborative learning environment. The quotes below indicate the variety of ways students appropriated these tools and what they valued. The connectivity, ability to capture events and ideas, and opportunities for formal and informal feedback from peers and lecturers feature highly in student expectations and experiences. These expectations have vital implications for the impact on lecturer integration of the tools and workload perceptions. (These issues are explored in other papers by the authors, see Cochrane, Flitta, and Bateman, 2009.)

As a record keeping tool, these things (blogs) allow you to go back and see what you did last week, and you can constantly inform your decisions based on what you have done in the past. Whereas if you have it in a notebook that sits in a corner of your room you forget that stuff, but you look at your blog every day, and so from that perspective it makes things better. Traditionally when you write something down in a notebook a Tutor will only read it at the end of the project when they mark it, but with blogging you can write something down and tutors and other students can comment almost immediately, so you get more real-time feedback (Student 1).

VOX creates a dialogue in realtime, with students and staff being able to comment and have input ... If you have an internet capable mobile phone you can get applications like Shozu, shoot something, the application loads up the photo, creating like a visual diary online ... Every iteration of my design I can document daily on my blog. I was at a lecture in AUT, and I found something interesting—I could take a video on my N95 straight away and upload it! It makes it easy for our lecturers to give us feedback and guidance no matter where they are ... It's a great way to organise your thoughts, ideas and media (Student 2).

I've been using the phone to check emails, send emails, take pictures and send pictures and take videos of what I'm doing, uploading media to VOX. I use the GPS a lot as a map, and browse the Web on the N95 (Student 3).

Without the mobile technology I would have had to do a lot more writing, and because I don't like writing I suspect I would have skipped out a lot of my ideas – I have a lot of ideas and then I either discard or include them, and that's something I'm learning as a designer is to document my thought processes, it's part of the design process so you can reflect on your decisions. So I found with the mobile technology, being able to pick up the phone, turn it on, video myself talking to it like it was a diary, sort of Captain Kirk style, that I can actually use the design processes that other people write, easier to do (Student 4).

In contrast to student 1, who valued the ability to compose and edit highly structured journal-like blog posts, student 4 valued the ability to capture moments of inspiration in a virtual flow-of-consciousness using the mobile Web 2.0 tools. Students' shared learning experience was enhanced by; being connected, and being able to follow along and interact with each other's learning journeys throughout the year. (This is illustrated further in the section below.)

## **2009**

Below is some of the initial feedback gathered from students during the 2009 m-learning implementation in the third year of the Bachelor of Product Design. The comments indicate that initial reactions to the use of the smartphones centres around their multi-functionality and the convenience of an all-in-one device for personal productivity. The various m-learning projects implemented indicate that students take longer to integrate the collaborative affordances of the mobile Web 2.0 tools into their educational experience. Each group of students is unique and socially constructs the use of the communicative mobile Web 2.0 tools differently (e.g., the use of instant messaging, twitter, social networking, etc.).

I have taken the opportunity to embrace technology that I haven't yet experienced. The Nokia N95 has so many functions and features that can assist and help enrich my project. I have already had benefits in time management in using the Web 2.0 functions and only having to

carry with me one product as opposed to: a camera, a cellphone, an MP3 player, and a Laptop (for email, and surfing the net)! (Student 1).

I've been using the n95 to Google on the Internet, to check my emails, and to do various other things—find places when I'm out & about—Google Maps is really useful. I've been taking photos—I've updated to a better camera now because I can use the N95 for snappy shots that I would have taken with my small camera, and use the bigger one for better quality photos. So that's been really good, because it's very useful just walking out with the phone and taking photos. I've been putting them up on Vox and then adding text using my laptop just because it's easier. However, I have noticed in playing with iPhones and the Xpressmusic phones that their screens are so much better than the N95 – so looking forward to the N97 a lot (Student 2).

### **Example M-learning Scenarios**

Students used the mobile Web 2.0 technologies to blog their assignment posts from virtually any context. As an example, four of the students decided to go on a mid-term “research” trip to the snowfields of Queenstown, officially to test their prototype snow-kite harness designs. However, two of these students were scheduled to present their NPC (New Product Commercialisation paper) research to the class that week. These students therefore recorded their NPC class presentations on their N95 smartphones, and uploaded the virtual presentations to their Vox blogs for the rest of the class and the course tutor to view and comment on their presentations, almost in realtime. To “prove” they were in Queenstown they also blogged mobile videos of their campervan and Queenstown scenery.

During the course of the year academic teaching staff attended conferences in three overseas countries: Japan, UK, and Spain as well as numerous New Zealand conferences in cities outside of Auckland. Staff used mobile Web 2.0 technologies to share these experiences and stay in contact with their student(s) from these countries and locations. The use of mobile Web 2.0 technologies allowed real time text, video and still images of the conferences, sites, design, and architecture to be easily and immediately uploaded to the staff member's blog for students to see and share in. The use of instant messaging and blog comments allowed students to remark on the posts, pose questions and request further information on the conference before the end of the visit. The use of mobile Web 2.0 technologies allowed the staff member, his fellow staff members and students to stay in regular contact sharing comments and project concerns: in effect a “virtual studio situation” was created. Upon the staff member's return, there was no need for time consuming catching up to take place and students were not significantly disadvantaged due to his taking time away from studio teaching.

### **Plans for M-learning Integration in 2009**

Tutors have noted that the integration of mobile Web 2.0 within the course has significantly engaged students and provided the basis for a flexible, context independent learning environment. Thus academic staff, with the help of the researcher (“technology steward”), are planning on integrating the use of mobile web

2.0 tools across all three years of the course for all students and staff in 2009. While it is believed that a student-owned smartphone model is the best approach, it may take another year of seeding the integration of mobile Web 2.0 into the programme before this is fully feasible. The cost of both the smartphones and mobile data have dropped significantly in the last year, and a variety of funding models will be explored for 2009. Following the enthusiastic response from the students and lecturers during 2008, internal institutional funding was sought, and approved, for extending these small projects to a major large-scale m-learning project in 2009 involving the use of 250 smartphones, and 200 netbooks. The third year Product Design course will be used as a “flagship” to illustrate the potential of the integration of mobile web 2.0 to the rest of the institution. The project is driven by asocial constructivist pedagogy.

Focus group feedback from participating students in 2008 indicated that the coverage of mobile Web 2.0 affordances during the 2008 COPs was too broad. Students would prefer to focus on fewer affordances, and use them well. Therefore specific mobile affordances will be utilized as part of the third year Product Design course. (See Table 5, the tinyurls reference Educause “7 things” series of articles on each technology.) Students’ core activity will be situated around a reflective blog that is accessible via mobile. Students’ VOX Blogs will become reflective journals of their design processes and learning throughout the year, as well as building up a showcase of their Design capabilities, for example: their ability to critique as well as be creative; their ability to communicate, collaborate, and convey ideas; and their ability to work with new technologies as part of the process (mobile Web 2.0 will be core in enabling this).

VOX groups and tags will be used for specific group and team projects throughout the year: for example, there will be a Vox Shac09 group that will facilitate sharing and communication between the four departments involved in the project. A Ning (online social network) group will be used for discussing and collaborating on a wider national/international basis around the project. Students Vox blogs will also become a “hub” for aggregating (collating) Web 2.0 media from other sites such as Flixwagon, Qik, YouTube, Flickr, Picasa, and so forth.

## **SHAC09**

The Sustainable Habitat Challenge (ShaC09) is a national competition in the form of a collaborative project for teams around New Zealand to design, develop, and build sustainable housing in their local community (<http://www.shac.org.nz>). Unitec is well positioned to accept such a challenge due to the strength and capabilities residing in the Departments of Design, Landscape, Applied Trades and Communication (UATI); however, due to the breadth of the Shac09 challenges, it was identified early on that good project management, collaborative working, and cross-departmental communication would be vital to the success of the project. Overall responsibility and project management for the construction of the house lies with staff in the Unitec Applied Trades Institute and Unitec’s Research Office. Subject specific academic briefs have been developed collaboratively by Department lecturers in the Departments of Design, Landscape and UATI. Web 2.0 tools including Vox, Ning, and Flickr were used to develop the briefs and supplement in person meetings during the writing stage. As an example, a Shac09 building site introduction is available at <http://www.flixwagon.com/watch/1537511>.

Designing successful products requires both extensive research and a high degree of communication and dialogue. Communication between all the stakeholders

in any design projects is needed to identify the possible ramifications or potential consequences of the decision-making process, as well as the opportunities that an innovative endeavor carries. Whether such ramifications emerge due to issues with manufacturing technologies, intellectual property, or simply through conflicts with project timing, an open channel of communication is imperative if all parties are to move forward together. To this end Product Design students participating in ShaC09 will need to manage their internal (with Product Design staff) and external (with Landscape, Communication and UATI staff) communications rigorously. Traditional modes of communication (in person) will be augmented with the use of mobile Web 2.0 technology to enable real-time updating of project progress and issues.

Product Design students will be working in one of five Product Design groups each of which is focusing on a specific ShaC09 design challenge however, the final designs they create and present will be arrived at individually and will be individually assessed. Students are required to carry out aspects of research in their group, sharing information via group meetings and Web 2.0 tools (see deliverables below).

### **Project Deliverables for Product Design Students Working on Shac09**

- An online report summarising all research undertaken and the key findings and insights.
- All forms of prototype and test modelling, that is, 3D sketch models, ergonomic models, interface design, proof-of-concept working models, and so forth.
- All drawings, sketches, and CAD models.
- A VOX blog/e-portfolio that runs throughout this phase and the rest of the year. You should post to your blog at least every few days (preferably daily).

Use your VOX blog/e-portfolio to collate the above, and reflect on your design process. Also regularly comment on each other's VOX blog posts, providing critique, feedback, and links to appropriate resources. Your VOX blog/e-portfolio should include the following elements:

- Audio Podcasts, Video VODcasts
- Uploaded images, including geotags (i.e., Google Maps links of image locations)
- Text posts (Reflection, critique, process, summary, comments, etc.)
- Links to Web 2.0 multimedia site original content (e.g., YouTube, Flickr, Google Docs, Slide.com, etc.)
- Evidence of Google Calendars for events/dates.
- Evidence of electronic communication via GMail, MSN Messenger and RSS feeds (e.g., via Google Reader or Newsgator).

### **Nomadic Studio**

This year students will be required to undertake a regular 'nomadic' session where they work away from the studio, but continue collaborating and learning conversations via mobile Web 2.0 connectivity. Social software tools can be effectively integrated into both face-to-face and online environments; the most promising settings for a pedagogy that capitalizes on the capabilities of these tools are fully online or blended so that students can engage with peers, instructors, and the community in creating and sharing ideas (McLoughlin & Lee, 2008, p. 3). Throughout the duration of the final year of Product Design, students will be required to integrate Web 2.0 into their studio practice. To this end, the programme will be providing smart phones (Nokia N95) and a weekly community of practice meeting

that will focus on understanding and experimenting with Web 2.0 tools and technologies. Throughout ShaC09, data sharing will be enabled through a range of software applications. Staff and students will make project work and resources available to the rest of the world online, via blogs, wikis and other Web 2.0 applications. Moving further away from the Atelier Method environment and building upon the work carried out in 2008 our research focus for 2009 is focused on the seamless integration of Web 2.0 into the Bachelor of Product Design as well as augmenting the level of flexibility for students to allow them to choose to work in virtually any context on and off campus.

### **Framework and Criteria for the “Virtual” or “Nomadic” Studio Session:**

During the “nomadic” studio session students are expected to:

1. Be online via MSN or following their tutor and classmates on Twitter
2. Make at least one relevant blog post summarising their work
3. Upload some multimedia content capturing what they are doing—for example, a Qik or Flixwagon videostream, a recorded VODCast, geotag, or a photo upload to Flickr, and so forth

### **Implications of the Research for the Research Questions**

The implementation of mobile Web 2.0 tools within the Bachelor of Product Design course has provided rich data that informs the wider research questions. These are briefly explored below.

#### **What are the key factors in integrating Wireless Mobile Devices (WMDs) within tertiary education courses?**

The pedagogical integration of the technology into the course criteria and assessment is critical. Lecturer engagement and modelling of the pedagogical use of the WMDs is essential. These changes in curriculum design and practice (and student acceptance) take time, in the example case study given this time frame has spanned several years. Innovative practice must take a staged approach to implementation, and lecturers (and students) require significant pedagogical and technical support during this time.

#### **What challenges/advantages to established pedagogies do these disruptive technologies present?**

Mobile Web 2.0 tools are “disruptive” technologies that democratize the learning environment, empowering students, and providing opportunities for social constructivist pedagogies. For many lecturers integrating a social constructivist learning environment will mean redesigning assessments and developing a new pedagogical “toolkit.” This takes time and commitment. Technological and pedagogical support for these paradigm shifts is critical.

#### **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?**

Mobile Web 2.0 can be used to facilitate collaborative, authentic learning within authentic contexts. The aggregation of a variety of mobile Web 2.0 tools facilitates metacognition and reflection. Students demonstrate increased motivation and engagement when using personal devices and personalized media-rich learning spaces.

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

Since the first attempts at marrying the affordances of Web 2.0 and mobile technologies in 2006, mobile Web 2.0 has developed into a range of viable, user-friendly, rich-media, flexible, and context-independent tools that can be used to bridge both the formal and informal learning environments, spanning both distance and time. As these tools develop further, so will their educational potential and richness.

## **CONCLUSION**

This article has provided a real world overview of the integration of mobile Web 2.0 technologies into a Bachelor of Product Design course and gives reflections from the teaching staff involved on the impact of this approach. The symbiotic relationship developed between the academic advisor (technology steward) the academic teaching staff and the students involved in each of the mobile learning trials has proven a rich environment for harnessing educational technology to design social constructivist learning environments relevant to the needs of these students. Significant changes in pedagogical approach and levels of student engagement have been realised. It is hoped the insights gained will be built upon to form a foundational model to fully embed mobile Web 2.0 tools into the entire Bachelor of Product Design curriculum for the future.

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## APPENDIX

### Focus Group Questions

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.

1. How would you rate the effectiveness of the WMD (N80 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. How would you rate the usefulness of the WMDs for your own teaching? (for tutors)
  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?

**Wireless Mobile Study: End of Trial Questionnaire (BDes2008 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 N95)?	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 was 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				

	<ul style="list-style-type: none"> <li>o. Taking and uploading photos</li> <li>p. Text</li> <li>q. Phone calls</li> </ul>
<p>18. What factors would be most important in deciding upon mobile learning?</p>	<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>
<p>19. Do you have any other comments on the mobile project?</p>	