

Introduction

The paper outlines the significant events in the pedagogical development of two academics over a period of four years. The participants 'mlearning journey' provides a rich source to reflect on critical incidents that have been either breakthroughs or breakdowns, and provides a foundation for future planning and integration of mlearning.

MLearning Research Project

The projects described in this paper form one case study from a wider participatory action research project from 2006 to 2009 involving five different tertiary education contexts. The research project investigates the potential of mlearning to engage and guide today's learners in education by leveraging the use of mobile web 2.0 tools within collaborative, technologically rich social constructivist environments. This paper specifically investigates the journey of discovery undertaken by one of the course lecturers and the researcher involved in the mlearning project from 2006 to 2009.

Defining MLearning

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 paper, 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). The WMD's wireless connectivity and data gathering abilities (e.g. photoblogging, video recording, voice recording, and text input) allow for bridging the on and off campus learning contexts – facilitating "real world learning".

The Goal

The goal of the mlearning project is to move the course from an Atelier pedagogical framework to a social constructivist model. Thus facilitating a student-centred, collaborative, flexible, context-bridging learning environment that empowers students as content producers and learning context generators, guided by lecturers who effectively model the use of the technology. The lecturers mlearning journey illustrates how the introduction of mobile web 2.0 has disrupted the underlying pedagogy of the course from a traditional Atelier model (face-to-face apprenticeship model), and has been successfully transformed into a context independent social constructivist pedagogical model.

Principal Actors

Roger Bateman MA.RCA.

Roger began his career in design as a studio assistant at the London company Flux Designs in 1985. In 1989 he began 'Square One' studio; concerned with the design and development of furniture and product designs for contract and domestic markets.

Throughout his career in furniture and product design Roger has academic positions at LIHE, Liverpool, Edinburgh College of Art, IED Barcelona and Eina Barcelona. Roger is currently a Senior Lecturer in the Department of Design and Visual Arts in Unitec's Faculty of the Creative Industries and Business where he has been working since November 2004. He teaches Product and Furniture Design, is a supervisor on the Master of Design and also runs a Design & Business Incubator called the Generator. His research interests include mobile learning, web 2.0, and Collaborative Practice. He is interested in the potential impact of wireless mobile computing on teaching and learning in higher education and how web 2.0 assists in collaborative projects. Roger is also researching into sustainable design and is currently developing a series of projects that investigate the application of biopolymers to the design of office furniture.

Thomas Cochrane (BE, BD, GDHE, MTS, MComp) is an Academic Advisor (elearning and Learning Technologies) with Unitec (March 2004 to present). His role at Unitec includes providing support for elearning and learning technologies for Unitec teaching staff, and pushing the boundaries of educational technology for enhancing teaching and learning at Unitec. His research interests include mobile learning, web2, and communities of practice. He is currently implementing mobile learning trials for his PHD thesis: "Mobilizing Learning: The potential impact of wireless mobile computing on teaching and learning in higher education in New Zealand". Harnessing the potential of social software tools (such as: Mobile Blogging, RSS, Instant Messaging, Moodle and Elgg...) using wireless mobile devices, such as: PDAs, laptops, and the new generation of mobile phones.

Other actants/actors influential in this project, i.e. key drivers in technology decisions and development include:

1. The downfall of Palm and dedicated PDAs
2. The introduction of new smartphones with functionality rivalling PDAs.
3. Introduction of the Apple iPhone
4. Marketshare – Nokia has 43% of smartphone market.
5. Student, lecturer and researcher technology preferences and previous experiences
6. The roll-out of campus-wide WiFi availability at Unitec
7. National coverage and pricing of 3G data
8. Project funding opportunities
9. Web 2.0 and mobile web 2.0 development
10. Research into the development of Communities Of Practice
11. The success of the first professional development COP at Unitec - Dummies2Delight in 2006.
12. Reflective research outputs – Conferences, worksho[s, and journal papers.
13. The researchers position at CTLI, facilitating collaborative relationships with lecturers, and building relationships with students as the technology steward.
14. The establishment of Moodle and Mediawiki as supporting platforms.
15. Unitec restructure, focus on innovation in programme delivery, and development of a new elearning strategy.

Interpretive Lenses

The following ‘lenses’ are used to interpret the critical incidents in the participants’ mlearning journey.

Critical Incident Analysis

Critical Incident Analysis records and evaluates incidents that facilitate a change in a learners understanding of a problem as either breakthroughs or breakdowns.

Breakthroughs are incidents that produce productive change or important conceptual change. Breakdowns are incidents of technological difficulty or misunderstanding (Sharples, 2009).

Communities Of Practice

Communities OF Practice (COPs) are formed by groups of people with a common interest who commit to a shared learning experience over a sustained period of time (Lave & Wenger, 1991; Wenger, 2005). In the surrounding research project, an intentional COP model was used for lecturer technological and pedagogical development followed by a secondary COP between the lecturers, their students, and the researcher investigating the use of mobile web 2.0 in their courses. One of the keys for the success of these intentional COPs was the inclusion in the group of the researcher as the ‘technology steward’ (Wenger, White, Smith, & Spa, 2005), guiding the group in its appropriation of mobile web 2.0 tools.

Social Construction of Technology

The social construction of technology (SCOT) contends that technology usage and development is socially constructed and often follows un-intended or unexpected directions. The ‘best’ technology is therefore not necessarily the most successful or ultimately adopted by consumers. SCOT analyses the duality that society influences the development of technology, and technology influences society (W. Bijker, 1995). The impact of the choices of the social group created by the students and lecturers in this project demonstrates SCOT in action.

Actor Network Theory

Actor-network theory (ANT) is an approach to analyse how technologies are developed and adopted as a volatile network of influential factors (‘actors’) that include both human and non-human actors. “An actor network, then, is the act linked together with all of its influencing factors (which are again linked), producing a network”, Ole Hanseth cited by Ryder (2007). “The important fact here is not that humans and nonhumans are treated symmetrically, but that they are defined relationally as arguments or functions in the network, and not otherwise”, Jay Lemke cited by Ryder (2007). “Methodologically, ANT has two major approaches. One is to ‘follow the actor,’ via interviews and ethnographic research. The other is to examine inscriptions”, from Nancy Van House cited by Ryder (2007). Proponents of ANT include Latour (2005) and Law (W. E. Bijker & Law, 1992). ANT is closely related to SCOT.

Activity Theory

Activity theory conceptualises learning as a social activity with an objective that is mediated by the use of tools and is context dependent (Engestrom, 1987). In this project, mobile web 2.0 technology is not perceived as the object of learning but as a tool to support students' learning activities (Uden, 2007).

Social Constructivism

Social constructivism perceives learning as a social activity where the learners are involved in discovering knowledge together. Social constructivism is the learning paradigm that links and underpins all of the 'lenses' used to analyse the research participants mlearning journey. All of the interpretive lenses used herein can be broadly classified as social constructivist. The origins of the development of the concepts of social constructivism are attributed to Vygotsky (Vygotsky, 1978), however the concepts have been appropriated and developed by many recent educational theorists and aligned with the affordances of web 2.0 and mlearning (A. Herrington & Herrington, 2007; Jan Herrington, et al., 2009; J Herrington, Mantei, Herrington, Olney, & Ferry, 2008; C. McLoughlin & M. Lee, 2008; C. McLoughlin & M. J. W. Lee, 2008).

Critical Incident Sources

Several primary sources were used to identify critical incidents in the participants mlearning journey. A variety of mobile friendly web 2.0 social software tools were embedded into the project and their use investigated and developed throughout the length of the project. These include content generated by the participants and uploaded to the participants online blog/eportfolio (Vox), original video clips captured via the participants laptop webcam or smartphone camera, video streamed directly from the participants smartphone, audio recordings, photographs taken on the smartphones and uploaded to Flickr, Picasaweb and Vox. Technical and pedagogical support were integrated into a weekly Community Of Practice (COP) involving the researcher as the technology steward, the course lecturers (participants) and the course students. The COP sessions were a rich source of interactions among the participants. A Moodle support course was established to scaffold the COP capturing many of these interactions. Also, as the partnership between the participant and the researcher developed, a series of collaborative research outputs based upon the mlearning project were co-authored. These research outputs feature reflections from the participants on the impact of the mlearning interventions in their courses, their teaching practice, and daily personal routines. A number of collaborative workshops and presentations were also developed and are captured on a series of wiki pages and video recordings of the events. Finally, the researcher kept a reflective journal throughout the timespan of the research project, which has provided primary source material of critical incidents as interpreted at the time by the researcher. Thus a rich source of data is available for interpretation.

The following elements are used to critique the identified critical incidents:

Table1: Critical Incident Elements.

Date	Date of the identified critical incident
Critical Incident	Description of the identified Critical Incident: Breakthrough or Breakdown?
Actors	Who were the influencing Actors in this incident?
Activity	What activity occurred as a result
Inscription	Supporting or triggering texts or media <ul style="list-style-type: none"> ○ Paper/Conference ○ Wiki ○ YouTube Video ○ Blog post

Rogers MLearning Journey

MLearning Beginnings

Date	3May 2006
Critical Incident	Introduction of Palm PDA moblogging project within third year Bachelor Of Product Design
Actors	The researcher, two course lecturers (including Roger), third year Bachelor of Product Design students, Unitec WiFi, Palm PDAs, Blog (http://www.blogger.com)
Activity	The first attempt at mobile web 2.0 integration into a course at Unitec, a test-run for the main mlearning project begun in 2007
Inscription	Researchers Journal Example student Blogs: http://teamslab.blogspot.com/ http://the-new-millennium.blogspot.com/

The first mlearning project with the third year of the Bachelor of Product Design course was a result of the researcher pitching the concept to the course lecturers as a proof of concept trial. The project involved the use of Palm WiFi PDAs (Palm Lifedrives and T|X's with folding infra-red keyboards) to access and update student reflective blogs on Blogger.com. The project lasted from the 3rd May to the beginning of July 2006. As a first project it highlighted several key issues for the future projects to solve. It had been assumed that students would be familiar with the use of web 2.0 tools and mobile technology, and therefore the project was only scheduled one two hour introductory support session. However the majority of students personal content creation via web 2.0 tools was a new concept. Therefore on-going support was provided via Moodle, Instant Messaging, and email, plus face-to-face in the researchers office. Several other 'breakdown' issues were identified. Using Palm Lifedrives and TX's with Blogger.com was buggy. The Moodle test server used for support initially was configured with a very slow external connection. Therefore Roger defaulted to communicating with the students via email due to time constraints in learning the web 2.0 tools.

The (first) mobile trial therefore highlighted crucial issues for success/failure, and highlighted the limitations of WiFi PDAs, moving the focus of the mobile projects to smartphones to facilitate ubiquitous connectivity in 2007. The following is a quote from the researchers journal at the end of this first project:

Today our first Wireless Mobile Device trial finished at Unitec, concluding with a focus group of students. The feedback was very useful, even though the trial could hardly be called a 'success' in terms of integrating technology into tertiary education. There are a lot of aspects that could be done better next time, and a few surprises as well.

The biggest surprise was the lack of technology skills of the 3rd year Product Design students - in particular their lack of understanding of RSS and inability to setup RSS subscriptions from their Blogger accounts.

In retrospect, the main issues are:

1. Not enough preparation and support for the students - a two hour intro to the concepts and technology at the start of the project was 'too little, too late' - we need regular sessions, I would suggest at least 4 x 2Hour, over-viewing the use of the technology, PRIOR to the start of the project.
2. Lack of Tutor engagement/integration with the technology - i.e. no modeling of Tutor Blogs, no comments from Tutors on student or group Blogs, no use of WMDs in delivery of the course by Tutors.
3. A lack of student connectivity - a surprising number of students still have NO Internet access at home, the limited WiFi connectivity options at Unitec (meaning students were always 'face-to-face' when they were in WiFi range anyway!).
4. We complicated the Blog process too much by requiring students to engage with 3 different Blogs (individual, group, and public). Most of the other issues are merely technical that can be easily overcome.

Connectivity

Roger's first attempts at a solution for mobility using laptop and VODEM (portable 3G data connection).

Date	August 2006
Critical Incident	Purchasing a 3G data connection and dongle for Rogers laptop
Actors	Researcher, Roger, VODEM, Vodafone
Activity	Facilitating ubiquitous internet connectivity
Inscription	Researchers Journal

Flexible connectivity and mobility were key issues for Roger. Roger was based in Building 1 rather than Building 76 where the students were, and was without WiFi coverage at the start of the project. Discussions with the researcher identified a solution: to use a 3G data card for Roger's laptop funded by the department. Once Roger had access to wireless connectivity, his experimentation with web 2.0 (in particular blogging) began.

Dummies2Delight: Developing an intentional COP model

Date	10 May to September 2006
Critical Incident	Dummies2Delight Community Of Practice
Actors	The researcher, six Heads of Departments, web 2.0 tools
Activity	Development of an intentional Community Of Practice model for professional development
Inscription	Group wiki pages http://ltxserver.unitec.ac.nz/mediawiki/index.php/Dummies2Delight http://ltxserver.unitec.ac.nz/mediawiki/index.php/DummiesDelight YouTube video summaries http://www.youtube.com/watch?v=-jn0HBIkF_U http://www.youtube.com/watch?v=kUuJ-gW_vuc

Although Roger was not involved in the development of the first COP (Dummies2Delight) it had significant impact on all the following mlearning projects, specifically as a model to support lecturer and student educational technology development.

MLearning Community Of Practice

Date	October 2006
Critical Incident	First attempt at forming a Design lecturer COP by the Technology Steward (researcher)
Actors	The researcher, 6 Design school lecturers, Moodle
Activity	A weekly COP session with a group of Design School lecturers
Inscription	Moodle support course http://moodle.unitec.ac.nz/course/view.php?id=28

The first attempt at forming a Design School lecturer COP consisted of a non-homogenous group of lecturers invited by the researcher. Consequently the group was not sustainable in the long-term. Therefore a strategy for forming lecturer COPs was developed around the researcher identifying a key lecturer within department, and supporting the lecturer to invite and form a peer COP themselves, with the researcher taking on the role of 'technology steward' (Wenger, et al., 2005) rather than COP convener.

Web 2.0 Integration

Date	February 2007
Critical Incident	Integration of student reflective blogs into the third year Product Design course.
Actors	The researcher, Roger, third year Product Design students, Wordpress.com
Activity	Development of collaborative student blogging using Wordpress.com within the course.
Inscription	Wordpress Blogs

During November 2006 to February 2007, the researcher spent several brainstorming sessions with Roger conceptualizing the integration of blogging into the third year Product Design course using Wordpress.com. This led to the establishment of a web 2.0 project based around blogging with third year Product students. The researcher provided support via MSN for Roger (while in Sydney March-May) and face-to-face meetings.

MiniSymposium: Product Design COP Formation

Date	August 2007
Critical Incident	CTLI MiniSymposium – invited presentations from several web 2.0 projects
Actors	The researcher, CTLI, Roger, 4 other presenters, Product Design peer lecturers
Activity	Roger presents his mlearning journey experience so far to colleagues
Inscription	Wiki for the MiniSymposium http://ctliwiki.unitec.ac.nz/index.php/CTLI_mini_symposium YouTube video summary http://www.youtube.com/watch?v=90ORtMXVW2M

A minisymposium was organized by the researcher to promote the web 2.0 and mlearning projects underway throughout the institution. Roger was invited to present his student project experiences so far. Presenters were encouraged to invite their peer lecturers along to be enthused, with the aim of forming department-based COPs. The CTLI minisymposium formed a catalyst for a second attempt at a COP formation, focusing specifically on Product Design lecturers. Roger was invited by the researcher to champion the COP development and choose the participants. Roger's first COP reflections were:

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 (<http://www.youtube.com/watch?v=jznHfb8dsvs>).

2008 MLearning Plan

Date	November to December 2007
Critical Incident	Planning the 2008 integration of mlearning into the third year Bachelor of Product Design course

Actors	The researcher, Roger, N95s and folding bluetooth keyboards
Activity	Brainstorming sessions between the researcher and the course lecturer
Inscription	2008 Mlearning plan on Google Docs http://docs.google.com/View?id=dchr4rgg_22hckp9zc9

After being reinvigorated by attending the MLearn2007 Conference, the researcher met regularly with Roger to brainstorm the implementation of an mlearning project within the third year Bachelor of Product Design course. The goal was to focus upon the context sensitivity of mobile devices. Other influential actors at this point included one Product Design lecturer taking a six month lecturer exchange with Limerick University, another lecturer leaving Unitec, and being replaced by Isaac (See Isaacs mlearning journey). Roger also finally replaced his PC laptop with a Macintosh laptop, finding the computing experience much more creative. Roger and Isaac were provided with Nokia N95 smartphones, bluetooth folding keyboards. And a 1GB per month 3G data plan in January 2008. The students were supplied with Nokia N80 smartphones, folding bluetooth keyboards, and 1GB per month 3G data plans for the duration of 2008.

In May 2008 \$10080 extra funding was secured to upgrade the trial to N95s for the students.

In June 2008, mid-trial feedback and reflection led to the extension of the mlearning project into the first and second year of the Bachelor of Product Design course.

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 (Roger, June 2008)

Conceptual Development

Date	Mid year Semester break 2008
Critical Incident	Lecturer reflections upon the impact of the mlearning project in 2008 so far.
Actors	The researcher, Roger, third year students, N95.
Activity	The researcher asked the Product design lecturers to reflect upon the impact of the mlearning project in 2008 by answering four questions.
Inscription	Roger's reflective VODCast uploaded to Vox http://ondesigno.vox.com/library/video/6a00f48cdf734b000300fa969507bd0003.html

26 August 2008 Rogers reflections on the benefits of mobile web 2.0 in the course are transcribed below.

There are many benefits and some drawbacks. In terms of benefits, the students who study art and design subjects are often entrenched in a rather traditional studio environment – in a sense that they occupy a space that belongs to them for a period of time, where they come &

have a desk etc which is theirs for the year. The interesting thing we are seeing this year as we embed the mobile web 2.0 technologies into the programme is that we are seeing a very different uptake in terms of the studio as the centre for the teaching and learning experience – and that was what we were hoping to find. What we are seeing in terms of benefit is that students are interacting with external agencies – subcontractors or other designers working on projects outside of the studio but keeping us informed on what they are doing and allowing us to comment on what they are doing in almost realtime scenario. From a staff members perspective that is very interesting because it also means I don't have to be in the studio, I can be in another environment and I can keep track of what the students are doing and reply. Which is very useful if for example they are making something in a workshop which might not be on the Unitec campus, they can keep in touch with me and I can make comments about what they are doing and steer them in a different direction if need be. Another potential benefit is that it allows other people who aren't in the studio or the staff to interact with the students and put a different perspective on it – this is a world-wide opportunity. Another interesting feature is that while students are blogging they are creating a reflective journal that is assessible and goes towards an online eportfolio. The things that are put up on the blog, including comments, have to be worthwhile, which involves an editorial process.

Have we seen increased engagement? Yes we have seen increased engagement – students are sharing on a more regular basis the things they are doing and uncovering with each other and with staff. I can engage with the students even when I am not in the studio via a variety of media. There has been some drop-off in engagement in some areas of the programme while students explored the potential of the mobile web 2.0 technologies. However with the introduction of the technology into the first year this would no longer be a problem, it would be a first year learning experience.

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.

Collaborative Research

Date	September 2008
Critical Incident	eFest2008, Design Symposium and EIT Teaching and Learning Conference presentations
Actors	The researcher, Roger, eFest2008, Design Symposium, EIT Teaching and Learning Conference, Google Docs, wiki pages.
Activity	Roger and the researcher facilitate joint presentations on the 2008 mobile web 2.0 project.
Inscription	(Cochrane & Bateman, 2008a, 2008b) Design Symposium Presentation (2008) http://www.youtube.com/watch?v=Fy_rxIqEAFs Wiki presentation http://ctliwiki.unitec.ac.nz/index.php/MobileWeb2

The researcher invited Roger to collaborate on reflective research publications on the 2008 mlearning project within the Bachelor of Product Design. Google docs was used as a platform to write the collaborative papers, and the presentations used wiki's rather than powerpoint. This provided a significant opportunity to reflect on the project impact, successes, and modifications required for 2009. This highlighted the critical importance of lecturer appropriation of the web 2.0 tools, and the integration with course assessment. "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" (Roger).

Web 2.0 Social Networking and Personal Appropriation

Date	December 2008
Critical Incident	Establishment of Ning social network for Bachelor of Product Design
Actors	Roger, the researcher, Product Design students, Ning
Activity	Roger experiments with using Ning to track graduating Product Design students, and to support inter-department collaborative projects for 2009

Inscription	Ning Social Network http://designprojects.ning.com/ Vox blog post http://ondesigno.vox.com/library/post/design-projects-ning-site-up-and-running.html
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Roger began a Ning social network site to keep connections with 2008 graduating students, and experimented with Ning to form the hub of a collaborative inter-department mlearning project planned for semester1 2009.

“Thom and I began the blogging project in 2006 and have progressively worked together defining and refining the project. Over the last year we have received funding from Unitec for the purchase of smartphone, fold away bluetooth keyboards and data plans. We have just been awarded a further round of funding to continue the project in 2009.

We are keen to stay in touch with you the students who participated in 08 3rd year product design. Please let us know if the blog you created proves to be useful even after graduating. Please let us know how you are using the blog - if you have created a new one(s) and any other information you think might help us improve the project for 09 students” (Roger).

Date	December 2008
Critical Incident	After loaning a demo unit from the researcher, Roger buys an iPod Touch v2 for personal use.
Actors	Roger, the researcher, iPod Touch
Activity	Roger appropriates mobile devices into his personal workflow
Inscription	Ning blog post http://designprojects.ning.com/xn/detail/2611358:Comment:161

“I bought a 16G B iPod touch a few days ago - it is quite amazing. The large screen and the ease with which I can use it to view web content whilst on the move is excellent. I also like the on screen type facility which is much easier to use than the iGo bluetooth folding keyboard. This new purchase makes me think that the iPod Touch will make the blogs we run next year will be easier to navigate and update whilst on the move” (Roger).

2009 MLearning Plan

Date	January 2009
Critical Incident	Development of 2009 mlearning plan
Actors	The researcher, Roger, Vodafone NZ
Activity	Collaborating on development of 2009 mlearning project plan
Inscription	Mlearning 2009 project plan on Google Docs http://docs.google.com/View?id=dchr4rgg_3d5wv977k

During January 2009 Roger and the researcher regularly brainstormed the 2009 mlearning projects, and established integration into the year1 and year2 Bachelor of Product Design courses as well. In February 2009, the researcher and Roger met with Vodafone New Zealand to discuss a partnership with the research, with Vodafone potentially providing a student-rate 3G data plan for connectivity.

International Collaborative Research

Date	February 2009
Critical Incident	IADIS mlearning Conference in Barcelona
Actors	The researcher, Roger, IADIS Conference, Conference participants
Activity	Collaborating on Conference paper and presentation using wiki and Google Docs
Inscription	<p>IADIS Mobile Learning Conference presentation notes on wiki: http://ctliwiki.unitec.ac.nz/index.php/MobilePedagogy2 Rogers VODCast introduction to 2009 students http://ondesigno.vox.com/library/video/6a00f48cdf734b00030110162f1180860c.html Researchers VODCast introduction to 2009 students http://thomcochrane.vox.com/library/video/6a00d09e55323abe2b01101669cb1d860d.html IADIS Conference Reflection http://www.youtube.com/watch?v=2f0na-Wez6g (Cochrane & Bateman, 2009)</p>

Writing a collaborative research paper on the 2008 mlearning project for an international conference was an opportunity to bench-mark the research against international mlearning research, and potentially establish international partnerships.

2009 MLearning Project Implementation

Date	11 March 2009
Critical Incident	Start of the 2009 third year Bachelor Product Design mlearning project
Actors	The researcher, Roger, Third year students, N95s, COP formation
Activity	Collaborative COP with students, researcher, and lecturer
Inscription	<p>Qik video stream of first student-lecturer mlearning COP 2009 http://qik.com/video/1215586</p>

Students were invited to volunteer to participate in the 2009 mlearning project within the third year Bachelor of Product Design course, forming a COP with the researcher and the course lecturer (Roger). Participants were supplied with Nokia N95 smartphones and folding bluetooth keyboards. In an attempt to move the mlearning projects to a more sustainable model, students were responsible for their own voice and 3G data costs in 2009. As a result, some of the class elected not to join the mlearning project. Creative ways of managing dual assessment modes were thus used.

Interim Technology Updates and Personal Appropriation

Date	April 2009
Critical	Updating lecturers from the Nokia N95 to the Nokia XM5800

Incident	touchscreen smartphone
Actors	The researcher, Roger and Isaac, XM5800
Activity	Lecturer appropriation of the Nokia XM5800 smartphone
Inscription	Txt messages from Roger to the researcher

With the securing of extra research funding, lecturers were upgraded from Nokia N95 smartphones to the Nokia Xpressmusic 5800 touchscreen smartphone. This was an interim update while we were waiting on the availability of the Nokia N97 smartphones that were ear-marked for the third year project. This gave the opportunity for the course lecturers to learn the new smartphone interface before going live with the students. Roger instantly fell in love with the XM5800, sending multiple sms text messages to the researcher stating: “Love this phone”!!!

EDULearn Conference July 2009

Date	July 2009
Critical Incident	EDULearn collaborative research paper and presentation
Actors	The researcher, Roger, Collaborators from the other mlearnig projects at Unitec, EDULearn Conference, Google Docs, wiki, other conference participants
Activity	Roger presents the collaborative research paper at the international conference in Barcelona, Spain.
Inscription	Rogers QIK video VODcasts Wiki Google Docs (Cochrane, Bateman, et al., 2009)

The EDULearn conference in Barcelona was used as a catalyst to gather together reflections from three of the 2009 mlearning projects by collaborating on a combined research paper. The paper was co-authored using Google Docs, and a wiki page created for the conference presentation. Roger secured funding to travel to the conference and present the paper. Thus Roger was established as a leader in mobile web 2.0 innovation at Unitec, and world-wide. Roger recorded and shared his experiences in Barcelona by using QIK video streaming from his XM5800 smartphone. However, as he was using roaming 3G data while in Spain, the Vodafone costs came to \$1500NZ.

Roger's Vox Blog post re using QIK in Spain:

Rather than writing blog posts this last week I have been using Qik to video post (see below left for a link) Using Qik has kept my postings fluid and immediate (once I realised I had to keep the camera reasonably still when videoing) Qik has proved to be very useful and importantly stable as a platform. I have been posting via my Nokia 5800 to this blog and that too has not posed any problems. The 5800 is a good all round device but the photo quality is not upto the standard I would like. I have become quite 'attached' to the 5800 so trading upto the N97 is going to be interesting - I hope the N97 lives up to my expectations.

However, for some unknown reason, Roger's QIK account was subsequently deleted by the QIK site administrators.

Technology Update

Date	July 2009
Critical Incident	Upgrade of the lecturers XM5800 and students N95 smartphones to N97s
Actors	The researcher, lecturers, students, N97
Activity	Group appropriation of the N97 smartphone
Inscription	YouTube video of N97 upgrade http://www.youtube.com/watch?v=atq9ZjnDUDE

The introduction of a more user-friendly smartphone device re-invigorated the 2009 project. This is an example of the social construction of technology, where the N95 had appeared so advanced to the group in 2008, it no longer did in 2009. Consequently the lecturers and students use of the smartphones increased and became more creative.

Conceptual Development – Scaffolding Mlearning Integration

Date	August 2009
Critical Incident	Reflections on the integration of mlearning accross all three years of the Bachelor of Product Design course
Actors	The researcher, Roger, eFest Conference, ASCILITE Conference, Google Docs, Unitecs nie elearning startegy
Activity	Collaborative research paper writing and planning for 2010 mlearning projects
Inscription	eFest paper http://docs.google.com/View?id=dchr4rgg_5hjkhqzdt ASCILITE paper http://docs.google.com/View?id=dchr4rgg_0dpzk7wfz Unitec elearning strategy implementationplan http://docs.google.com/View?id=dchr4rgg_11c3wp3sd2

During August 2009, the opportunity to write collaborative research papers for both the annual eFest Conference and the ASCILITE conference provided a stimulus to reflect on the way forward for integrating mlearning across all three years of the Bachelor of Product Design course in 2010. At the same time, the researcher was involved in finalizing Unitecs new elearning strategy, which was heavily informed by the results and reflections on the implementation of three years of mlearning projects and the developmenr of an intentional COP model for professional development and learner support. Thus a model of scaffolding the integration of mobile web 2.0 across the three years of the course was developed.

Discussion

The following summaries the impact of Roger's mlearning journey on his teaching and the course:

As a faculty staff member that comes from a creative industries background that is mostly immersed in a standard studio-teaching model, I have witnessed a number of benefits for mobile web 2.0 technologies to enhance teaching and learning. The standard studio teaching environment of one communal space and one timetable is unlikely to offer the best support and learning opportunities for today's creative students; it does not mirror the 'real contemporary world'. Mobile web 2.0 technology allows for a shift away from the default studio environment to a new more fluid and dynamic situation. Utilising mobile web2.0 has disrupted the timetabled studio-learning environment and has placed the student groups into a social constructivist framework. The mlearning trials have required me to develop a set of new skills and attitudes. Initially this proved to be uncomfortable and time consuming however as I immersed myself into the initial trial the obvious benefits for teaching and learning I encountered convinced me to continue. The chief benefits I have noted are: increased interaction between students, increased interaction from external non-timetabled commentators, and the development of student reflective journals. Clients have been able to track projects in the making, add comments and steer students if need be. At final presentations, clients have arrived 'knowing' the projects and can engage deeply on the projects outcomes and validity. Student blogs have effectively become online reflective journals. Design students often struggle to document their design process and methodologies and as a result, can find it hard to remember how they arrived at their end result. The use of blogs has created a 'bread crumb' trail that students and staff can go back to both during and after the project to check their working.

I have witnessed an increased engagement in the course from students when using mobile web 2.0 technology. With each project over the last 3 years the initial 10 -14 day period of the projects sees a drop off in 'normal' project activity. This is due to the newness of the tools used, the setting up of the software and hardware and the fun students have exploring the new technology made available to them. The increased engagement from students using mobile web2.0 comes from a sense of connectivity via immediate access to the Internet, photo sharing, IM, emailing and the usual phone and txt messaging the WMDs bring. Students often group together looking at online material, send each other files and photos, URLs and other digital information. Video blogging has become a favourite and is an effective way to get out of studio information across in a short space of time. There is also a sense of current technology being embedded into the learning experience. Initially evenings saw a sharp increase in student posts. This included comments on each others blogs as well as end of day reflective posts, however over the years this has changed and students blog regularly during the day and at weekends. Finally, 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 start of the project up to today shows how the students have learned about editing content and getting ideas across efficiently.

The trials have shown that there are key issues to confront if mobile web 2.0 is to be successfully integrated into courses. The issues include: assessment and staff

participation, staff blogging and professional development, and technology choices and support. Projects that do not carry an assessment weighting see a slower and lower uptake. Students want to receive credit for doing something that takes time, focus and commitment. 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 their blogs and commenting on posts as well as offering 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. Our projects have allowed students to have the WMDs free of charge. This ensured that participants had the tools they needed to work effectively. A regular technology update is also required and we have found that the most effective way for this to occur is in a community of practice form with participation from a technology steward. Over the last 3 years, the introduction of mobile web2.0 tools into the Bachelor of Product Design has facilitated significant flexibility for students allowing them to stay connected, share their ideas widely, participate in world wide creative communities and choose to work in virtually any context on and off campus.

Conclusions

The paper has outlined and critiqued the journey of two academics integrating the use of mobile web 2.0 tools within a tertiary education course. One of the academics is an academic advisor and the principal researcher in the mlearning project, while the other is a senior lecturer in the course. This collaborative partnership has been invaluable in facilitating both conceptual and pedagogical transformation within the course, facilitating the movement to a flexible social constructivist teaching and learning environment. The use of several interpretive 'lenses' has provided a framework to critique and map this journey via a series of identified and recorded critical incidents. Looking back over this journey allows us to see how far we have progressed, and where more reflection and work is needed for future development as the journey continues.

References

- Bijker, W. (1995). *Of bicycles, bakelites, and bulbs. Toward a theory of sociotechnical change*. Cambridge: MIT Press.
- Bijker, W. E., & Law, J. (Eds.). (1992). *Shaping Technology / Building Society: Studies in Sociotechnical Change*. Cambridge: MIT Press.
- Cochrane, T., & Bateman, R. (2008a, 1-3 October). *Engaging Students with Mobile Web2.0*. Paper presented at the EIT Teaching & Learning Conference, EIT, Napier, New Zealand.
- Cochrane, T., & Bateman, R. (2008b, 8-10 September). *Engaging Students with Mobile Web2.0*. Paper presented at the eFest, Sky City Convention Centre.
- Cochrane, T., & Bateman, R. (2009). *Transforming Pedagogy using Mobile Web 2.0*. Paper presented at the IADIS International Conference on Mobile Learning 2009. from <http://www.mlearning-conf.org/>
- Cochrane, T., Bateman, R., Clifflin, P., Gardner, J., Henderson, I., & Holloway, S. (2009, 6th to 8th July). *Mobilizing Learning: Mobile Web 2.0 Scenarios in Tertiary Education*. Paper presented at the EDULEARN09 the International Conference on Education and New Learning Technologies, Barcelona, Spain.
- Cochrane, T., Flitta, I., & Bateman, R. (2009). *Facilitating Social Constructivist Learning Environments for Product Design Students Using Social Software (Web2) and Wireless Mobile Devices*. [Journal]. *DESIGN Principles and Practices: An International Journal*, 3(1), 15pp.
- Engestrom, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit.
- Herrington, A., & Herrington, J. (2007). *Authentic mobile learning in higher education*. Paper presented at the AARE 2007 International Educational Research Conference, Fremantle, Australia.
- Herrington, A., & Herrington, J. (Eds.). (2006). *Authentic learning environments in higher education*. Hershy: Information Science Publishing.
- Herrington, J., Herrington, A., Mantei, J., Olney, I., & Ferry, B. (Eds.). (2009). *New Technologies, new pedagogies: Mobile learning in higher education*. Wollongong: Faculty of Education, University of Wollongong.
- Herrington, J., Mantei, J., Herrington, A., Olney, I., & Ferry, B. (2008, 1 - 4 December). *New technologies, new pedagogies: Mobile technologies and new ways of teaching and learning*. Paper presented at the ASCILITE 2008, Deakin University, Melbourne, Australia.
- Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- McLoughlin, C., & Lee, M. (2008). *Mapping the digital terrain: New media and social software as catalysts for pedagogical change*. Paper presented at the ASCILITE Melbourne 2008, Deakin University, Melbourne.
- McLoughlin, C., & Lee, M. J. W. (2008). *Future Learning Landscapes: Transforming Pedagogy through Social Software*. *Innovate: Journal of Online Education*, 4(5).
- Ryder, M. (2007). *What is Actor-Network Theory?* Retrieved from http://carbon.cudenver.edu/~mryder/itc/ant_dff.html

Sharples, M. (2009). Methods for Evaluating Mobile Learning. In G. Vavoula, N. Pachler & A. Kukulska-Hulme (Eds.), *Researching Mobile Learning* (pp. 17 - 39). Bern: Peter Lang.

Uden, L. (2007). Activity theory for designing mobile learning. *International Journal of Mobile Learning and Organisation*, 1(1), 81-102.

Vygotsky, L. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.

Wenger, E. (2005, 14 October). *Communities of Practice: a brief introduction* Retrieved 17 July, 2006, from <http://www.ewenger.com/theory/index.htm>

Wenger, E., White, N., Smith, J., & Spa, K. R.-. (2005). *Technology for communities*. 2006(14 July). Retrieved from <http://technologyforcommunities.com/>