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Facilitating social constructivist learning environments for product design Students using social software (Web2) and wireless mobile device.

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Facilitating Social Constructivist Learning
Environments for Product Design Students Using
Social Software (Web2) and Wireless Mobile
Devices

Thomas Cochrane, Roger Bateman and Isaac Flitta

Facilitating Social Constructivist Learning Environments for Product Design Students Using Social Software (Web2) and Wireless Mobile Devices

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Abstract: It is well understood and has been well documented that there is much to gain by using social software in creating collaborative learning communities. However little is known about using a context independent interactive collaborative environment with an emphasis upon sharing, ease of use, customization and personal publishing (Mobile Web2). This paper describes an innovative and integrated Mobile Web2 technology in a product design live project setting, that assists product designers to solve a real problem to serve a real client. Students and teaching staff use a smartphone to capture design decisions and prototypes and collate and share these via an online eportfolio. From the data collected from staff/students surveys it was found that this method provided a stimulating collaborative environment that develops personal skill to bring out their latent creativity in such a way that these will become part of their project. Opportunities for mobile web2 product design projects are outlined. The logistics of providing access to appropriate hardware and software for all students are also discussed.

Keywords: Mobile Web2, Social Constructivism, Product Design, Education

Introduction

THE TERM WEB 2.0 was coined in 2005 (O'Reilly, 2005) as a way of characterising the emerging interactive, user-centred web based tools that were revolutionising the way the Internet was conceptualised and used. These tools include: blogs, wiki's, image-sharing (e.g. Flickr), video-sharing (e.g. YouTube), podcasting etc… Many educators have harnessed web 2.0 tools for creating engaging student-centred learning environments. This appropriation of web 2.0 tools within a social constructivist pedagogy facilitates what has been termed "pedagogy 2.0" (McLoughlin & Lee, 2008). This research project is interested in appropriating the benefits of web 2.0 and pedagogy 2.0 anywhere anytime using mobile web 2.0 (web 2.0 services that are formatted for use with mobile devices) and wireless mobile devices (or WMDs).

Definitions of mobile learning have focused initially upon the mobility of the devices and more recently the mobility of the learners. Sharples (2006) proposes a form of Laurillard's conversational framework (Laurillard, 2001), excluding the teacher, to define mobile learning by its contextual and informal learning characteristics. "The processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies" (Mike Sharples *et al.*, 2006). However, a key element in the conversational framework is the dialogue between teacher & student. In contrast to Sharples et al (2006), Laurillard (2007) emphasises the teacher's input in mobile environments through good pedagogic design that facilities continuity between the face to face and remote peer learning contexts. Her definition of mobile learning incorporates the critical pedagogical design input of the teacher: "Mlearning, being the digital support of adaptive, investigative, communicative, collaborative, and productive learning activities in remote locations, proposes a wide variety of environments in which the teacher can operate" (Laurillard, 2007).

Recent research into mlearning has highlighted the context 'awareness' of mobile devices (Cook *et al.*, 2007; M Sharples *et al.*, 2007), and the ability to 'span' learning contexts (Wali *et al.*, 2008). However, what is unique about WMDs for mlearning is their ability to BRIDGE contexts – i.e. to provide ubiquitous connectivity independent of the context of use, thus linking multiple contexts into the learning environment, continuing learning 'conversations' via social presence and communication technologies. The WMD's wireless connectivity and data gathering abilities (e.g. photoblogging, video recording, voice recording, and text input) allow for bridging the on and off campus learning contexts – facilitating "real world learning". In particular, the context bridging and media recording capabilities of today's smart-

phones make them ideal tools for mobile blogging. Smartphones allow a user to send text, photos, video and audio directly from the site of recording to the users online Blog. An example of the potential of mobile blogging is the rise of citizen journalism (Cameron, 2006; Elmendorp, 2007; Fulton, 2007; Skoeps, 2007). Collaboration and communication with peers and Lecturers can be maintained in any context using WMDs with a variety of communication technologies (email, online LMS, Instant Messaging, audio and video conferencing, SMS, MMS, mobile phone calls etc…).

This paper explores how the introduction of mobile web 2.0 technologies into a Bachelor of Product Design programme have impacted, disrupted and transformed the established teaching and learning paradigms. Several scenarios are detailed illustrating this transformation. The goal of the research and project has been to move pedagogical approaches in tertiary education from instructivist pedagogies to a social constructivist pedagogy (Vygotsky, 1978) and to facilitate a context bridging collaborative learning environment.

Disruptive technologies (Mike Sharples, 2000, 2001, 2005; Stead, 2006) are those technologies that challenge established systems and thinking, requiring change and are thus viewed by many as a threat to the status quo. Disruptive technologies democratise education environments challenging the established power relations between lecturers and students. Their disruptive nature forces a rethink of pedagogical strategies and relationships in education.

Research Methodology

The philosophical basis for this research is participatory action research in a sense that it was intended to examine the potential of mobile web2.0 as a phenomenon constructed by lecturers and learners in the context of tertiary education. The research summarised in this paper is part of a wider research project investigating the potential of mobile web 2.0 for enhancing education teaching and learning through a series of participatory action research projects (Creswell, 1994; Wadsworth, 1998) in a variety of disciplines since 2006.

Yoland identifies the key characteristics of 'participatory action research' as: *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. The contexts of the wider research project included: Bachelor of Product Design, Diploma of Landscape Design, and the Diploma of Contemporary Music. The wider characteristics of the research are

1. The identification of the key factors in integrating Wireless Mobile Devices (WMDs) within tertiary education courses
2. The Challenges/advantages of these disruptive technologies present to established pedagogies
3. The capacity at which these WMDs can be utilised to support learner interactivity, collaboration, communication, reflection and interest, and thus provide pedagogically rich learning environments that engage and motivate the learner.
4. The extent of WMDs that can be used to harness the potential of current and emerging social constructivist e-learning tools.

This particular research paper is focused upon the effect of mobile web 2.0 upon the pedagogical development of the Third year Bachelor of Product Design programme. Within this context the authors are focused on positive pedagogical changes within the course that lead to benefits for the students. The research was designed to reveal relevant constructs based on the experiences of the students and lecturers and their reflections as determined through actions. Thus the emphasis upon the following key characteristics:

- The potential benefits of the mobile web2 technology to enhance teaching and learning
- The increase participation and engagement of the students in using the technology.
- The Issues of the integration of the technology into the course then programme
- The consequent methodology on the lecturer teaching approach using the technology.

The methodology involved using a combination of structured surveys and semi-structured focus groups with both students and lecturers in a way which enable them to reflect in detail their experience of using the technology. They were given maximum opportunity to be reflective about their experiences of using the technology. The data gathering consisted of:

- Pre-trial surveys of lecturers and students, to establish current practice and expertise
- Post-trial surveys and focus groups, to measure the impact of the wireless mobile computing environment, and the implementation of the guidelines.
- Lecturer and student reflections via their own blogs during the trial. The blog is also an online eportfolio 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 online on Google Docs at http://docs.google.com/Doc?id=dchr4rgg_5478zdzbgw&hl=en_GB (Cochrane & Bateman, 2008). An 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. Students and teaching staff volunteer to participate in the research project, signing acceptable use and ethics consent forms to become participants. Participants 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, and VODCasts (video recordings uploaded to their blogs and YouTube).

Bachelor of Product Design Mobile Web 2.0 Project

The Product Design Programme at UNITEC NZ is developed through continuous cross fertilisation of ideas between teaching staff and design industries. The programme believes strongly in collaboration with industry so that all students are exposed to live projects to provide 'hands-on' experience. In the first semester of 2008, third Year Product Design students undertook major collaborative projects in conjunction with three industrial partners and were given the brief to develop commercially viable products. Students used blogs and eportfolios to record pictures, videos, articles related to their project etc. and reflect on their design process. These were made available to their respective client for feedback and interaction to guide the development process and address any relevant design issues. Students and staff were initially supplied with a Nokia N80 WiFi/3G smartphone and folding Bluetooth keyboard, which was later upgraded to a Nokia N95 smartphone. Students used the smartphone for recording and uploading evidence of their design development process and models to their VOX blog (http://www.vox.com) and other online media sites such as YouTube for video. They were marked on this evidence of the design process, eportfolio and reflection, as well as their critique and reflection on other students' blogs via commenting. The smartphones are also used as a communication tool between students and with teaching staff for immediate feedback via instant messaging, email and RSS subscriptions. Students are responsible for paying for a voice call and text message account but are reimbursed the cost of a 1GB/month 3G data account. The project is supported by a weekly "Community of Practice" (Lave & Wenger, 1991), comprising the course Lecturers, the student volunteers, and the researcher who is also the 'technology steward' (Wenger et al., 2005) for the community of practice. An interactive concept map illustrating the integration of the mobile web 2.0 technologies with the smartphone is available at http://ltxserver.unitec.ac.nz/~thom/mobileweb2concept2.htm.

Table 1: Outline of the Product Design Mobile Web2 Project

Course: Bachelor of Product Design, third year class	
Participants	• 9 students – The average age of the students is 24 (19 to 33), and all are male students. • 2 Course Lecturers • Technology Steward
Mobile Technology	Nokia N80 WiFi Smartphone (upgraded to N95 in Semester2), Bluetooth folding keyboard, 1GB/month 3G data
Pedagogical Focus	Documenting the research and design of three products throughout the year, including working with a client company in small design teams
Community of Practice	Weekly throughout the entire course
Support LMS	Moodle
Deliverables	An online Blog/eportfolio documenting and showcasing your design processes and forming the basis of a collaborative hub with worldwide peers and potential employers/clients.
Timeframe	February 2008 through to November 2008, expanding to entire three year course in 2009.

Transforming Product Design

The following section outlines several examples illustrating how the introduction of mobile web 2.0 technologies has impacted and transformed the Bachelor of Product Design course.

Mobile Web 2.0 Scenarios in Product Design

Major Project – Changes from 2006 to 2008

The third year major assignment has been modified each year between 2006-2008 to assist 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 on Google Docs (Bateman & Cochrane, 2008), included here are the details of deliverables that have changed between 2006 and 2008.

Table 2: Third Year Bachelor of Product Design Major Assignment Changes

Assignment Iteration	Deliverables
2006	- A report summarising all research undertaken and the key findings and insights. - All forms of prototype and test modelling i.e. 3D sketch models / ergonomic models / interface design wireframes / proof-of-concept working models, etc. - All drawings, sketches and CAD models.
2007	- A report summarising all research undertaken and the key findings and insights. - All forms of prototype and test modelling i.e. 3D sketch models / ergonomic models / interface design / proof-of-concept working models, etc. - All drawings, sketches and CAD models. - A project plan for Part Two of the Major Project - A blog that runs throughout your major project. You should post to your Blog regularly - Use your blog to collate project information and reflect on your design process. Also regularly comment on each other's blog posts – providing critique, feedback, and links to appropriate resources.
2008	- A report summarising all research undertaken and the key findings and insights. - All forms of prototype and test modelling i.e. 3D sketch models / ergonomic models / interface design / proof-of-concept working models, etc. - All drawings, sketches and CAD models. - A project plan for Part Two of the Major Project - A VOX blog/eportfolio that runs throughout this phase and the rest of the year. You should post to your Blog at least weekly (preferably daily). - Use your VOX blog/eportfolio 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/eportfolio should include the following: - An audio Podcast - A Video VODCast - Uploaded images (include geotags if possible – i.e. Google Maps links of image locations) - Text posts (Reflection, critique, process, summary, comments…) - Links to Web2 multimedia site original content (e.g. create your own accounts on YouTube, Flickr, Google Docs, Slide.com etc…) - Use shared Google Calendars for course events/dates. - Electronic communication will be via GMail, MSN Messenger and RSS feeds (e.g. via Google Reader or Newsgator).

Student Example/s

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

This illustrates the affordances of mobile web 2.0 tools to facilitate user content creation and sharing, and context independent (ubiquitous and seamless) input from lecturers (Laurillard, 2007).

NPC Project – Changes from 2007 to 2008

One of the Bachelor of Product Design courses modified by the inclusion of mobile web 2.0 technologies was the New Product Commercialisation (NPC) paper. Below is an outline of the change in NPC assessment deliverables facilitated by mobile web 2.0:

Table 3: Third year Bachelor of Product Design Major Assignment Changes

Assignment Iteration	Deliverables
2007	• One booklet that provides a concise overview of successful product development and commercialisation processes. This booklet must have high production values and must reflect the importance that design plays in this process (see letter that you have been sent to read more detail of what is required).
2008	• A blog that provides a concise overview of successful product development and commercialisation processes. The blog must reflect the importance that design plays in this process. • On a weekly basis and in addition to notes taken at each of the guest lectures, you must find an article that raises issues related to "New Product Commercialisation" (e.g. NZ magazines Design and Business, such as IDEALOGY, BRIGHT, UNLIMITED), the article maybe directly relevant e.g. the description of an NPC project, or it may simply raise issues that you can discuss in terms of NPC e.g. the impact of imports, a clever marketing initiative, tax changes for R&D etc... • Using a blog as a mean of communication, you will write a synopsis of the article followed by your own interpretation of the points raised in it (Around 500 words per post). The synopsis and comments are to be published in a blog along with a link to the original article either as a weblink or magazine's reference for the submission. Tag your NPC project blog posts (and any other relevant media you upload to your Blog – e.g. supporting images, video, podcasts, embedded YouTube videos etc...) with the tagword "NPC" to allow tracking and collation of your posts. You could also define an "NPC" collection within Vox. • Collaboration and interaction are important aspects of the project. Therefore each student will work with their group to refine their chosen article and any additional comments on it using the 'comments' feature of each other's Blogs. The article will then be presented every week at the tutorial group sessions. It is expected that each member of the work-group will be familiar with the article and be able to assist the author in reporting back.

Student Blogging Example/s

The following is an example of a student blog post for their NPC paper and the resulting comments from their classmates. The post (Figure1.) and comments (Figure2.) show significant engagement and critical reflection occurring by multiple parties and within multiple contexts. The use of the blog facilitated the posting of student reflections on examples of new product commercialisation and the extra dimension of peer critique of these ideas, with the ability to respond and enter into a collaborative 'conversation'. The use of WMDs (Smartphone) facilitated searching for examples anywhere, anytime, and the ability to upload supporting media directly to the student's blog. Lecturers viewed and commented on student blog posts using their smartphones and bluetooth

keyboards, and subscribed to student blogs via RSS. However, students tended to read each other's blogs on their laptops. This is an example of a socially constructed use of the technology rather than an affordance of the technology itself (Bijker *et al.*, 1987). Students were encouraged to subscribe to each oth-

er's blog RSS feeds to enable automatic notification of new posts for discussion. Additionally, VOX features a weekly 'neighbourhood update' email, that students could receive and read on their smartphones. This facilitated a social constructivist learning environment.

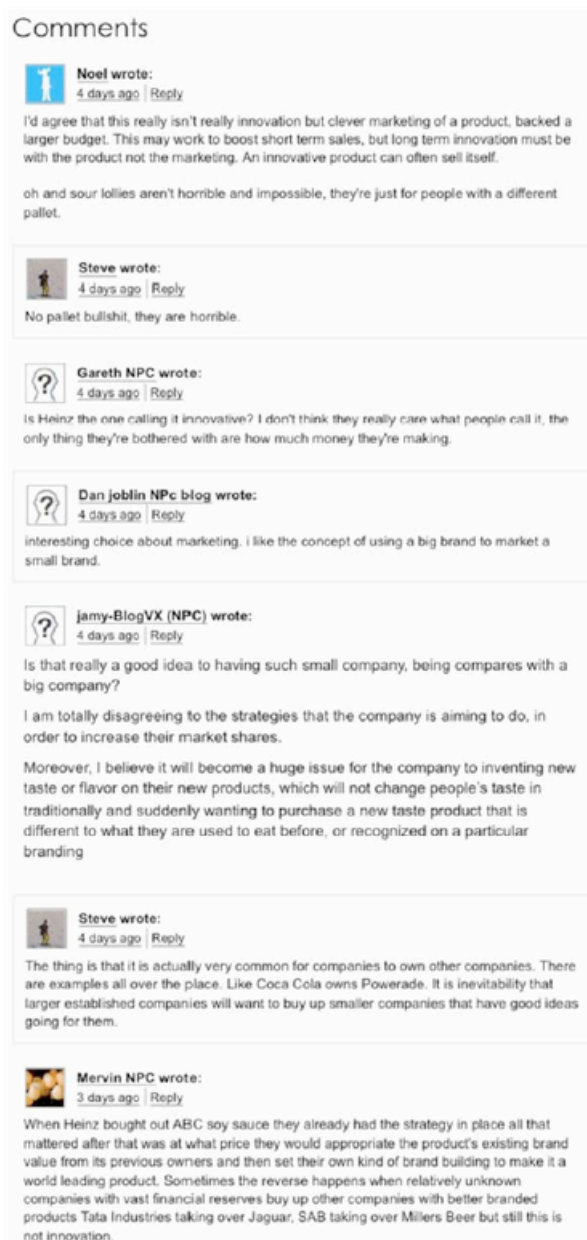Fig 1: Screenshot of Example Student NPC Blog Post

Fig 2: Screenshot of Example Student NPC Blog Comments

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 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, in almost realtime. To 'prove' they were in Queenstown they also blogged mobile videos of their campervan and Queenstown scenery.

Beyond NPC

During the course of the year academic teaching staff have visited three overseas countries: Japan, UK, Spain, France as well as numerous New Zealand towns outside of Auckland: Rotarua, Tauranga, Napier, Hastings. Staff used mobile web 2.0 technologies to pass relevant information to their student(s) from these countries and locations.

Context Bridging Scenarios

1. During April 2008, a staff member visited Kyoto, Japan to participate in a conference that took place during the teaching semester. This scenario provided the opportunity for the staff

member to test the use of Web2 as a distance communication tool: could regular contact be maintained between the staff member and students and information be easily shared using a smartphone? The use of mobile web 2.0 technologies allowed real time text, video and still images of the conference, sites, design, architecture to be easily and immediately uploaded to the staff members blog for students to see and share in. By return, 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.

2. In a second case, a staff member was required to make a trip to the UK and France taking valuable time away from teaching. At this stage, students were well advanced into their projects and having a staff member overseas posed a potentially difficult situation for them and the programme. 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 members 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.

Student Feedback

Student feedback on the integration of mobile web 2.0 technologies into the curriculum has been extremely positive. Students were asked to provide reflective feedback at the end of semester one:

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 everyday, and so from that perspective it makes things better. Traditionally when you write something down in a notebook a lecturer will only read it at the end of the project when they mark it, but with blogging you can write something down and Lecturers and other students can comment almost immediately, so you get more real-time feedback.

An example of moblogging is – here's a bunch of images I've just photographed while in the Library and then I straight-away upload them, then I can comment on them, my classmates can comment on them, so I find it a lot faster, and it's productive time. Also you can see what other students have just blogged and see what they are thinking about at the moment – so we've got our heads in everyone else's projects as well, so you are not just in your own little box (Bachelor Product Design Students 2008).

Students were surveyed at the end of the NPC Project (mid semester two 2008) using Surveymonkey. The student feedback is useful in critiquing the impact of the mobile web2.0 technologies on the course. Sixteen of the eleven students in the class responded, nine of these were mobile web 2.0 users:
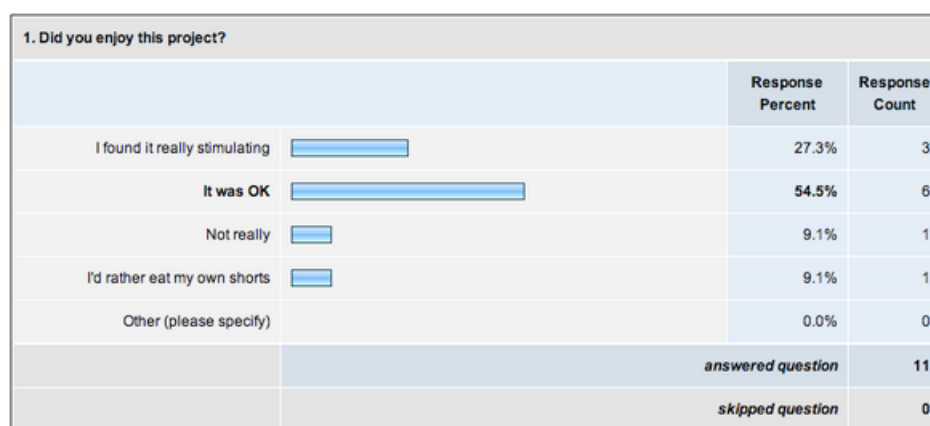
1. Did you enjoy this project?		Response Percent	Response Count
I found it really stimulating		27.3%	3
It was OK		54.5%	6
Not really		9.1%	1
I'd rather eat my own shorts		9.1%	1
Other (please specify)		0.0%	0
	answered question		11
	skipped question		0

Fig 3: Student Responses to NPC Survey Question 1

The majority of the students enjoyed the project (see fig 3).

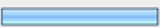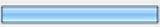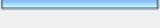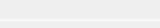| 2. What were the benefits to your learning of using the Blog and commenting in this assignment? Choose all that you agree with.		Response Percent	Response Count
Greater interaction with my classmates ideas		36.4%	4
It produced more in depth reflection than a paper-based assignment		36.4%	4
I could use a variety of media to illustrate my ideas		27.3%	3
It was flexible (I could blog from anywhere, anytime)		36.4%	4
It produced a valuable record of my learning		36.4%	4
view Other (please specify)		9.1%	1
	answered question		11
	skipped question		0

Fig 4: Student Responses to NPC Survey Question2

Students recognised and appreciated the benefits of the use of a blog for facilitating the project (See fig 4).
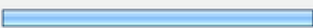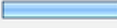
3. What were the disadvantages of this approach to the assignment? Choose all that you agree with, and/or enter a comment.		Response Percent	Response Count
It was time intensive		72.7%	8
I couldn't cheat		18.2%	2
I had to maintain another blog		18.2%	2
I don't have broadband at home		9.1%	1
I didn't like my group		9.1%	1
Not everyone pulled their weight		27.3%	3
view Other (please specify)		9.1%	1
	answered question		11
	skipped question		0

Fig 5: Student Responses to NPC Survey Question 3

Students expressed the time intensive nature of regular blogging and commenting, and the issues of work-parity in group assignments (See fig 5), however the mobile participants were unanimous in preferring this new approach to assessment and feedback to that of more traditional approaches (See fig 7).
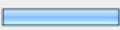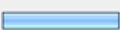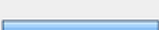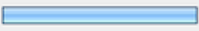
4. How did you use your N95 with this project? Answer all that apply.		Response Percent	Response Count
I uploaded photos to VOX from the N95		27.3%	3
I uploaded Videos to VOX or YouTube from the N95		18.2%	2
I browsed for relevant info on the N95		18.2%	2
I subscribed to my classmates' blogs using the N95		0.0%	0
I checked my VOX weekly neighbourhood email update on the N95		27.3%	3
I listened to relevant Podcasts on the N95		9.1%	1
I watched relevant YouTube videos on the N95		36.4%	4
view Other (please specify)		45.5%	5
		answered question	11
		skipped question	0

Fig 6: Student Responses to NPC Survey Question 4

Students used their smartphones to research content, upload and interact with their blogs in a variety of ways (see fig 6).
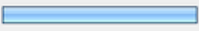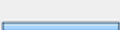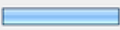
5. How could this project be improved? Answer all that you agree with or/and add a comment.		Response Percent	Response Count
By using a VOX group page instead of multiple new blogs		45.5%	5
I should have used RSS to subscribe to my classmates' blogs		9.1%	1
Weekly formative feedback (comments) from the tutor on our posts		63.6%	7
Having more time for research and reflection		27.3%	3
I'd rather go 'old-school' with a paper journal or research essay		9.1%	1
view Other (please specify)		27.3%	3
		answered question	11
		skipped question	0

Fig 7: Student Responses to NPC Survey Question 5

While students were encouraged to use their original course VOX blog for the NPC project and identify NPC postings using tags, most students created a secondary blog using VOX for the NPC project. The effort of maintaining multiple blogs convinced students of the benefits of tagging within a single blog, or alternatively creating a group within VOX for specific projects.

A key issue identified by students (See fig 7) was the lack of regular formative feedback from the Lecturer on their blog posts. This was due to time pressure on a new staff member entering the programme. This lack of formative feedback then created a more time intensive summative marking and feedback process at the end of the NPC project. This has high-lighted the disruptive nature of mobile web

2.0 tools (Mike Sharples, 2001) changing Lecturer pedagogies and learner experiences, illustrated by the affordance of mobile blogging for providing an avenue for regular formative feedback from Lecturers.

The initial usage of mobile web 2.0 tools places new and increased time, organisational, and pedagogical demands on the lecturers. To mitigate potential increased workload when using web 2.0 tools across multiple projects the use of the features of VOX such as tagging, RSS and groups are essential. Critically, the successful use of mobile web 2.0 tools requires a change in time management and a refocus on regular formative feedback rather than the traditional summative end-of-project feedback and assessment procedures. When this is implemented the benefits for students and lecturers in being continuously emersed in the projects is realised, creating much lower reliance upon end-of-project presentations and summative assessment.

Fig 8 provides and overview of what types of activities and how regularly students used their smartphones as enabling tools within their course and their wider social lives. This illustrates that students integrated the mobile technologies into their daily routines in a variety of ways, and they were encouraged to personalise the use of the smartphones throughout the period of the project.
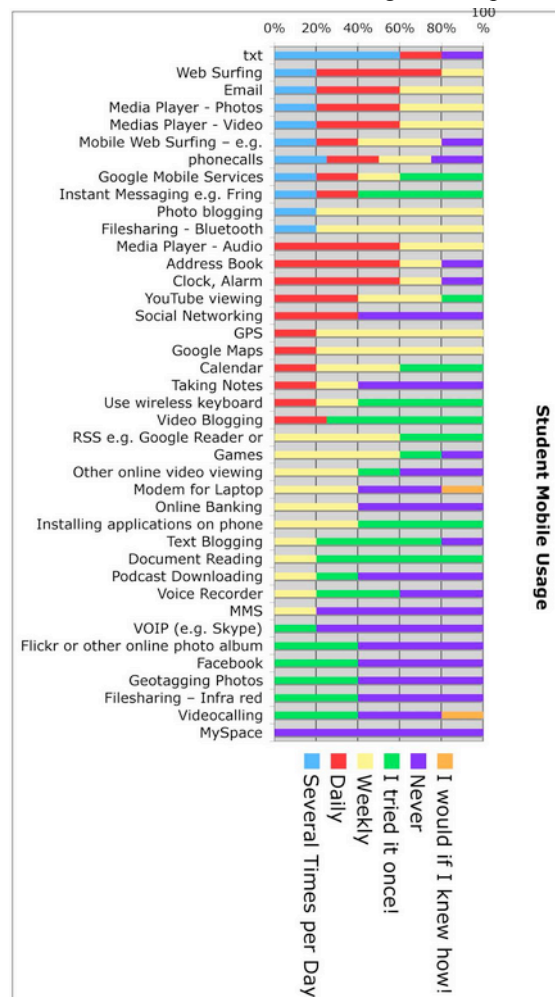
Fig 8: Student Mobile Usage

Staff Feedback

Teaching staff were asked to reflect on the impact of the introduction of the mobile web 2.0 technologies on the course, using the following questions related to the main research questions for the overall research project.

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?

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 closer comment 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 in 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.

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 ex-ploring 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 characterised by the immediate access to the Internet, photo sharing, instant messaging (IM), emailing and the usual voice and txt 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 favourite 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.
5. Students construe the use of the technology in their project as exciting and gained enjoyment from working in teams. This lead to students to subscribe to each other's blog and created a social constructivist learning environment and increased interest in the subject overall.
6. A noticeable increase in students' confidence as the year progressed, and become more reflective about the learning processes they have mastered.

What are the Key Issues to Successfully Integrating this Technology into Courses?

1. Assessment and staff participation. The 2007 project did not carry an assessment weighting

and the uptake of students was lower than 2008 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. It is important, that lecturers continue to provide the support on the type, scope, size, and pedagogical input of the mobile web 2.0 aspects of the projects that are introduced into courses. 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.

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.

4. Creating a course-wide strategy for the integration of mobile web 2.0 within the programme that would enable all of the teaching team to support one another in supporting these innovations should be a goal for 2009.

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.

Key Issues

The mobile web 2.0 integration project within the Bachelor of Product Design has highlighted several key issues.

The project has illustrated the potential to create increased student engagement with the learning environment.

Higher levels of student reflection and critique were achieved compared to that previously seen with more traditional assessment procedures.

Anywhere, anytime learning (context independent and context bridging) has been facilitated and made use of in unforeseen scenarios.

Tutor engagement with the technology is essential for students to value its use and to gain an understanding of its pedagogical usefulness beyond social activities.

The integration of the mobile web 2.0 technologies into the assessment (Both formative and summative) is critical for student motivation.

Access issues must be considered carefully when planning to integrate the use of mobile web 2.0 technologies. The sustainable provision of hardware, software and connectivity (3G data plans and wifi availability) must be thought through. Various models for achieving this sustainability are being brainstormed for the future of this project.

The integration of mobile web 2.0 facilitated a change in pedagogical approach that needed significant scaffolding for both students and Lecturers. This made supporting the project via a Community of Practice, and sound pedagogical design essential.

Conclusions

The work over the last two and a half years on the integration of mobile web 2.0 technologies into the Unitec Bachelor of Product Design has been very successful. As both case studies show the student and lecturer experience within the programme have been enhanced through the facilitation of a social constructivist environment that bridges multiple contexts. Over the last two and a half years significant changes in pedagogical approach and levels of student engagement have been realised. Our future aim is to build upon the insights gained and form a foundational model to fully embed mobile web 2.0 tools into the entire Bachelor of Product Design curriculum.

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Thomas Cochrane is an Academic Adivsor (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

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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, the studios' clients included Viaduct Furniture, London/ Glosbrook and the Liverpool City Council. In 1994 Roger joined rds London as partner and design director. The company designed, developed, manufactured and sold contemporary furniture to clients as diverse as Diesel, British Airways, the V&A Museum London, Scottish parliament, KLM, Morgan Grenfell, TSB, Foreign and Commonwealth Offices, The Royal Opera House London, The Dome UK, British Council, Warner Music and Virgin Music. In 1998 he joined the Keen Group Ltd London, overseeing the design and development of office furniture solutions. Keens clients include Apple Computers, BBC, Chanel, IXC Tokyo and the Stella McCartney Studio. In 2000 Roger moved to Spain to oversee design development and manufacture of Keen Products whilst at the same time forming a design partnership with Jane Dillon and Tom Grieves. Their clients included Casas Barcelona and AvantGarde Milan. 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 Associate Head and Senior Lecturer in the School of Design where he has been working since November 2004. Roger teaches in the Bachelor of Product Design the Master of Design, is Head of the Schools Design & Business Incubator and a member of the School's Research & Advanced Practice Committee. Roger is currently developing the areas of Design Enterprise, Knowledge Transfer and Knowledge Exchange within the School.

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