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Beyond the Yellow Brick Road: mobile Web 2.0 informing a new institutional e-learning strategy

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Mobile learning (m-learning) has moved beyond the realms of fantasy to become a viable platform for contextual learning that bridges formal and informal learning environments. This paper overviews how mobile Web 2.0 has been instrumental in facilitating pedagogical change and informing an institution's new e-learning strategy that focuses upon social constructivist pedagogies. The project developed an intentional community of practice model for supporting new technology integration, pedagogical development, and institutional change. Beginning with a small selection of early adopter trials, the results of the research are now informing a wider integration of wireless mobile computing.

Keywords: m-learning; Web 2.0; case study

Introduction

This paper reflects upon how the integration and support of mobile Web 2.0 projects have transformed a tertiary education institution's approach to e-learning. This transformational journey is based upon four years of research on appropriating the pedagogical benefits of Web 2.0 and pedagogy 2.0 (McLoughlin and Lee 2008) anywhere anytime using mobile Web 2.0 and wireless mobile devices (WMDs), in particular WiFi (wireless ethernet) and 3G-enabled (third-generation mobile 'broadband') smartphones, and 3G-enabled netbooks. A series of participatory action research (Swantz 2008; Wadsworth 1998) m-learning projects was used to draw out implications and strategies for facilitating social constructivist learning environments. These m-learning projects were situated within a variety of educational contexts, at different educational levels, and took place longitudinally across one to three years of implementation, involving cycles of reflection and refinement with earlier project results informing the design of the following projects. The learning contexts included: Bachelor of Product Design (2006 using Palm Lifedrive; 2008 using Nokia N80, N95; 2009 using Nokia XM5800, N95, N97), Diploma of Landscape Design (2006 Using Palm TX; 2007 using Nokia N80; 2008 using Sony Ericsson P1i; 2009 using Dell mini9 netbook), Diploma of Contemporary Music (2008, 2009 using iPod Touch, iPhone 3G), Bachelor of Architecture (2009 using Nokia XM5800 and Dell Mini9 netbook), and the Bachelor of Performing and Screen Arts (2009 using Dell Mini9 netbook and Nokia XM5800). Overviews of these projects are available online:

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- <http://prezi.com/kr94rajm9u/>
- <http://www.youtube.com/watch?v=FcwL8kQoRSI>
- <http://www.youtube.com/watch?v=5vGNWMwEypY>

Unitec is New Zealand's largest tertiary Technical Institute.¹ The institution's previous default model for lecturer professional development was delivery of an annual series of generic workshops, with very low attendance levels and invisible outcomes in students' educational experiences. The entrenched instructivist pedagogical teaching model has also been challenged and disrupted (Sharples 2001) by the implementation of mobile Web 2.0, creating a shift to social constructivist teaching and learning paradigms. The resulting mobile Web 2.0 support and implementation models developed from the research have been influential in informing the development of the institutions new e-learning strategy, with many of the pedagogical and support strategies developed during these projects becoming integrated into this new e-learning strategy. Thus the outcome of using an action research methodology has met the researcher's goal of having significant positive impact on the institution and the associated learning community.

The m-learning project research questions were as follows:

- What are the key factors in integrating WMDs within tertiary education courses?
- What challenges/advantages to established pedagogies do these disruptive technologies present?
- To what extent can these WMDs be utilised to support learner interactivity, collaboration, communication, reflection and interest, and thus provide pedagogically rich learning environments that engage and motivate the learner?
- To what extent can WMDs be used to harness the potential of current and emerging social constructivist e-learning tools?

Data gathering consisted of the following:

- 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.

Literature review

This section contextualises some of the core concepts underpinning the m-learning projects that then informed the institutions e-learning strategy.

Communities of practice

An intentional communities of practice (COP) model (Langelier 2005) was developed by the researcher (Cochrane 2007; Cochrane and Kligyte 2007) and used to provide longitudinal lecturer professional development and technological support, and to provide pedagogical and technological scaffolding for the students throughout the length of the projects.

Social software and communities of practice

Wenger et al. (2005) discuss the contribution that technologies can make to COP; in particular Web 2.0, social software tools.

Social software (or Web 2.0) tools make a natural companion to COP. The key characteristics of social software fit well with social constructivist pedagogies, enabling a natural and relatively simple approach to creating collaborative learning communities (McLoughlin and Lee 2007; Mejias 2006). Web 2.0 is about moving beyond content delivery to an interactive collaborative environment with an emphasis upon sharing, ease of use, customisation and personal publishing (Alexander 2006). Thus, in an educational setting, Web 2.0 provides opportunities for students to be involved in the learning process; to create their own unique collaborative environments that can be shared globally (Hughes 2009).

Wenger's exploration of the use of Web 2.0 tools to enhance COP (Wenger, White, and Smith 2009; Wenger et al. 2005) paralleled the early development of the researcher's research methodology. Wenger's largest influence on the research project was the development of the concept and role of the 'technology steward' within COP.

The technology steward

COP can be enhanced with the use of appropriate communications technologies when under the guidance of a technology steward. The technology steward (Wenger et al. 2005) is a member of the community with a grasp of how and what technologies can enhance the community. They act as a guide to the rest of the community as the community learns to utilise and benefit from technology. The technology steward thus forms a pivotal role in the successful integration of technology into the groups practice. As the research project has developed, and in particular with the development of an intentional COP model to support the pedagogical and technological integration of WMDs into each project, so has the understanding of the crucial role of the technology steward in supporting these projects. At the same time, Wenger also continued to develop his understanding of this key role within COP in the twenty-first century technological environment.

Wenger, White, and Smith (2009) see technology stewardship within COP as an emergent role that is clearly distinguished from traditional information technology (IT) support.

The role of the technology steward was appropriated by the researcher within the context of COP for lecturer professional development, followed by student communities of practice for scaffolding their learning during the m-learning projects. These were effectively 'intentional' communities of practice (Langelier 2005), focused on the pedagogical and technical support of the m-learning projects.

Intentional communities of practice

While classical COP form organically and spontaneously, they can also be created intentionally and cultivated for specific purposes. Intentional COP share the same characteristics as organic communities of practice, but have at their core a plan (Langelier 2005, 31). These are similar to semi-formal learning communities (Kukulska-Hulme and Pettit 2008) but more longitudinal throughout the length of the m-learning projects, and therefore creating collaborative projects between the 'technology steward', the course lecturers, and the students on the course.

Mobile Web 2.0

The author of this paper proposes that m-learning can support and enhance both the face-to-face and off-campus teaching and learning contexts by using the wireless mobile devices as a means to leverage the potential of current and emerging collaborative and reflective e-learning tools (e.g. blogs, wikis, RSS). These are often called social software or Web 2.0 tools, facilitating student-generated content (Bruns 2008) and student-generated learning contexts (Cook et al. 2007). The WMD's wireless connectivity and data-gathering abilities (e.g. photoblogging, video-recording, voice-recording, and text input) allow for bridging (Vavoula 2007a) the on-campus and off-campus learning contexts – facilitating 'real-world learning'. In particular, the context-bridging and media-recording capabilities of today's smartphones make them ideal tools for mobile blogging. Smartphones allow a user to send text, photographs, video and audio directly from the site of recording to the user's online blog. The integration of mobile Web 2.0 within the courses has formed a catalyst for pedagogical change that the researcher as the technology steward within each community of practice has been able to explicitly capitalise upon.

2009 case studies

The 13 m-learning projects represented within the five case studies referred to herein provide rich examples of practical pedagogical integration of m-learning within a variety of tertiary education courses. In this section we briefly summarise the main lessons learnt from the three longest-running case studies.

The core activity of each of the projects is the creation and maintenance of a reflective blog as part of a course group project, effectively creating student e-portfolios. However, the smartphone or netbook can be used to enhance almost any aspect of the course, as was illustrated by the range of activities used in the projects. Several unique affordances of the new generation of smartphones were focused on in the 2009 projects (Cochrane and Bateman 2010c). These affordances facilitate student-created content and formative lecturer and peer feedback, core aspects of a social constructivist pedagogy that is foundational for the institution's new e-learning strategy.

Case study 1: Diploma of Landscape Design 2007–2010

The mobile Web 2.0 project with the Diploma of Landscape Design was born out of a desire to provide flexibility and enable situated learning environments for students who are predominantly part-time, and to create authentic teams of students who work on real-world projects as part of their final-year course. The course lecturer envisioned mobile Web 2.0 tools as potential facilitators of this pedagogy, but required technological and pedagogical support to implement these ideas. In 2007 students used Nokia N80 smartphones to document and share their design for an exhibition garden at the annual Ellerslie Flowershow. The 2008 project integrated the use of smartphones for reporting a field-trip to Japan. The short-term nature of these projects and the wide range of student experiences and capabilities in the increasingly mature and part-time student demographic of the course led to a rethink of the mobile Web 2.00 integration in 2009, and a focus upon 3G-enabled netbooks for creating student e-portfolios.

Beginning in 2007, the first m-learning project (Cochrane 2009b) paved the way for the following projects, highlighting a range of technical and implementation issues

that could be improved upon. The project also emphasised the disruptive nature of m-learning (Sharples 2001; Stead 2006), illustrating the process of lecturer pedagogical reconceptualisation of teaching, and the process of student reconceptualisation of learning required as the course moved from teacher-centred (pedagogy) to social constructivism (andragogy to heutagogy). Thus the importance of a robust yet flexible technical and pedagogical support strategy was highlighted. The unique student profile (all the students were aged between 43 and 69) of the 2008 iteration of the Landscape Design m-learning project highlighted the importance of choosing appropriate WMDs for the needs of each unique student group. Thus the 2009 Landscape Design m-learning project used netbooks to minimise the cognitive load for the students, and highlighted the importance of learning community formation to be integrated into the course (Cochrane et al. 2009a).

Lecturer feedback

We found that the ‘e’ and mlearning component of our project worked really well this year – we’ve had extremely high participation from our students. They seem to really enjoy the ability to contribute to the discussions at any time digitally, and we had each group performing really well, the conversations between groups was good, and the multidisciplinary work with Design worked very well for us. So the group work was fantastic. The second aspect I wanted to mention was the learning environment that we setup with Thom’s time. We set ourselves up in the back of Long Black Café in an open learning situation with the notebooks around a big table. It seemed to work very well. They liked the access to food, they enjoyed the aspect of all getting together once a week to blog and it seemed to spur them on to get going independently as well. (Lecturer, May 2009)

Case study 2: Bachelor of Product Design 2008–2010

Aspects of this case study have been published in various peer-reviewed papers (Cochrane and Bateman 2009b, 2010a, 2010b; Cochrane et al. 2009; Cochrane, Bateman, and Flitta 2009a, 2009b; Cochrane, Flitta, and Bateman 2009). One of the key drivers for the introduction of m-learning into the course was the development of a flexible, context-independent teaching and learning environment. The 2008 m-learning project was initially envisioned as a voluntary project involving two lecturers and eight students investigating the potential for bridging the on-campus and off-campus learning contexts using Nokia N95 smartphones. The enthusiastic response from the participants led to the implementation of m-learning projects across all three years of the course in semester two of 2008. These projects were followed up in 2009 with the full integration of m-learning with all of the students and lecturers in the three year classes of the course in a staged and scaffolded project with first-year students using 3G netbooks and Nokia Xpressmusic 5800 smartphones, second-year students using Xpressmusic 5800 smartphones and their own laptops, and third-year students using Nokia N97 smartphones plus their own laptops.

The Product Design m-learning projects achieved significant progress in course integration, pedagogical reconceptualisation, and development of a staged and scaffolded implementation model for developing learning communities facilitated by intentional communities of practice across each year of the course. The case study illustrated the potential to stage and scaffold m-learning integration across all three years of a bachelor-level course, starting with establishing a learning community

culture involving both the students and the lecturers and facilitation of a progression of teaching paradigms from pedagogy to heutagogy (PAH) (Luckin et al. 2008) following the first year to third year of the course. The PAH continuum maps well with the progression of mobile Web 2.0 course integration from Web 2.0 appropriation (JISC 2007; Knight 2009) in the first year to student mobile facilitated content creation (Bruns 2007; Hughes 2009) in second year, and finally the context independence and bridging affordances of m-learning (Luckin et al. 2008; Vavoula 2007b) leveraged in the third-year ‘nomadic studio’ (Cochrane et al. 2009).

Lecturer feedback

The standard Atelier Method or 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’. Over the last two to three years, the introduction of mobile Web 2.0 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. (Lecturer, 2009)

Case study 3: Diploma of Contemporary Music 2008–2010

This project was centred on preparing students for the music technology paper that is part of the Diploma of Contemporary Music, which was scheduled to run for the first time in semester one of 2009. In this course, students experiment with and evaluate current music creation and delivery technologies, including podcasting and sharing via blogs, e-portfolios, and social networking. The goal of the project was to illustrate the potential of a personal learning environment, facilitated by mobile Web 2.0 technologies, that was unconstrained by the limitations of the institutional learning management system. For semester one of the project, lecturers and students were provided with an iPod Touch (16 GB) each, which was upgraded to a 3G iPhone in semester two when they become officially released in New Zealand.

It became clear that the iPhone project needed to be embedded in a course, with clearly related assessment tasks, for the students to participate more fully in it (Cochrane 2009a). In particular, 2009 projects were designed to investigate the use of MySpace, student-created podcasts, and microblogging as authentic mobile learning environments within the context of music delivery, promotion and critique.

The 2009 project was explicitly linked to two courses, one within the second year of the Diploma of Contemporary Music, the other within the first year of the course with second-year students as peer mentors. Thus the integration of m-learning was staged across the two years of the course, and the use of mobile Web 2.0 tools were integrated into the course assessment.

The Diploma of Contemporary Music m-learning project developed from an initial exploration of the potential of m-learning to engage students and enhance the course to an example of successful course integration and student adoption and appropriation of m-learning. During the first iteration of the m-learning project, students and lecturers were enthusiastic and engaged by the tools, but sceptical as to the potential impact on the course and learning outcomes (Cochrane 2009a). The second iteration of the m-learning project integrated the m-learning tools into the course assessment, leading to adoption and appropriation by the students beyond personal and social use,

leveraging the learning context-bridging (Vavoula 2007b) affordances of mobile Web 2.0 for facilitating authentic (Herrington and Herrington 2007) course-related learning environments beyond the classroom. This case study also demonstrates the need for significant time for lecturer pedagogical reflection for the necessary ontological shifts (Chi and Hausmann 2003; Hameed and Shah 2009) in their pedagogical conceptions to be able to integrate m-learning authentically.

Lecturer feedback

I think we're starting to see the students working in very different ways than what we've seen before. I think it's a very gradual process for them to adapt to this way of learning and what may help it is a lot more time and experience, but it's starting to work. (Lecturer, 2009)

Institutional implications

The impact of the integration of a community of practice model facilitated by a technology steward for pedagogical and technological support for the m-learning case studies is illustrated by the following lecturer feedback:

I can't say enough about your contribution to our Year 3 New Technologies mobile learning project this year. You facilitated it seamlessly, laying the initial groundwork by up-skilling the staff – all the while imbuing your training with the social-constructivist applications of the gear. This provided an initial context for these new communication tools, with which the Screen Arts staff involved shall always associate and use them. Next, you rolled-out the mobile tools to the students – well in advance of the actual classes (your suggestion) – and provided hands-on training (for the 19 students) in a very caring manner. At the end of their online presentations, you debriefed them in such a way as to allow them to look inside and assess the substantial value they derived from the project. Your attentiveness to the entire process demonstrates to me a thorough practitioner who cares very much about innovative facilitation and student outcomes. (Lecturer, 2009)

A limitation of the participatory action research methodology of the research is the significance of the input of the researcher as the technology steward for the projects. The partnerships developed between the researcher and the participants (particularly the lecturers) have been critical in supporting and providing direction for the projects. In order to create a transferable model to other learning contexts involving different technology stewards. The role of eLearning Community Coordinator (eLCC) has been established within each department of the institution as a core part of the new e-learning strategy.

Introducing Unitec's e-learning strategy (2010)

Learning technologies or e-learning are critical components of a reconceptualised approach to teaching and learning at Unitec. The new strategy involves the utilisation of a range of learning technologies as integral parts of contemporary and engaging teaching and learning experiences. It is based on one powerful pedagogical idea – that the e-learning strategy will support Unitec's decision to reconceptualise all programmes within a commitment to a social constructivist pedagogy, or 'living curricula'.

The strategy includes the following objectives:

- (1) To create authentic learning conversations that enable graduates to succeed in the twenty-first century.
- (2) To provide accessible environments and creative solutions for students' access to online tools via WMDs.
- (3) To enhance wireless computing infrastructure.

The strategy focuses on three key areas: staff capability, student capability and access, and infrastructure changes. The community of practice model developed during the m-learning action research projects forms a core element of the new e-learning strategy. Staff capability is enhanced by the establishment of eLCCs within each department who facilitate departmental COP. The eLCCs take on the role of technology stewards within these COP as modelled within the m-learning projects. The eLCCs report to the institution's central professional development unit, of which the researcher is the e-learning team leader. The establishment of the eLCC role was launched in February 2010 with a week-long workshop facilitated by Etienne Wenger and Beverly Traynor,² modelling a COP approach to staff professional development, and authenticating the researcher's model.

As part of the e-learning strategy, student access is facilitated by the specification of appropriate student-owned WMDs and the integrated use of these for class, tutorial and study sessions. Students with genuine hardships will be provided with institutionally owned WMDs for use in their courses.

The use of WMDs within each course is led by an evaluation of the potential pedagogical benefits to each course and how the utilisation of various learning technologies will be scaffolded across the length of the course. Investment in wireless infrastructure is being made to improve coverage, capacity and connection speed, and the sequential movement of staff computers from desktops to WMDs will be undertaken.

Conclusions

Participatory action research (McLoughlin and Lee 2007; Wadsworth 1998) has proven to be a useful methodology for this research, allowing the researcher to take on the key role of the 'technology steward' (Wenger, White, and Smith 2009; Wenger et al. 2005) to guide the projects as well as receive and act upon direct participant feedback, reflections and critique, and subsequently modify the research process throughout the length of the research. The researcher has thus created an inter-related feedback loop between all of the m-learning projects across a variety of disciplines and contexts, channelling findings and reflections between each project. Significant beneficial change has been achieved for the various participants and stakeholders involved in the research, including demonstrable transformation in pedagogical strategies and pedagogical reconception from participating lecturers, increased engagement and collaboration from participating students, and strategic input into the institution's new e-learning strategy (Cochrane and Bateman 2009a, 2010a, 2010b; Cochrane et al. 2009). While requiring time-intensive input from the researcher as the technology steward, the outcomes have been very rewarding, with the development of a sense of trust and collaboration between all the participants, and between the researcher and the course lecturers in particular. The researcher's role in facilitating

these pedagogical changes is now being replicated throughout the institution with the development of the eLCC within each department.

The longitudinal exploration and implementation of a series of participatory action research m-learning projects has provided a model and momentum for transforming the professional development and student scaffolding models of the institution. The m-learning projects have also provided proof-of-concept that the pedagogical integration of WMDs into course curricula can provide a catalyst for pedagogical change towards a social constructivist pedagogy facilitating student-generated content and student-generated learning contexts beyond the classroom. The integration of the identified strategies and principles into the new e-learning strategy provides an exciting opportunity for the institution.

Notes

1. See <http://www.unitec.ac.nz>.
2. See <http://www.youtube.com/watch?v=U18BbjfK4Iw>.

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