Leveling the playing field: Exploiting technology to enhance tertiary learning

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This paper reports on an on-going case study project to explore ICT/ eLearning across several disciplines and with students from diverse backgrounds at tertiary level in New Zealand. The project has been designed to address issues of tertiary-level pedagogy, e-pedagogy, and research with the goal of building eLearning capacity, leveraging pedagogical change, and closing participatory gaps for students and lecturers. Initial design decisions, the pedagogy that has informed the case studies, and the challenges and benefits of working across subjects and levels in a multi-disciplinary team are described. We also discuss research knowledge mobilization within our own instructional context and more broadly elsewhere.

Keywords: eLearning research, blended learning, knowledge mobilization, tertiary education

Background to the research

In New Zealand the tertiary sector is experiencing a number of challenges to current teaching and learning practice through the increased diversity of the student body, changes to how universities are funded (Russell, 2007), issues relating to student retention and completion (Government of New Zealand, 2006), and student satisfaction with learning opportunities (Krause, Hartley, James, & McInnis, 2005). As a way to address some of these concerns, universities are turning to ICT and eLearning opportunities to engage and motivate students, to provide additional support for teachers, and to extend learning opportunities beyond classroom walls. The incorporation of ICT/ eLearning is always mediated by political, technological, financial, workload, and student learning implications (Selander, 2008), and universities need to understand how to close the participatory gap to ensure that technology is equitably and effectively used across disciplines (Whitworth, 2006). While insights from overseas studies can guide and inform eLearning practice within the New Zealand tertiary sector, the importance of developing deep understanding of local contexts and practices cannot be underestimated.

This eLearning project is a two-year research study, funded by the New Zealand government. Of note is that it brings together a multi-disciplinary team of researchers, practitioners, and students from different Schools across the university to investigate and enhance pedagogical practices within blended and virtual learning environments. Thus, while the physical learning "place" remains the university, the learning "spaces", both physical and virtual within which students and teachers function, are profoundly different and reflect differing needs across the cohorts. Using an activity theory framework (Jonassen & Rohrer-Murphy, 1999), the project has the overall goal of documenting, developing, and disseminating effective and innovative practice so as to leverage pedagogical change, close participatory gaps for students and lecturers, and develop a cross-university educational research culture that informs practice.

Given that the project is in its early stages, this paper discusses the three blended learning case studies from the perspectives of initial design decisions, the pedagogy that has informed the cases, and the

challenges and benefits of conducting e-research across subjects and levels in a multi-disciplinary team. We also discuss research knowledge mobilization within our context and more broadly elsewhere.

Research method and analytical framework

The project is guided by one overall guiding research question and the key goal of leveraging pedagogical change. The main research question asks "How are different lecturers/groups exploiting the potential of ICT/eLearning to support tertiary-level student learning?" During the first year case studies, student reflections about their ICT practices within education (as opposed to how they use technology for their own personal activities) are being collected through a common online survey, the design of which was informed by other relevant studies of ICT implementation (Salaway, Caruso, & Nelson, 2007). In addition, lecturer reflections are being collected through key informant interviews while selected student and tutor feedback is being collected through facilitated focus group discussions.

The main explanatory framework for the study is activity theory. Research that is grounded in activity theory focuses on the interactions of people, tasks, and mediating tools, rather than on individual behaviours, performance, or mental models. This paradigm is particularly suited to the activity of complex organizations as it can help identify and explicate multiple perspectives. The concept of 'activity' itself derives from the Vygotskian concept of socially meaningful activity (Vygotsky, 1978), which recognises that virtually all human activity is embedded within a social matrix of people and artifacts. The process of mediation, that is the use of both conceptual and physical tools within an activity, is central to an activity theory perspective. As Lantolf (2005) explains, the interactions between tools and tasks are not one-way; the tool affects how and why learning emerges, but also the learners themselves use the tool in "unexpected and creative ways in order to make sense of their own learning activity" (p. 348). Lantolf also states that because activity theory focuses on the context of human activity, it seeks to answer such questions as how, where, when, and importantly why something is done, which involves uncovering the "motives and goals of human action" (2005, p. 345).

The Year 1 case studies

Google Earth within an Earth Sciences undergraduate paper

Key goals of Earth and Ocean Science degree study are to develop students' geoscientific thinking and practical skills – specifically their ability to think spatially, develop a geoscientist's understanding of time, view the earth as a complex and inter-related system, and develop the necessary skills to conduct fieldwork. Kastens, Manduca, Cervato, Frodeman, Goodwin, Liben, Mogk, Spangler, Stillings, & Titus (2009) discuss pedagogical challenges facing geoscientist educators and state that "Two key features of geoscientists' temporal thinking distinguish them from the general population: They take a long view of time, and they expect low-frequency, high-impact events" (p. 265). At the University of Waikato, undergraduate papers in Earth and Ocean Sciences make frequent reference to landforms, particularly around New Zealand, yet, as the student population has become more diverse, an increasing number of learners have had no personal experience of the locations being studied. This lack of prior familiarity with the physical environment limits students' ability to maximize learning experiences in the field and develop their specific academic literacy competence. Artifacts, such as maps and aerial photographs have been used with first year students, but the diversity of cultural and physical abilities in classes has made it difficult to ensure that all students progress at a satisfactory rate. In addition, various multi-media computer-based methods, including GIS and virtual fieldtrips such as the Tongariro Crossing DVD, have been trialed as tools to develop students' skills, but have been of minimal success due to cost, technological requirements, and user interface complexity.

However, freeware such as Google Earth now provides an economical and simple interface with relatively low technological requirements. Accessing Google Earth on university or personal computers is very straightforward and the software itself is easy to use. Also, with the recent release of Google Streets for New Zealand, there exist a large number of web overlays for New Zealand locations that facilitate three-dimensional visualization (spatial thinking), with access to environmental data such as glacier extent and real-time wave and weather conditions. These classroom tools have the potential to facilitate new learning opportunities for a diverse range of teachers and students by supplementing physical space (the classroom, labs, and field trips) through the use of software. Moreover, Google Earth data is updated continuously so that the virtual lab-based resources are much more current than more traditional textbook or other print-based materials.

This case study is investigating the impact of a new pedagogical approach combining physical and online activities. Students attend lab sessions during which they utilize Google Earth, in conjunction with maps and aerial photos, to examine landforms and other physical objects around the University of Waikato campus and nearby locations. The lab is intended to develop sufficient skills with Google Earth to allow students to use linked KMZ files in Moodle to "visit" locations referenced in lectures and labs prior to their fieldtrip to Raglan, a West Coast ocean beach. As part of the fieldtrip activity, students will be able to compare their expectations, determined from the virtual 'pre-visit', to the physical reality of the site, but moreover, students will be able to "revisit" locations later through Google Earth. Such ability to enhance physical activities through pre-planning, to compare measurements of spaces obtained in Google Earth with the reality of outdoor places, and to review fieldwork can supplement the pedagogical richness of students' experience. Thus, this case has taken advantage of the potential of a blended learning environment to provide students with multiple and multimodal opportunities to develop and consolidate their understandings of geographical concepts.

GNU Image Manipulation Program (GIMP) within a Screen and Media undergraduate paper

Increasingly the Screen and Media Studies program at the University of Waikato expects students at second and third year levels to have generic computer literacy skills that extend beyond simple word processing. The learning of skills inherent to creative software is closely integrated into conceptual work in media studies and is required for students to complete assessments. The challenge for the department, however, is to design first-year papers that can provide a foundation in such skills, within a curriculum that must address a wide range of students' existing skills and experience with computers, and within the practical constraints of large class sizes (200-300 students) and limited availability of computer labs. In addition, proprietary software (Adobe Photoshop) was used to teach image processing concepts, but such use then restricted teaching to the physical computing labs in which it was installed.

In previous years, in order to address these constraints, tight scheduling of lab time for groups of students was required. During multiple face-to-face instructional sessions, all students worked through the same set of introductory Adobe Photoshop concepts, regardless of whether or not their image processing skills were basic or advanced. Given the range of students' computing proficiencies, some of them found the task of producing their own images overwhelmingly difficult, while others were bored by its simplicity. Also, due to lab and software constraints, there was no flexibility in the timing of assessments as teachers had to keep large groups of students 'moving' through the labs and curriculum concepts in order to cover the first-year requisite skills.

This case study involves the adaptation of the existing curriculum to one in which an OSS graphics package, the GNU Image Manipulation Program (GIMP) and Moodle are used. There are several advantages to this new blended instructional environment. One is that because GIMP and Moodle are used, the revised curriculum can be tailored to differentiate between existing skill-levels of incoming students. Resources designed for more confident or experienced computer users have been moved into the Moodle environment, and students can work through them at their own pace, during their own time. Face-to-face instructional time in the computer lab can now be focused on helping less experienced students develop requisite introductory image processing skills.

Once a student has completed an exercise, s/he uploads the image to the Moodle glossary function. Moodle rotates through the images and randomly displays them to the course community. This serves not only as a prompt to those yet to complete the assignment, but also demonstrates a variety of strategies for completing the exercise. Finally, the GIMP software tool meshes well with conceptual material at first-year level by exemplifying OSS developments within digital media. Through this new blended approach the physical instructional space can now be used to support students who need more face-to-face assistance. In addition, students are required to assume more responsibility for the management of their own learning.

Online academic literacy workshops within a pre-degree equity program

Within the University of Waikato, the Certificate of University Preparation (CUP), Huarahi Maori is a one-semester, pre-degree equity programme to assist Maori and Pacific young people who want to begin university degree study, but who lack university entrance qualifications. The predominant method of teaching in the program is face-to-face, classroom-based instruction, five days a week. Although students in the Huarahi Maori programme are familiar with the use of computers and many have their own laptops, they often struggle to acquire basic academic literacy skills such as paraphrasing, conducting research,

referencing, and structuring information into cohesive prose. Moreover, students often feel embarrassed when they do not understand key academic literacy concepts and are reluctant to display perceived inadequacies in front of peers. However, the Moodle environment includes a rich array of online tools to support student learning, particularly academic writing, and can be tailored to provide a culturally appropriate online presence for students from diverse backgrounds. Also, as a web-based environment, it can be accessed at a student's convenience and requires no specialist software other than a web-browser and access to the Internet.

Student Learning, an academic skills development unit at the University, has designed and developed a range of online workshops within Moodle to help students learn about, practice, and improve their basic academic literacy skills. The workshops were created as SCORM and the interface that we used is eXe (eLearning xhtml editor) – free software for making educational exercises. Previously learning development at the university had been provided solely through face-to-face meetings with students, however, not all students conduct their academic study between 8:30 and 5:00 when the learning tutors are (physically) available. Importantly, with widespread access to computers and the Internet, students have come to expect that support and resources will be available on-demand (Wesch, 2009). It is this combination of face-to-face interaction with students, supplemented by the online workshops, that has helped Student Learning extend its service by synchronizing physical and virtual environments. Such an approach is entirely consistent with current thinking about the role of eLearning to support academic literacies within higher education (Goodfellow, 2007).

This case study focuses on the collaborative development of introductory academic literacy skills, in particular the essay writing process, paraphrasing, and time management for Maori students through online workshops and face-to-face teaching. Online resources are being used to extend and reinforce conventional classroom-based instructional processes and through a collaborative approach, CUP and Student Learning tutors hope to enhance flexible learning pathways into degree study for Maori (NZCER, 2004, p. 7). In addition, the research will contribute to eLearning pedagogy development among CUP tutors and promote a deeper understanding among Student Learning tutors of appropriate content resources for Maori learners.

Reflections on conducting e-research and knowledge mobilization

Working with a multi-disciplinary team, whose members at the outset did not know each other well (or each other's academic fields), and with case studies focusing on different cohorts and relatively large numbers of participants (approximately 450 students this year), has been stimulating, but challenging. Although all of the researchers are experienced computer-users, the degree of up-skilling involved in preparing for teaching and in using research tools for the project itself have been non-trivial. Each researcher has had to test the software tools, adapt to their constraints, or address their development (for example, determine what is new in Google_Earth), rather than taking these aspects for granted when designing pedagogy.

More broadly at the project level, there have been two key issues; one is how to organize and manage the range and volume of data being generated by the cases, while the second is how to facilitate communication around the design, planning, and on-going research questions of the different team members and then extend this conversation to others both within and beyond our context. For the data, we wanted a central, secure, fully backed-up, and easily accessible project management tool, which we could tailor to our project needs. Our data includes student survey responses, key informant interview transcripts (oral and textual), official documents, resources for the individual case studies, and notes from regular team meetings. After discussion, we selected the university's project portal software. In addition to meeting the need for data security, it contains document management, scheduling and calendaring, and discussion tools. The user interface is relatively simple and the tool seemed to suffice until we began interviewing and collecting oral transcripts. We then discovered the portal's file upload size limit of 15MB, which is too small for most audio files, but which also could not be altered on a 'per-project' basis. The size restriction for the entire portal had to be changed and although this did occur, it pointed to a key assumption of the software – that research data is primarily text-based. Increasingly however e-research data also contains sound and video files, which require flexible and versatile project management tools. Even with an increased upload size (20MB), we struggle to create sufficiently small audio files, and central storage of video is beyond the current capacity of the portal. Moreover, the time required to solve these (relatively) minor problems has been excessive, especially considering the competing time demands on the project team.

As for the mobilization of knowledge across the team, we believe that the most effective project communication tool has been regular, face-to-face meetings – especially as a key feature of this project is its multidisciplinary focus. Of course, the team has also been supported by software such as Google Docs (for co-editing), VoIP (Skype) for interviewing, and email for day-to-day business, but the benefits of talking together in shared space cannot be under-estimated. Whitworth (2006) in his discussion of research into eLearning environments advocates a holistic and participatory approach, while acknowledging that such a method can lead to competing interpretations of research results. We believe that it is precisely this shared "conversation" that can best address such issues by developing and consolidating knowledge across team members. Moreover a "blended" research approach is entirely consistent with findings about the efficacy of blended learning in teaching (Means, Toyama, Murphy, Bakia, & Jones, 2009). It is the mix of face-to-face communication in a shared physical space, supported by various e-tools, that is particularly effective in education and, we would assert, in research. As for knowledge mobilization more generally, Levin (2004) has argued effectively for frequent, targeted, and multi-modal communication of research, involving direct and mediated means such as face-to-face, print, electronic, and formal and informal communication. This can include traditional websites, media announcements, journal articles, research networks, and conferences such as this one.

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