

EDUCATING THE NET GENERATION

A Handbook of Findings for Practice and Policy

2009

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Executive Summary

It has been widely suggested, and in some respects accepted, that a so-called Net Generation of students is passing through our universities. Born roughly between 1980 and 1994 these students have been characterised as being technologically savvy, having grown up in an age where computers, mobile phones and the Internet are part of mainstream culture and society. A number of commentators have even suggested that educators – whom they label ‘digital immigrants’ – need to radically adjust their teaching and learning strategies to accommodate their ‘digital native’ students, predominantly by adopting and capitalising on the affordances of emerging technologies.

This project explored the notion of the Net Generation in higher education to gain a better understanding of:

- students’ and teachers’ current technological experiences and preferences (in the *Investigation* stage of the project); and
- a range of issues associated with the implementation of emerging technologies in local learning and teaching contexts (in the *Implementation* stage of the project).

This Handbook represents a key project outcome and this *Executive Summary* aims to distil its key findings and elements. The six statements presented below represent the main messages that have emerged from the *Educating the Net Generation* project.

1. The rhetoric that university students are Digital Natives and university staff are Digital Immigrants is not supported.

An extensive literature review revealed comparatively few comprehensive empirical studies of the Net Generation (see studies from the *PEW Internet and American Life Project* and the *Educause Centre for Applied Research* from the United States). Studies from Australia and the UK began to emerge from 2006. Available research indicates that young people tend to be high users of established technologies, such as computers, the Internet, email and mobile phones but are less likely to use emerging technologies, including so-called ‘Web 2.0’ technologies. This research also suggests that even though young people’s access to and use of computers and some information and communications technologies is high, they don’t necessarily want or expect to use these technologies to support some activities, including learning.

The evidence from the Investigation stage of the project does not support the notion that a homogenous group of Net Generation students, broadly adept with the latest technology, are entering our universities. We found little evidence that technology usage patterns can be explained primarily on the basis of broad generational differences – dispelling the digital natives versus digital immigrants argument. While age did account for variation in two technology-based activities (*Advanced Mobile Use* and *Media Sharing*), the average difference between younger

and older people was small and the absolute level of engagement these activities was low.

Any differences in students’ technology usage patterns were more likely to be related to the university they were attending and a range of other key demographic variables including their gender, whether they were domestic or international residents, and their socio-economic status. However, technology use did not vary significantly according to subject discipline, and the magnitude of any differences between groups of students, even when significant, was generally small.

2. There is great diversity in students’ and staff experiences with technology, and their preferences for the use of technology in higher education.

Both the Investigation and the Implementation stages of our project provided striking evidence revealing the diversity of technological experiences of both students and staff. It cannot be assumed that incoming university students are broadly technologically literate, just as it cannot be assumed that university staff are broadly technologically backward.

The results of our Investigation stage – reported in Section 3 of this handbook showed students were relying on core technologies for the fairly traditional purposes of communicating and information gathering. Students reported very high use of mobile phones for calling and texting, and the Internet for accessing general information, reference information, and email. Web 2.0 technologies such as blogs and wikis were used by a small proportion of students and while there was evidence that social networking, digital file sharing and podcasting were popular among a minority of students, very few students were regularly using technologies such as social bookmarking.

Students were generally more positive than staff about how useful technologies could be in supporting university-based learning and teaching; staff were generally more sceptical and unsure about the potential value of technologies. None of the technologies included in our survey was universally accepted as being useful in learning and teaching.

There are at least two clear implications of this diversity: caution should be exercised when making assumptions about what students or staff already know or prefer in relation to technology, and a one-size-fits-all approach to the implementation of learning technologies is unlikely to succeed and should be avoided.

3. Emerging technologies afford a range of learning activities that can improve student learning processes, outcomes, and assessment practices.

The overall evaluation of students’ discipline-based understanding across the eight implementation projects was somewhat equivocal – the number of students who reported that the activity helped develop their understanding was similar to the number of those who didn’t. Students were,

however, more likely to report that the implementations helped them develop a greater understanding of how to use particular technologies in their studies. When implementations were considered individually, there were clear cases in which the use of emerging technologies positively impacted on students' learning processes and outcomes in areas such as self-reflection, peer evaluation and independent research skills.

A clear theme that emerged across all evaluations was that many students recognised or gained unexpected benefits from their exposure to the ideas and experiences of other students that were shared using Web 2.0 technologies. The use of publishing and information sharing tools, such as wikis, blogs and photo sharing sites, positively impacted on many students' engagement with the subject material, their peers and the general learning community.

Another clear finding was that the use of new and emerging technologies often provided new opportunities in assessment practice. Specifically, these technologies often provided more flexible access to and opportunities for both informal, formative self-assessment by students and informal, formative assessment by teachers. The latter, in particular, presented opportunities for 'contingent teaching' whereby staff were able to tailor their classes to better align them with the needs of students.

4. Managing and aligning pedagogical, technical and administrative issues is a necessary condition of success when using emerging technologies for learning.

The success of the implementation projects seemed to depend on how the pedagogical, technical and administrative components of the task were designed, managed and integrated. It was clear that despite the best efforts of staff, students could become disengaged or disgruntled if they felt the activity was not educationally relevant or if it was not well supported technically or administratively. Simply matching a learning design (e.g. collaborative writing) with a technology (e.g. a wiki) is unlikely to guarantee student engagement if the learning activity is not adequately supported within the course of study.

Positive staff and student experiences with learning technologies were consistently associated with learning activities that were clearly integrated within the broader curriculum and assessment. Students in particular are more likely to appreciate the value of a learning activity when its assessment criteria and its specific alignment with their learning objectives and the broader curriculum are made explicit. However, there are significant challenges associated with clearly communicating the requirements of students and their responsibilities when using new learning technologies, particularly when unfamiliar technologies and learning activities are being employed.

5. Innovation with learning technologies typically requires the development of new learning and teaching and technology-based skills, which is effortful for both students and staff.

From the Implementation stage of the project it was clear, but perhaps not surprising, that designing, developing and implementing learning activities involving new and emerging technologies can require both staff and students to develop new technological skills. What was more surprising was that some key but non-technological aspects of the learning activities (e.g. collaborative work) were *also* novel to staff and students. As a result, staff and students were required to develop new general skills, including the ability to negotiate new roles with staff members and fellow students.

Guidance and time is needed to develop these two sets of skills; both in the design and development of learning tasks that employ new and emerging technologies and also in their implementation in undergraduate studies. The development of all the learning activities trialled in this project required a team with a diverse set of skills and involved a significant amount of effort on the part of team members. This should not be underestimated by individuals or by those responsible for staff development.

6. The use of emerging technologies for learning and teaching can challenge current university policies in learning and teaching and IT.

The findings from the Investigation and Implementation stages of this project clearly show that many areas of university policy warrant review and updating so as to accommodate opportunities and challenges raised by learning and teaching with emerging technologies.

For example, many Web 2.0 technologies enable students to publicly publish and share content in forums hosted outside their university's infrastructure. This raises complex questions about academic integrity including issues of authorship, ownership, attribution and acknowledgement. Most staff were alert to potential difficulties of plagiarism in online environments, but staff and students were less clear about the conventions for attribution and acknowledgment of material published using new media, or about the rights to re-use material produced by themselves and others.

Institutional guidelines in the area of educational technology often fall into 'learning and teaching' policy and 'IT infrastructure' policy. Attention needs to be given to the revision and integration of some policy areas – the rights and responsibilities of the institution, individual staff members, students, and other interested parties – when it comes to learning and teaching with emerging technologies.

1.0 Brief Project Outline

A number of authors have argued that students who are entering the higher education system have grown up in a digital culture that has fundamentally influenced their preferences and skills in a number of key areas related to education. It has also been proposed that today's university staff are ill equipped to educate this new generation of learners – the Net Generation – whose sophisticated use of emerging technologies is incompatible with current teaching practice. This project, supported by the Australian Learning and Teaching Council, adopted a critical, evidence-based approach to investigating the 'problem' of *Educating the Net Generation*.

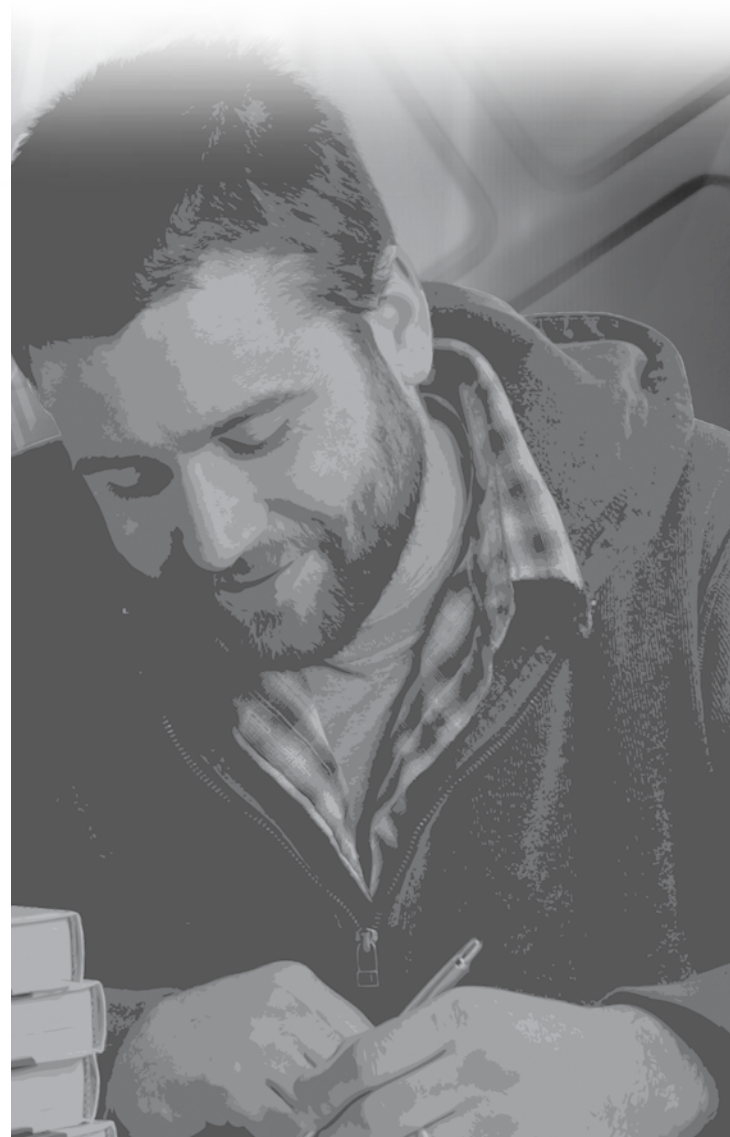
The project was a collaboration between staff at The University of Melbourne, the University of Wollongong and Charles Sturt University – institutions that in many ways represent the diversity of the Australian higher education sector. The project was conducted in three stages beginning in the second half of 2006.

The first stage – *Investigation* – involved surveying and interviewing first-year students and their teachers about the degree to which they accessed and used technology-based tools, how they were using technology to create and exchange information and knowledge, their skill levels with different technologies, and their perceptions of how technologies could be used in learning and teaching at university. Over 2600 questionnaire responses were collected and 50 hours of interviews were conducted, transcribed and analysed.

The second stage of the project – *Implementation* – was informed by the results of the investigation and the expertise of staff in local learning and teaching environments. Five technology-based learning activities were developed and implemented within eight specific learning and teaching contexts across the three partner institutions. Members of the project team worked with teaching staff in their institutions to modify aspects of existing curricula, learning activities and assessment tasks to try to harness the potential of emerging technologies. The activities included collaborative contributions to a wiki, student-generated podcasts, blogging, photo and file-sharing, and social bookmarking. Each project was evaluated during and after its implementation, incorporating input from the staff and students involved.

The lessons learnt during the first two stages of the project formed the basis of two major outcomes of the project: this *Handbook* and a complementary *Toolkit*. This *Handbook* provides a detailed description of the Investigation and Implementation stages of the project and outlines both practice and policy guidelines associated with using emerging technologies in higher education. The *Toolkit* provides a suite of resources that can be used by teachers and academic developers who are planning modifications to curriculum, assessment, learning designs and activities to incorporate student-created content using blogging, photo-sharing, podcasting, social bookmarking and wiki-writing.

These resources and others, such as academic publications and the project website (www.netgen.unimelb.edu.au), are key components in the *Dissemination* stage of the project. In addition members of the project team conducted a series of capacity-building workshops with teaching staff, academic developers, policy developers and learning technologists at universities across Australia during 2009.



2.0 Background Literature

2.1 The Net Generation in Higher Education: Technology Use and Skills

In recent years there has been widespread interest in the notion of a Net Generation of young people, who are characterised by their familiarity with and reliance upon information and communication technologies (ICTs). Born roughly between 1980 and 1994 (McCrinkle, 2006), members of the Net Generation have grown up in an era of pervasive technology use and are said to have a greater interest in and aptitude for using ICTs than previous generations (Oblinger & Oblinger, 2005b). According to several commentators, Net Generation students' familiarity with digital technologies has affected their preferences and skills in key areas related to education. For example, they are said to: prefer receiving information quickly; process information rapidly; prefer multi-tasking and non-linear access to information; have a low tolerance for lectures; prefer active rather than passive learning; rely heavily on communications technologies to access information and to conduct social and professional interactions; and expect technology to be an integral part of their education (Barnes, Marateo & Ferris, 2007; Frand, 2000; Gros, 2003; Oblinger, 2003; Oblinger & Oblinger, 2005a; Philip, 2007; Prensky, 2001a, 2001b).

Much of the debate about the educational needs of today's young people has been stimulated by Marc Prensky's (2001a, 2001b) commentaries on 'digital natives' and 'digital immigrants'. According to Prensky, current university students can be described as digital natives who have "spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age" (Prensky, 2001a, p. 1). Prensky claimed that the digital culture and environment in which these 'natives' had grown up had changed the way they think: "It is now clear that as a result of this ubiquitous environment and the sheer volume of their interaction with it, today's students think and process information fundamentally differently from their predecessors" (p. 1). Prensky made a further claim that the skills and preferences of digital native students can be contrasted markedly with those of their digital immigrant teachers, suggesting that there is a fundamental mismatch between the language and culture of today's students and their teachers. According to Prensky, the disparity between the ICT experiences of current students and the sophistication and degree to which these technologies are employed by teaching staff is the "biggest single problem facing

education today" (p. 2). However, empirical research comparing students' and lecturers' use of ICT is virtually non-existent, with the exception of the project reported here (Kennedy, Dalgarno, Bennett, Judd, Gray & Chang, 2008).

Given the potential significance of the claims made by Prensky and others, there is a clear imperative for educational researchers to take a critical stance and investigate these assumptions further. However, many of the arguments about the technological skills and educational preferences of Net Generation students have been based on conjecture and anecdotal accounts (see Bennett, Maton & Kervin, 2008). Despite intense interest in the notion of a Net Generation – it has been the subject of much commentary both in academic circles and in the broader press (e.g. Ferrari, 2007; Head, 2007; Leech, 2006; Pesce, 2007) – until recently there has been very little empirical research into the ICT skills and experiences of its membership. This is beginning to change, however, with the recent publication of large-scale surveys of students' access to and use of current technologies as well as smaller qualitative inquiries into students' expectations and preferences for technology use in higher education.

According to the published findings, young people are high users of established technologies, such as computers, the Internet, email, and mobile phones. However, most of this evidence comes from the United States, with little information available about how Australian teenagers and young adults use technologies today. The most recent data from the Australian Bureau of Statistics (2007) gives information about general household use of information technology, reporting that in 2006-2007 64% of households in Australia had Internet access and 73% had access to a computer.

In the context of higher education, Krause, Hartley, James and McInnes (2005) reported that first-year students were spending 4.2 hours per week on the web for study and research and only 3% said they never used the web for study purposes. More recently, Oliver and Goerke (2007) published findings from research that surveyed first-year students at an Australian university in both 2005 and 2007. They found that high proportions of students in both cohorts said they had access (or would have access) to the Internet outside university (over 90%); and most said they frequently used online resources for study purposes (93% and 87%). Just under half the students in each cohort owned laptops, whereas only a small percentage owned handheld computers. The vast majority of students owned mobile phones – ownership of iPods or MP3 players was also high (up from 40% in

2005 to 70% in 2007). The survey also asked whether students used instant messaging, blogs and podcasts: most used instant messaging (82%; 88%), many used blogs (21%; 30%) and some used podcasts (7%; 22%), with use of the blogs and podcasts increasing substantially between 2005 and 2007.

The use of technologies by students in the United Kingdom has been investigated through a series of studies funded by the Joint Information Systems Committee (JISC). These studies, conducted as part of the "Learner Experiences of E-Learning" project, mostly involved qualitative methods aimed at gaining an in-depth understanding of how students in different learning settings used and viewed technologies as learning tools. An online survey was also conducted in which respondents identified the following tools as those they used most frequently to support their studies: email, the Internet, computer, word processing, and instant messaging (Conole, de Laat, Dillon & Darby, 2006).

While the JISC studies focussed on technologies as learning tools, several large American surveys have provided a wealth of information about American teenagers' and college students' more general use of ICTs. This information largely derives from the PEW Internet and American Life Project (e.g. Lenhart & Madden, 2007), and annual surveys conducted by the Educause Centre for Applied Research (ECAR). The latest ECAR report (Salaway, Caruso & Nelson, 2008) was based on a survey of 27,317 students from 98 colleges and universities, as well as focus group discussions. The report notes that more than 80% of respondents own laptops and 54% own desktop computers. The ownership of Internet-capable mobile phones was said to be on the rise with 61% of respondents reporting ownership of those devices, although most respondents did not use their mobile phones to access the Internet. Both the 2008 ECAR report and a 2007 PEW report (Lenhart, Madden, MacGill, & Smith, 2007) suggest there are very high levels of use of social networking sites (e.g. *MySpace*, *Facebook*) among young people. In the case of the ECAR report, 85% of respondents said they used social networking sites, with most stating that they used them primarily to stay in touch with friends. The ECAR study also reported very high levels of a range of other technologies including: university library websites (93%), presentation software (92%), spreadsheets (86%), text messaging (84%), and course management systems (83%). Most students also reported that they were "fairly skilled" to "very skilled" in using a range of core learning technologies.

2.2 Living and Learning in the Digital Age

While the surveys outlined above show high levels of access to and use of core technologies by young people, other research findings reveal a more complex picture regarding how students feel about technologies as learning tools. The latest ECAR study (Salaway *et al*, 2008) found that a small majority of respondents preferred only a "moderate" amount of IT in their courses, which is in line with previous ECAR findings, while the 2007 report (Salaway, Caruso & Nelson, 2007) revealed a degree of hesitation and ambiguity in students' attitudes towards technology. For instance, while more than 80% of respondents said they used instant messaging and social networking, they said they did not want to use these tools in educational contexts. Students said they preferred that "IM and social networking remain within the scope of their private lives". Furthermore, in educational settings students did not want "technology to eclipse valuable face-to-face interaction with instructors" (Salaway *et al*, 2007, p. 13).

The JISC project examining British high school students' use of and attitudes towards new technologies, and their expectations about technology use at university, produced similar findings (Ipsos MORI, 2007). The project report highlighted that students did not like using technology for technology's sake: they wanted to see clear educational or social value in using it. The students involved in this project also seemed to conceptualise learning and teaching as a didactic process, and their understanding of education had an impact on how they viewed information technologies in a learning context: "it seems that our audience of young people automatically think of ICT improving their learning through giving them more access to data and research resources, rather than imagining totally new methods of teaching, learning, or interacting with peers and lecturers" (p. 25). Similarly, a small ethnographic study by Lohnes and Kinzer (2007), found that the students observed seemed to hold a fairly traditional view of teaching and learning, believing it to be something that goes on inside the classroom, where the "professor's expertise" is the primary source of learning. While all of the students reported using particular technologies in dorm settings, they were often resistant to their use in the classroom. One student used a laptop in class and other students saw this as antisocial – "a barrier to creating and maintaining the classroom community" (p. 3). The student who used the laptop appeared to hold views that more closely aligned with common assumptions about the Net Generation. The authors suggested that their findings "question the notion that

being part of the Net Gen means that college students seek to integrate technology into all aspects of their college experience" (p. 4).

In summary, the findings from the published empirical research into Net Generation or digital native students show that, while their access to and use of computers and some ICTs may be high, this does not necessarily mean they want to use these technologies constantly and in all the contexts of their lives. It appears, therefore, that there could well be a mismatch between what Net Generation commentators and university staff expect from students – in terms of their digital literacy and preferences for technology use – and students' own capabilities and preferences. Problems may therefore arise if new technologies are introduced in higher education without adequate guidance for students, not only in using the technology, but also with regards to how innovative technological tools could facilitate new forms of learning (Bruns & Humphreys, 2007). Such considerations are particularly relevant given the current interest in the potential use of Web 2.0 technologies in higher education and the assumption that current university students are already tech-savvy Web 2.0 producer/users (Bruns, 2007). The following section discusses the concept of Web 2.0 technologies further and provides a brief review of examples of Web 2.0 technologies that have been used in higher education.

2.3 Using Emerging Technologies in Higher Education

Many emerging Internet technologies can be broadly grouped together under the label 'Web 2.0', an umbrella term used to describe web-based applications, including social software tools, such as blogs, social networks, social bookmarking, podcasts, and wikis (Bryant, 2007). What links many of these tools and defines them as social software, is the central role users play in *creating*, rather than simply *consuming* the content that they contain. Furthermore, socially focussed Web 2.0 tools typically facilitate the development of social networks, or communities of users.

Given these characteristics, many have argued that Web 2.0 technologies have great potential as learning tools generally, and particularly for the Net Generation (Duffy & Bruns, 2006; Alexander, 2006; Bryant, 2006; Evans & Larri, 2006; Richardson, 2006; Sandars & Schroter, 2007). However, as with the commentaries about Net Generation students, it is important that debates about the potential value of new technologies in higher education are grounded in empirical research

that shed light on how such tools can be best used to support learning.

Some Web 2.0 technologies, such as blogs, wikis and podcasts, have already been widely used in higher education contexts. Blogging refers to the practice of publishing reflections, articles, and information in chronological order on a web site, where others can read and respond to this information (Duffy & Bruns, 2006). Blogging appears to offer great potential as a reflective learning tool that can promote peer knowledge-sharing. Blogging activities have been trialled in a number of settings where reflective journals could be valuable learning tools, such as in teacher education (e.g. Stiler & Philleo, 2003; West, Wright, Gabbitas, & Graham, 2006), professional development (Instone, 2005), and business and cultural studies (Williams & Jacobs, 2004; Farmer, Yue & Brooks, 2008). However, these evaluations of blogging in education show that implementations of blogging as a learning activity have had varying degrees of success. A common observation has been that students need more guidance on how to make use of blogging as an educational activity in the particular learning contexts in which it is introduced (e.g. Farmer *et al*, 2008; Instone, 2005; West *et al*, 2006).

Like blogs, wikis are beginning to be used more extensively in higher education, again with varying degrees of success (Bower, Woo, Roberts, & Watters 2006; Bruns & Humphreys, 2005, 2007). Wikis are websites that can be edited by multiple users. They can be used as collaborative writing tools and have the potential to facilitate "collaborative knowledge building amongst learners" (Lee, 2005, p. 18). Wikis have been used to support weekly discussion activities (Bower *et al.*, 2006), semester-long group projects (Bower *et al.*, 2006), the development and publication of student essays (Forte & Bruckman, 2006), the development of a class annotated bibliography (Bruns & Humphreys, 2005), and as a way of encouraging informal student interaction on an online course (Augar, Raitman & Zhou, 2004).

While there are numerous examples of the use of wikis in education, and much discussion about their potential as educational tools (e.g. Richardson, 2006), only a small proportion of these include empirical evaluations and these tend to show mixed findings. Bower *et al* (2006) reported a discrepancy between students' and staff perceptions of wikis, with staff more positive than students, particularly with respect to the use of wikis to support group work. In an evaluation of a wiki as an essay writing and publication tool, Forte and Bruckman (2006) reported more positive results, suggesting that the use of the wiki

improved students' writing, with students responding constructively to peer feedback. Other reports on the use of wikis in higher education have primarily relied on anecdotal evidence, rather than formal evaluations, to ascertain the lessons learned from the use of wikis as learning tools (e.g. Bruns & Humphreys, 2005, 2007).

Podcasting has similarly been the subject of many implementations in higher education. While the use of audio and video as instructional media has been widespread for some time, the terms podcasting and vodcasting refer specifically to the distribution of audio or video over the Internet via syndication feeds that users intentionally subscribe to. Many websites routinely offer users audio files (e.g. MP3s) as direct downloads or via streaming but in the absence of syndication feeds (typically in RSS or ATOM format) these are not podcasts. Unlike direct downloads or streaming audio or video, podcast files are automatically downloaded to the users' computer as they become available. Once downloaded, they can then be accessed on the user's computer or transferred to a mobile device (e.g. iPods, MP3 players) for later playback. Podcasting in higher education has typically been used to distribute lectures and other learning content (e.g., Gosper, Green, McNeill, Phillips, Preston, & Woo 2008; Kurtz, Fenwick, & Ellsworth, 2007; Lane, 2006; Malan, 2007). However, there have also been examples of more innovative uses of podcasting such as the creation of audio recordings by students for course assignments, a use that is more closely aligned with the description of Web 2.0 users as "producers" (Chan, Lee & McLoughlin, 2006; Frydenberg, 2006).

Evaluations of student-generated podcasting activities suggest these have been well-received by students. The studies by Chan *et al* (2006) and Frydenberg (2006) both reported that students valued the experience they gained from creating podcasts; furthermore Chan *et al* (2006) reported that students who listened to the podcasts found them to be educational and useful. Certainly, there appear to be benefits to students in being able to listen to and review recorded lectures. McKenzie (2008) reported findings from a survey of students' beliefs about the educational value of recorded lectures, suggesting that students felt audio-recorded lectures were as effective as face-to-face lectures at meeting learning objectives. Similarly, Gosper and colleagues reported that most students have responded positively to the introduction of web-based recordings of lectures in an Australian university, although staff responses were less positive (Gosper *et al.*, 2008; Phillips, Gosper, McNeill, Woo, Preston, & Green, 2007). However, other evaluations of the use of lecture podcasts have returned mixed findings.

For example, students interviewed by Kurtz *et al* (2007) were openly hostile about podcasts, possibly because in their study podcasts were used to replace face-to-face lectures in order to make class time available for group project work. A common finding reported across many published evaluations of podcast lectures is that students listened to podcasts on their computers, rather than portable MP3 players, questioning the assumption that one of the key advantages of podcasting for students is in providing the opportunity for "mobile ubiquitous learning" (Lee & Chan, 2006, p. 95).

Various commentators have highlighted the potential for other Web 2.0 technologies, such as social networking, social bookmarking, and digital file sharing web sites (e.g., Flickr) to be used as learning tools (Bryant, 2006; Kamel Boulos & Wheeler, 2007) but few empirical studies have been conducted evaluating their use in higher education.

2.4 Emerging Technologies and the Net Generation in Higher Education

Given the affordances of Web 2.0 technologies, some commentators have argued that members of the Net Generation are – or should be – quintessential Web 2.0 technology users. The notion that by using Web 2.0 technologies students become producers and not just consumers of information, accords with perspectives of the Net Generation such as those articulated by Lorenzo *et al* (2006):

Constantly connected to information and each other, students don't just consume information. They create – and re-create – it. With a do-it-yourself, open source approach to material, students often take existing material, add their own touches, and republish it. Bypassing traditional authority channels, self-publishing – in print, image, video, or audio – is common. (p. 2).

As mentioned above, while there is certainly evidence that some Web 2.0 tools – such as social networking sites – have become increasingly popular among young people in recent years, the research reviewed above suggests that other tools – such as blogs and podcasts – are not as widely used as assumed. As Bruns and Humphreys (2007) have argued, it cannot be assumed that all students come to higher education already possessing the skills necessary to make effective use of Web 2.0 technologies as learning tools.

2.5 Summary and Project Aims

Given this background, this project sought to further understand the characteristics of the so-called Net Generation of students entering Australian universities. The project team took a critical approach to this issue – moving beyond opinion, rhetoric and anecdote – and sought to contribute to the emerging evidence-base in this area.

The project sought to investigate the technological experiences of Australian first-year university students and examine the proposed technological literacy gap between these students and the staff who teach them. Data were also collected from both students and staff on how useful an array of technologies was perceived to be in university teaching and learning.

Then, using the results of these investigations as a backdrop, the project team considered how emerging Web 2.0 technologies could be effectively employed in learning and teaching contexts in Higher Education. With local support, the members of the project team designed and then implemented a range of technology-based learning activities and collected detailed information about these implementations. Using this approach the project sought to identify the implications educating the Net Generation has for learning and teaching in Australian universities.

This section of the handbook was prepared by Jenny Waycott and Gregor Kennedy

References

- Alexander, B. (2006). Web 2.0: A new wave of innovation for teaching and learning? *Educause Review*, 2006(March /April), 33-44.
- Augar, N., Raitman, R., & Zhou, W. (2004). Teaching and learning online with wikis. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds.), *Beyond the Comfort Zone: Proceedings of the 21st ASCILITE Conference* (pp. 95-104). Perth, Australia. Available from: <http://www.ascilite.org.au/conferences/perth04/procs/pdf/augar.pdf>
- Australian Bureau of Statistics. (2007). Household Use of Information Technology, Australia, 2006-07 Retrieved 8th December, 2008, from <http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyCatalogue/ACC2D18CC958BC7BCA2568A9001393AE?OpenDocument>
- Barnes, K., Marateo, R. C., & Ferris, S. P. (2007). Teaching and learning with the net generation. *Innovate*, 3(4).
- Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology*, 39(5), 775-786.
- Bower, M., Woo, K., Roberts, M., & Watters, P. (2006). *Wiki pedagogy - A tale of two wikis*. Paper presented at the International Conference on Information Technology Based Higher Education and Training (ITHET).
- Bruns, A. (2007). Prodsusage: Towards a broader framework for user-led content creation. In B. Shneiderman (Ed.), *Proceedings of the 6th ACM SIGCHI Conference on Creativity & cognition C&C '07* (pp. 99-105). New York: ACM Press.
- Bruns, A., & Humphreys, S. (2005). Wikis in teaching and assessment: The M/Cyclopedia project. In D. Riehle (Ed.), *Proceedings of the 2005 International Symposium on Wikis* (pp. 25-31). New York: ACM Press.
- Bruns, A., & Humphreys, S. (2007). *Building collaborative capacities in learners: The M/cyclopedia project revisited*. Paper presented at the Wiki Symposium 2007.
- Bryant, L. (2007). Emerging trends in social software for education. In *Emerging Technologies for Learning: Volume 2* (pp. 9-18). Coventry, UK: Becta. Available from http://emergingtechnologies.becta.org.uk/index.php?section=etr&catcode=ETRE_0001&rid=14167
- Bryant, T. (2006). Social software in academia. *Educause Quarterly* (2), 61-64.
- Chan, A., Lee, M. J. W., & McLoughlin, C. (2006). Everyone's learning with podcasting: A Charles Sturt University experience. In *Proceedings of the 23rd annual ascilite conference: Who's learning? Whose technology?* The University of Sydney. Available from http://www.ascilite.org.au/conferences/sydney06/proceeding/pdf_papers/p171.pdf
- Conole, G., de Laat, M., Dillon, T., & Darby, J. (2006). *JISC LXP: Student experiences of technologies: Final Report*: Joint Information Systems Committee. Available from <http://www.jisc.ac.uk/>
- Duffy, P., & Bruns, A. (2006). The use of blogs, wikis and RSS in education: A conversation of possibilities. In *Proceedings of the Online Learning and Teaching Conference 2006* (pp. 31-38). Brisbane, Australia.

- Evans, V., & Larri, L. J. (2006). *Networks, Connections and Community: Learning with Social Software*. Canberra: Australian Flexible Learning Framework.
- Farmer, B., Yue, A., & Brooks, C. (2008). Using blogging for higher order learning in large cohort university teaching: A case study. *Australasian Journal of Educational Technology*, 24(2), 123-136.
- Ferrari, J. (2007, November). Go digital or lose out, teachers told. *The Australian*, p. 9.
- Forte, A., & Bruckman, A. (2006). From Wikipedia to the classroom: Exploring online publication and learning. In S. Barab, K. Hay & D. Hickey (Eds.), *Proceedings of the 7th International Conference on Learning Sciences* (pp. 182-188). Bloomington, Indiana: Indiana University.
- Frاند, J. L. (2000). The Information-Age mindset: Changes in students and implications for higher education. *Educause Review*, 15-24.
- Frydenberg, M. (2006). Principles and pedagogy: The two P's of podcasting in the information technology classroom. In *The Proceedings of ISECON 2006* (Vol. 23). Dallas.
- Gosper, M., Green, D., McNeill, M., Phillips, R., Preston, G., & Woo, K. (2008). *The Impact of Web-Based Lecture Technologies on Current and Future Practices in Learning and Teaching*: Australian Learning and Teaching Council. Available from <http://www.altc.edu.au/carrick/go/home/pid/347>
- Gros, B. (2003). The impact of digital games in education. *First Monday*, 8(7).
- Head, B. (2007, August). The D Generation: Leading the emerging generation of digital natives calls for a light touch. *AFR Boss*, 26-30.
- Instone, L. (2005). Conversations beyond the classroom: Blogging in a professional development course. In *ASCILITE 2005: Balance, Fidelity, Mobility: maintaining the momentum?* (pp. 305-308). Available from http://www.ascilite.org.au/conferences/brisbane05/blogs/proceedings/34_Instone.pdf
- Ipsos MORI. (2007). *Student Expectations Study: Key findings from online research and discussion evenings held in June 2007 for the Joint Information Systems Committee*: JISC. Available from <http://www.jisc.ac.uk/>
- Kamel Boulos, M. N., & Wheeler, S. (2007). The emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education 1. *Health Information and Libraries Journal*, 24(1), 2-23.
- Kennedy, G., Dalgarno, B., Bennett, S., Judd, T., Gray, K., & Chang, R. (2008). Immigrants and Natives: Investigating differences between staff and students' use of technology. In *Hello! Where are you in the landscape of educational technology? Proceedings ascilite Melbourne 2008*. Available from <http://www.ascilite.org.au/conferences/melbourne08/procs/kennedy.pdf>
- Krause, K., Hartley, R., James, R., & McInnes, C. (2005). *The first year experience in Australian universities: Findings from a decade of national studies*. Canberra, Australia: Department of Education, Science and Training.
- Kurtz, B. L., Fenwick, J. B. J., & Ellsworth, C. C. (2007, March 23-24). Using podcasts and tablet PCs in computer science. Paper presented at the ACM South East Regional Conference (ACMSE 2007), Winston Salem, NC, USA.
- Lane, C. (2006). *UW Podcasting: Evaluation of Year One*. Washington: Catalyst Office of Learning Technologies.
- Lee, M. J. W. (2005). New tools for online collaboration: Blogs, wikis, RSS and podcasting. *Training and Development in Australia*, 32(5), 17-20.
- Lee, M. J. W., & Chan, A. (2006). Exploring the potential of podcasting to deliver mobile ubiquitous learning in higher education. *Journal of Computing in Higher Education*, 118(1), 94-115.
- Leech, R. (2006, March). *Teaching the digital natives. Teacher: The National Education Magazine*, 2006, 6-9.
- Lenhart, A., & Madden, M. (2007). *Teens, Privacy & Online Social Networks: How teens manage their online identities and personal information in the age of MySpace*. Washington: Pew Internet & American Life Project.
- Lenhart, A., Madden, M., MacGill, A. R., & Smith, A. (2007). *Teens and Social Media: The use of social media gains a greater foothold in teen life as they embrace the conversational nature of interactive online media*. Washington: Pew Internet & American Life Project.
- Lohnes, S., & Kinzer, C. (2007). Questioning assumptions about students' expectations for technology in college classrooms. *Innovate*, 3(5), <http://www.innovateonline.info/index.php?view=article&id=431>.

- Lorenzo, G., Oblinger, D. G., & Dziuban, C. (2006). *How Choice, Co-Creation, and Culture Are Changing What It Means to Be Net Savvy* (No. ELI Paper 4): Educause.
- Malan, D. J. (2007). *Podcasting Computer Science E-1*. Paper presented at the SIGCSE March 7-10, Covington, Kentucky, USA.
- McCrinkle, M. (2006). *New Generations at Work: Attracting, Recruiting, Retraining & Training Generation Y*. McCrinkle Research.
- McKenzie, W. (2008). Where are audio recordings of lectures in the new educational technology landscape? In *Hello! Where are you in the landscape of educational technology? Proceedings ascilite Melbourne 2008*.
- Oblinger, D. G. (2003). Boomers Gen-Xers Millennials: Understanding the New Students. *Educause*, 38 (July/August).
- Oblinger, D. G., & Oblinger, J. L. (2005a). Is it age or IT: First steps toward understanding the Net Generation. In D. G. Oblinger & J. L. Oblinger (Eds.), *Educating the Net Generation* (pp. 2.1-2.20): EDUCAUSE. Available from www.educause.edu/educatingthenetgen/
- Oblinger, D. G., & Oblinger, J. L. (Eds.). (2005b). *Educating the Net Generation*: EDUCAUSE. Available from www.educause.edu/educatingthenetgen/
- Oliver, B., & Goerke, V. (2007). Australian undergraduates' use and ownership of emerging technologies: Implications and opportunities for creating engaging learning experiences for the Net Generation. *Australasian Journal of Educational Technology*, 23(2), 171-186.
- Pesce, M. (2007, December 2). Brace for a steep re-learning curve. *The Age*.
- Philip, D. (2007). The knowledge building paradigm: A model of learning for Net Generation students. *Innovate*, 3(5).
- Phillips, R., Gosper, M., McNeill, M., Woo, K., Preston, G., & Green, D. (2007). Staff and student perspectives on web based lecture technologies: Insights into the great divide. In *ICT: Providing choices for learners and learning. Proceedings ascilite Singapore 2007* (pp. 854-864). Available from <http://www.ascilite.org.au/conferences/singapore07/procs/phillips.pdf>
- Prensky, M. (2001a). Digital Natives, Digital Immigrants. *On the Horizon*, 9(5).
- Prensky, M. (2001b). Digital Natives, Digital Immigrants, Part II: Do they really think differently? *On the Horizon*, 9(6).
- Richardson, W. (2006). *Blogs, Wikis, Podcasts, and Other Powerful Web Tools for Classrooms*. Thousand Oaks, California: Corwin Press.
- Salaway, G., Caruso, J. B., & Nelson, M. R. (2007). *The ECAR Study of Undergraduate Students and Information Technology, 2007*. Boulder, Colorado: Educause Center for Applied Research. Available from <http://www.educause.edu/ecar>
- Salaway, G., Caruso, J. B., & Nelson, M. R. (2008). *The ECAR Study of Undergraduate Students and Information Technology 2008*. Boulder, Colorado: Educause Center for Applied Research. Available from <http://www.educause.edu/ecar>
- Sandars, J., & Schroter, S. (2007). Web 2.0 technologies for undergraduate and postgraduate medical education: an online survey. *Postgraduate Medical Journal*, 83, 759-762.
- Stiler, G. M., & Philleo, T. (2003). Blogging and blogspots: An alternative format for encouraging reflective practice among preservice teachers. *Education*, 123(4), 789-797.
- West, R. E., Wright, G., Gabbitas, B., & Graham, C. R. (2006). Reflections from the introduction of Blogs and RSS Feeds into a preservice instructional technology course. *TechTrends*, 50(4), 54-60.
- Williams, J. B., & Jacobs, J. (2004). Exploring the use of blogs as learning spaces in the higher education sector. *Australasian Journal of Educational Technology*, 20(2), 232-247.



3.0 Investigating the Net Generation

3.1 Rationale and Method

This project focussed on use of new and emerging technology-based tools in three areas: communication, publishing and file sharing. Traditional digital communications technologies (mobile phones and email) have recently been supplemented by other web- and phone-based communications tools, including instant messaging (e.g. *Messenger*) and Web 2.0 technologies such as social networking and blogs (Alexander, 2006; Bryant, 2007). Accordingly, in addition to the more entrenched technologies this project focussed on emerging technology-based tools such as: web-based communications tools including instant messaging and social networking; text-based mobile phone communication; online publishing using blogs and wikis; digital file sharing using the web and mobile phones; the use of the web to access published material particularly via syndicated feeds (e.g. RSS) and the use of MP3 players for audio playback and podcasting.

The project was conducted in three stages: *Investigation*, *Implementation* and *Dissemination*. The Investigation stage documented how first-year Australian university students, and university staff, routinely use established and emerging technologies, both in their day-to-day activities and to support students' learning. This stage comprised two phases of data collection. In the initial phase, a questionnaire was circulated to first-year students in a range of disciplines across the three participating institutions. This questionnaire asked students about the degree to which they accessed and used technology-based tools, how they used technology to create and exchange information and knowledge, their perceived skill with these technologies, and their perceptions of how useful technologies were or how the use of technologies could be improved in their studies. A questionnaire asking broadly similar questions was circulated to teachers in the students' discipline areas. This asked teachers about their experience and skills with a range of technologies and technology-based tools and how they currently use technology to support student learning. The student and staff survey data were collected in the second half of 2006.¹

¹ Copies of the questionnaires used are available from www.netgen.unimelb.edu.au

In the second phase of the Implementation stage a series of interviews and focus group sessions were conducted with students to better understand their use of the most popular technologies. The focus group sessions enabled us to gather more detailed information about how students used specific technologies for particular purposes, what they like about popular technologies, and to explore ways in which they thought these technologies could be harnessed for educational purposes. A second series of focus group sessions were conducted with teaching staff and educational designers. Again, these focus group sessions asked how staff use popular technologies both in their everyday lives and to support their teaching activities. The staff focus group sessions also identified facilitators and barriers to the use of emerging technologies and technology-based tools in local learning contexts.

3.2 Demographic Data

3.2.1 Staff and student survey data

Table 3.1 gives the percentage of students and staff from each of the three universities that made up the sample.

University	Students (n= 2588)	Staff (n=108)
University of Melbourne	45.4 %	24.1 %
University of Wollongong	27.5 %	14.8 %
Charles Sturt University	27.0 %	61.1 %

Table 3.1: Percentage of students and staff from each university in the sample.

Overall, there were more female respondents than male (Females: 68.9%; Males: 31.0%) although for the staff sample slightly more males than females responded (Males 53.3%; Females 46.7%). Table 3.2 shows the age ranges of the student and staff samples. The vast majority of student respondents (84.4%) were nominal members of the Net Generation, being 25 years of age or younger, while only a small number of staff (7.5%) could be put in this group (see McCrindle, 2006; Oblinger & Oblinger, 2005).

Age	Students (n= 2588)	Staff (n=108)
25 years or younger	84.4%	7.5%
26-34	9.1%	21.7%
35 years or older	6.5%	70.8%

Table 3.2: Age distribution of students and staff in the sample.

A key aspect of the Investigation stage was to consider how the students' experiences with technology may differ as a function of the discipline in which they were studying. Students were asked to nominate the course and subject in which they were responding to the questionnaire and these were used to classify students into the discipline categories of *Arts*, *Science*, *Professions*, and *Mixed* categories (based on the Australian Standard Classification of Education Codes (see Trewin, 2001)). The percentage of students in each of these categories is reported below (Table 3.3).

Discipline	Students (N =2588)
Arts	23.2%
Science	24.7%
Professions	37.2%
Mixed	13.0%
Missing	1.9%

Table 3.3: Proportion of students by discipline in the sample.

Other demographic data for the student sample that may be of particular interest are presented in Table 3.4.

Demographic Characteristic	Proportion of Student Sample
Part-time students	3.9%
Students studying in distance mode	9.5%
Students from non-English speaking backgrounds	21.5%
International students ²	12.6%
Aboriginal or Torres Strait Islander students	1.0%
Students with a disability	2.1%
Students living in a 'Major City' ³	67.7%
Students living in an Outer Regional or Remote area ³	6.5%
Students who were of 'Low' socio-economic status ⁴	34.0%

Table 3.4: Indicative demographic characteristics of the student sample.

² On-campus students from other nationalities visiting Australia on a student visa.

³ Remoteness index was based on national postcode (Australian Bureau of Statistics, 2006).

⁴ Socio-economic status was determined by the postcode of local students' permanent home address.

3.2.2 Staff and student interview data

In total 46 first-year students took part in the interviews or focus group sessions. Twelve student interviews and six focus group sessions were conducted, involving 11 students from the University of Melbourne, 19 students from the University of Wollongong, and 16 students from Charles Sturt University. Students were asked about the technologies they used in their everyday lives, the technologies they used to support their studies, and the technologies they would like to be able to use to support their studies.

A total of 31 staff were interviewed or participated in focus group sessions across the three universities. Participants included nine lecturers/tutors at the University of Melbourne, eleven lecturers and two educational designers at CSU, and six lecturers, and three educational designers at the University of Wollongong. Staff were asked about the technologies they used in their everyday lives, about how they design and teach their subjects, how they currently use technology to support their teaching, what technologies have been successful and unsuccessful, what technologies might be useful in the future, and what they saw as barriers and facilitators to the adoption of technology for teaching and learning.

3.3 Descriptive Findings

3.3.1 Students' access to hardware

Students were asked to indicate their level of access to types of technology, not including their access on campus. Figure 3.1 shows almost ubiquitous student access to mobile phones and high access to desktop computers, memory sticks, digital cameras and camera phones. Only nine students reported having no access to a computer (desktop or laptop) and while access to MP3 players is high, over one fifth of students (21.6%) reported having no access to an MP3 player.

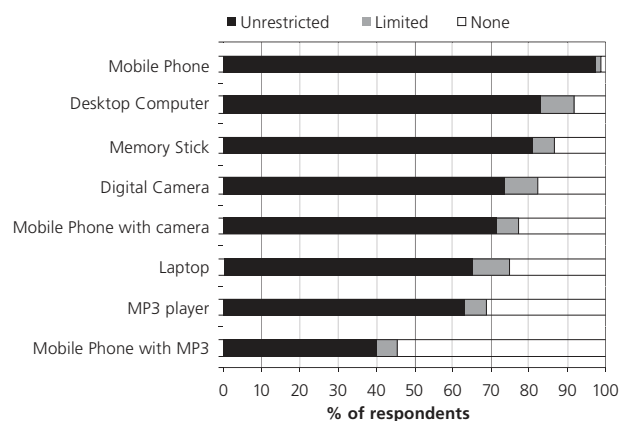


Figure 3.1: Students' access to hardware.

3.3.2 Students' access to the Internet

Separate to campus access, the vast majority of students said they had unlimited access to broadband internet connections (76.0%). Of the 24% who didn't have unlimited access to broadband, approximately half rely solely on dial up internet access (12.5%).

"At home I don't have the Internet; because dial-up's way too slow, we don't have broadband in the area."
(Chemistry student)

A small but significant number of students in the sample reported no access to the Internet at all (4.2%).

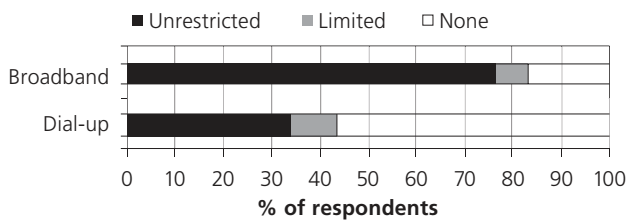


Figure 3.2: Students' access to the Internet.

3.3.3 Students' use of mobiles

Students showed a high reliance on mobile phones for texting and making calls, with the vast majority of them doing this on a daily or weekly basis. Among a subset of students, there was clearly a culture of regularly taking and sending pictures using mobile phones. The more advanced features of mobile phones – features associated with accessing the Internet for web services or checking email – were being used by only a few students.

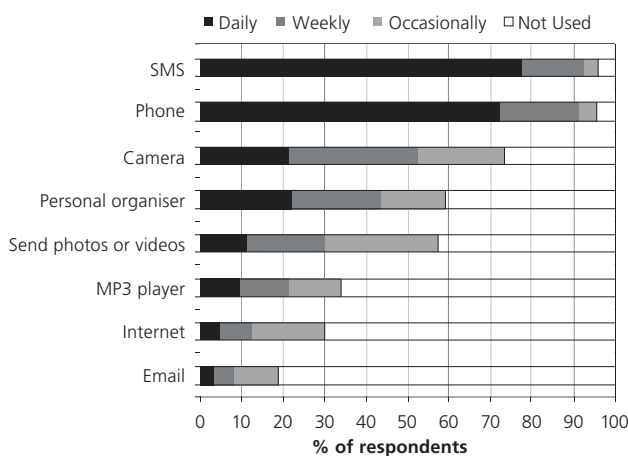


Figure 3.3: The frequency with which students use mobile phone-based technologies.

The focus group findings supported these results. Several interviewees spoke about using the basic features of their mobile phones to maintain communication with family and friends. For example, one student said she used her mobile phone for:

"Mainly texting ... It's mainly for basic correspondence, like, to tell when I'm getting home or when we're meeting up, so basic things." (Psychology student)

3.3.4 Students' traditional use of the web

The majority of students were regularly using the Internet – daily or weekly – for looking up general information or information related to their study, email and instant messaging and other pastimes. The use of the Internet to access services (such as banking) and for buying and selling was less common, although a majority of students still reported doing this occasionally (at least once every few months).

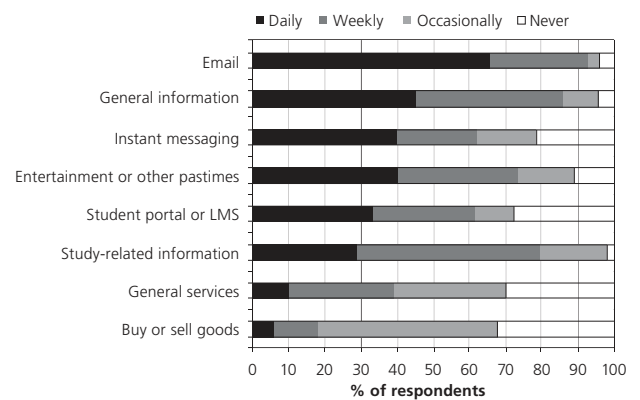


Figure 3.4: The frequency with which students use traditional web-based technologies.

"Well I do this other thing, I check up on it every now and then. It's like this website where people post sewing projects that they've done because I'm fairly heavily in to sewing." (Psychology student)

"My sister's overseas so I use it to talk to her as well and family – I'm from the country, so family back home."
(Education student)

3.3.5 Students' use of Web 2.0 technologies

Most students were very infrequent users of emerging technologies, such as Web 2.0 tools (see Figure 3.5). For example more than 80% of students surveyed had never produced a podcast and had never contributed to a wiki. More than 70% had never kept their own blog. More than 50% had never used a social networking site, read someone else's blog or downloaded a podcast.

Nevertheless there was a small but significant minority of students who were very frequent users of Web 2.0 technologies. For example, 16% of students indicated that they used social networking software once per day or several times per day, and nearly 18% of students said they commented on blogs at least once per week. Similarly, 15% of students said they produced and contributed to their own blog on a daily or weekly basis.

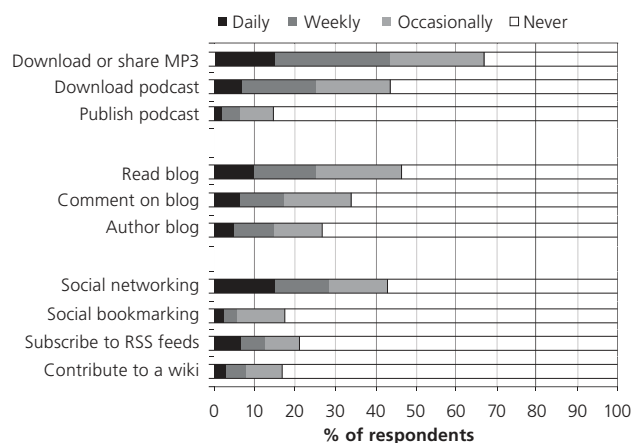


Figure 3.5: The frequency with which students use emerging web-based technologies.

In the focus groups, there were some students who had not heard of Web 2.0 technologies such as podcasting and blogs; for example: "What's a blog? I don't know what it is." (Chemistry student).

It is important to reiterate that the survey was carried out in the second half of 2006, and it could be expected that usage of some of the technologies in these categories would have increased in the ensuing years. For example, the social networking site *Facebook* clearly boomed during 2007 (McCarthy, 2008). These data can be seen in contrast with some more recent studies that have been carried out in Australia, the US and the UK (Salaway, Caruso & Nelson, 2008; Ipsos MORI, 2007; Oliver & Goerke, 2007). Oliver and Goerke (2007) found noticeable increases in the percentage of Australian university students using blogs and podcasts between 2005 and 2007. The most recent study from the Educause Centre for Applied Research showed that 85% of students in the United States were using social networking sites, over one-third were contributing content to blogs and wikis, and almost half were contributing content to photo or video websites, such as *Flickr* and *YouTube* (Salaway et al, 2008). A UK study has shown that 65% of the teenagers sampled were using social networking sites regularly, and a further 23% used them sometimes, while 62% said they regularly or sometimes used "wikis, blogs or online networks" (Ipsos MORI, 2007, p. 10). The study report did not clarify, however, the proportion of respondents

participating in each of these activities, nor whether they were contributing to, authoring, or simply reading blogs and wikis. Even taking the timing of our survey into account and the potential for cross-cultural differences, there remains strong evidence of low usage of emerging technologies.

3.3.6 Students' skills with technology

The skills items showed that students reported being very skilled at using the Internet for email and instant messaging, for fun and for finding information, while they reported not being skilled at social bookmarking and producing podcasts (but few students were engaging in these activities). When it came to mobile phones students reported being very skilled at using them to call, text, take photos and as a personal organizer.

The clear trend in the data across all items was that students who reported using a particular technology generally also reported a medium to high level of skill with it. This is reflected in the mean correlation between frequency of technology use and skill with technology (.44). Or to put it another way, few students reported using their chosen technologies in unskilled ways. Typically less than 10% of the sample reported unskilled use (and, of course, this figure would be lower if it were calculated as a proportion of students who actually used the technology).

The clear exception was in the area of producing and editing new media. For activities like manipulating digital photos or images, creating media-rich presentations (e.g. *PowerPoint*) and for creating and editing audio and visual material, between 15 and 25% of students reported being 'not very skilled'. This is despite the majority of students reporting using these technologies and tools. One interviewee spoke about his lack of skills in using *PowerPoint*, reporting that he chose to use overhead transparencies for a presentation because he was unable to learn to use *PowerPoint* in time:

"I remember earlier this session I had to give a presentation for history and I thought it would be real good if I could do PowerPoint but I've never done it and I didn't have that much time to learn it all so I just did the overheads and that was fine." (Sociology student)

3.4 Use of Technology Comparisons

In order to more easily make comparisons between groups (e.g. staff and students, universities, male and female) a number of the technologies considered in the investigation were combined into five meaningful categories of technology-based activities as shown in Table 3.5.⁵

Activity	Defined by ...
Advanced Mobile Use	Using a mobile phone as a personal organiser, to take and send pictures or movies, listen to MP3s, make video calls, access the Internet, or to send or receive email,
Media Sharing	Downloading or sharing MP3 files or podcasts, publishing podcasts, sharing photos or digital files on the Internet, using social bookmarking.
Web 2.0 Publishing	Creating or commenting on blogs or vlogs, contributing to a wiki, and using social networking software.
Creating and Using Media	Using a computer to create, manage or manipulate digital images, for creating presentations and for creating or editing audio and video files.
Traditional Web Use	Using the Internet to look up reference information for study purposes, to browse for general information, to send or receive email, and for other pastimes.

Table 3.5. Definitions of categories of technology-based activities.

These categories were then used to make a number of comparisons between groups. Where appropriate we have chosen to also alert the reader to any additional noteworthy differences that occurred between groups.

3.4.1 Comparisons between the 'natives' and the 'immigrants'

One of the enduring assumptions underpinning the notion of the Net Generation is that 'digital natives' (students now entering universities) far exceed 'digital immigrants' (educators within universities) with regards to their experiences with technology. In order to test this assumption we compared the degree to which staff and students engaged in the five technology-based activities described above. We also considered how those who were part of the Net Generation – as defined by age – may have differed to those who were not.

Perhaps surprisingly, there were no significant differences between staff and students with regards to their technology-based activities; but there were significant age-based differences (see Figure 3.6). Those under 25 years of age were significantly more likely to engage in *Advanced Mobile Use* and *Media Sharing* (and there was a tendency for them to engage in more *Web 2.0 Publishing*). However, it is worth pointing out that despite these differences, the technology-based activities falling within these two categories were only enjoying modest use: on average less than 'every few months'.

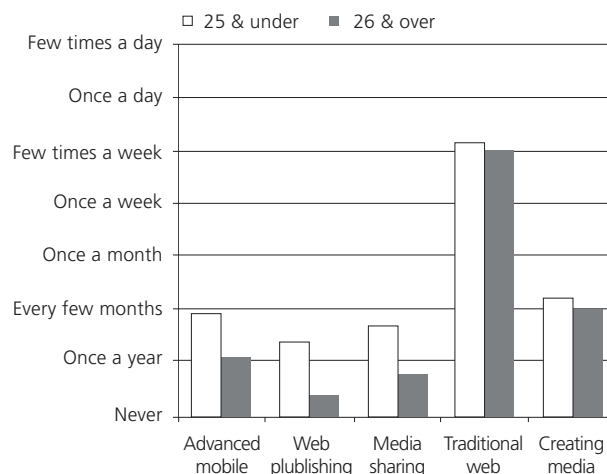


Figure 3.6: Comparisons of technology use by age.

⁵The categories used in these analyses were formed conceptually rather than statistically (e.g. through a technique such as factor analysis). While this has resulted in clear and intuitive categories, it should be noted that this approach – and the categories derived from it – differs from a previous analysis of the same data (see Kennedy, Dalgarno, Bennett, Judd, Gray, & Chang, 2008).

3.4.2 Comparisons between universities and disciplines

A key component of this project was to determine whether there were systematic differences in students' experiences with technology across the sector or whether these experiences were largely uniform. We investigated whether the university that students were attending and their discipline area had any impact on the degree to which they engaged in the five technology-based activities.

We found no differences by discipline area; that is, students in Arts, Science and the Professions all reported around the same level of technology use in all five areas. However, clear differences between the three universities could be seen (see Figure 3.7) which showed that, with the exception of *Creating and Using Media*, students from the University of Melbourne were engaging in each of the technology-based activities significantly more frequently than students from either the University of Wollongong or Charles Sturt University. It was also evident that students from the University of Wollongong were engaging in two of the activities (*Web 2.0 Publishing* and *Media Sharing*) significantly more than students from Charles Sturt University.

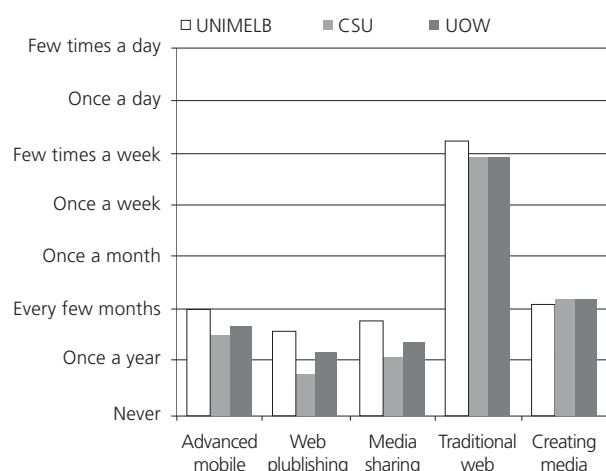


Figure 3.7: Comparisons of technology use by university.

3.4.3 Demographic comparisons

The final set of comparisons we considered were based on key demographic characteristics of the students sampled: gender, residency and socio-economic status⁶. These demographic variables went some way in accounting for differences in students' participation in the five technology-based activities.

The clearest findings were that males engaged in activities within the categories of *Media Sharing*, *Creating and Using Media*, and *Web 2.0 Publishing* to a greater extent than females (see Figure 3.8). A significant difference between males and females was recorded for *Advanced Mobile Use* despite the magnitude of this difference being only marginal. International students were more inclined to engage in *Advanced Mobile Use*, *Web 2.0 Publishing* and *Media Sharing* compared to their local counterparts (see Figure 3.9). When considering socio-economic status (SES), those of high SES tended to engage in *Advanced Mobile Use and Media Sharing* more often than those of either low or medium SES. Several two- and three-way interactions were recorded in these analyses, the reporting of which is beyond the scope of this report.

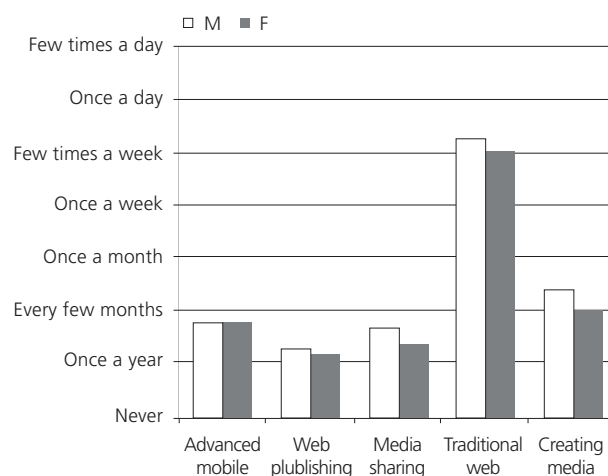


Figure 3.8: Comparisons of technology use by gender.

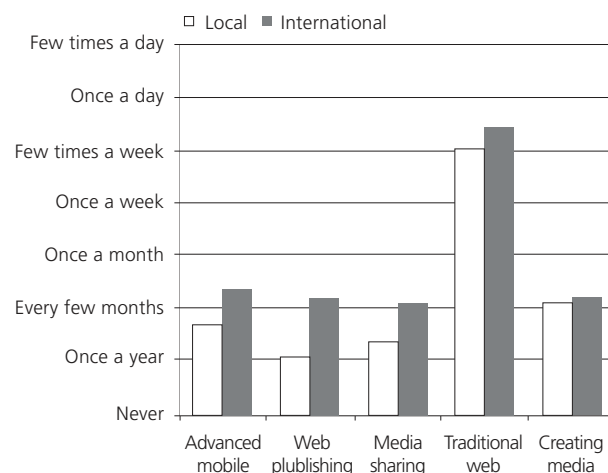


Figure 3.9: Comparisons between local and international students' use of technology.

⁶ Socio-economic status was determined by the postcode of local students' permanent home address.

3.5 Usefulness of Technology in Higher Education

3.5.1 Students' perceptions of the usefulness of technology

Students were asked to indicate how useful a series of technologies currently were or would be in their studies (see Figure 3.10). Students indicated a strong preference for using the web to access university services with 83.3% of students indicating this would be useful.

The use of technology to either access or receive course-related material and information was also seen as useful by many. Approximately three-quarters of the students sampled indicated web-based recordings of lectures would be useful, while 60% indicated that using RSS feeds to receive course information would be useful. While receiving course information such as timetable changes and grades via text message was seen as useful by many students (~40%), over a quarter of students felt this was not useful. In the focus groups, some students suggested that the immediacy of text messaging meant this form of communication would be preferable to checking for announcements on a learning management system or receiving emails:

"a lot of people won't check their email all the time, every day, whereas everyone, or usually everyone, always has their phone on them, so they'll get the message and pretty much read it straight away, whereas the email might sit there for a couple of days." (Chemistry student)

"Sometimes when they send us a message and say that the class is not on and then you get here because you didn't check SOLS [the learning management system]. It would be nice if you could like be SMS-ed because more people would check their texts rather than log on in the morning before they come to uni." (Education student)

Conversely, others felt the immediacy of the technology made it more disruptive than other forms of communication and did not want to be contacted by the university in this way:

"And also people tend to have their phone on them so you might be getting information you don't need at an inconvenient time." (Chemistry student)

"I don't like that because my phone is like my personal life and my education is separate" (Education student)

When it came to communication and collaboration, a number of students felt technologies such as instant messaging with peers (52.7%) and with staff (49.1%),

webconferencing (27.8%) and social networking (27.8%) would be useful. However, the perceived usefulness of these technologies was clearly not uniform, with a quarter of students indicating these forms of communications were not useful. Interview comments show that some students felt synchronous communication technologies such as online chats would be difficult to moderate in a group situation, for example:

"the thing I find with mass chats, with a whole group of people, sometimes it's really difficult to get in what you want to say because people type and everyone posts at the same time so you get a whole mass of questions and it just gets really complicated when the answers come in ... And so I don't think it'd be that effective." (Chemistry student)

Finally, there was low support for the usefulness of blogs and wikis in students' university studies with half the students sampled stating that these technologies would not be useful. One of the reasons for this could have been students' lack of familiarity with these technologies, which emerged in some of the focus group discussions.

3.5.2 Staff perceptions of the usefulness of technology

When staff were asked similar questions about the usefulness of particular technologies in supporting student learning in higher education their responses were more muted (see Figure 3.11). Downloading or accessing audio-video recordings of lectures (42.9%) and supplementary material (45.5%) were seen as useful by many staff, as was asking students to prepare multimedia presentations (46.3%), providing students with RSS-based alerts (31.4%) and asking students to share digital content about their course (29.1%).

A relatively high proportion of staff indicated that they did not know whether some technologies would be useful in supporting students' learning. This was particularly the case for the emerging technologies of social networking (37.9%), RSS feeds (33.7%) and wikis (35.6%).

It seems, therefore, that many staff are unconvinced, or at least unsure, about the academic usefulness of many technologies and technology-based tools that they were asked about, including the use of instant messaging, mobile phone-based texting for content provision or administrative support, creating or contributing to blogs, and asking students to create a web page as part of their course.

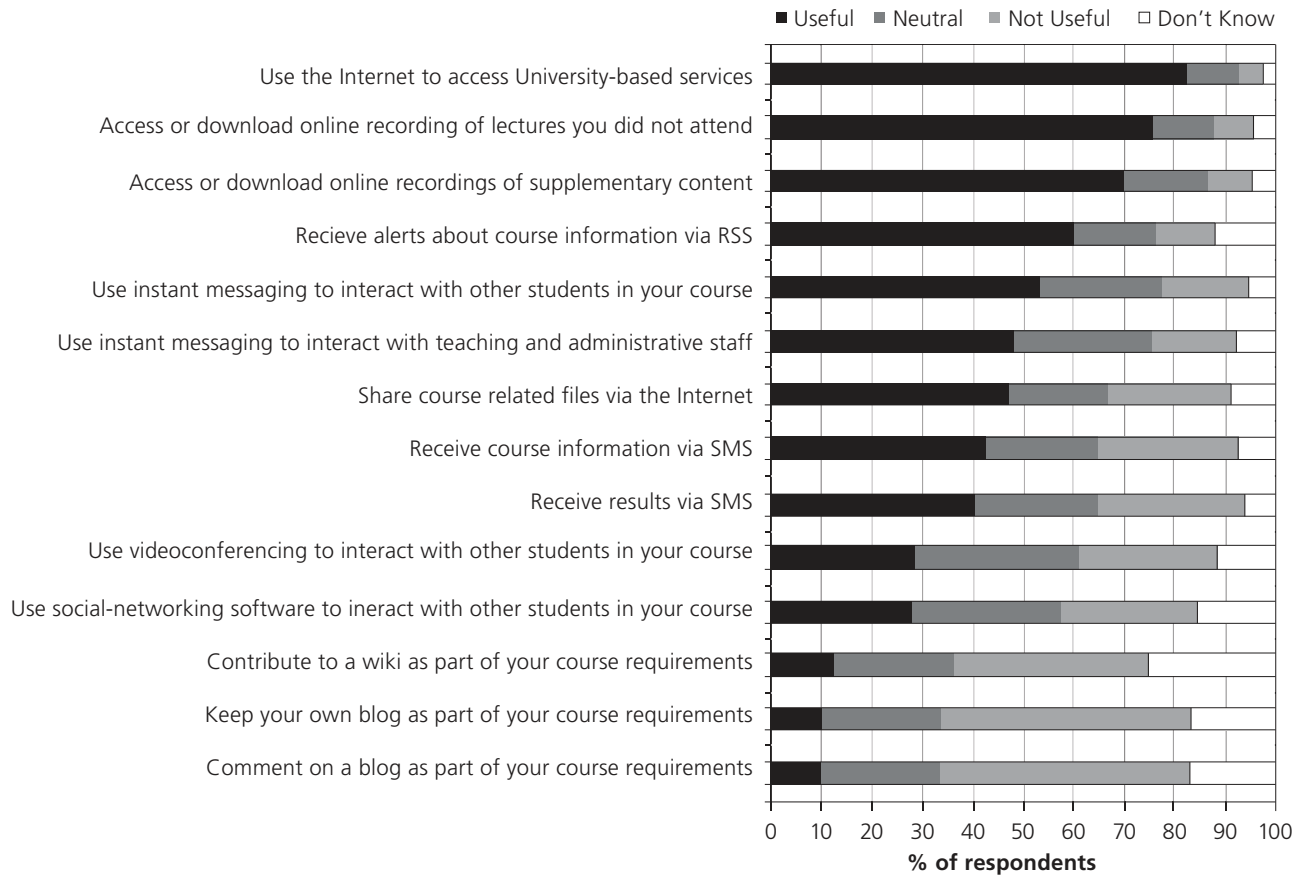


Figure 3.10: Students' perceptions of the usefulness of technology in their studies at university.

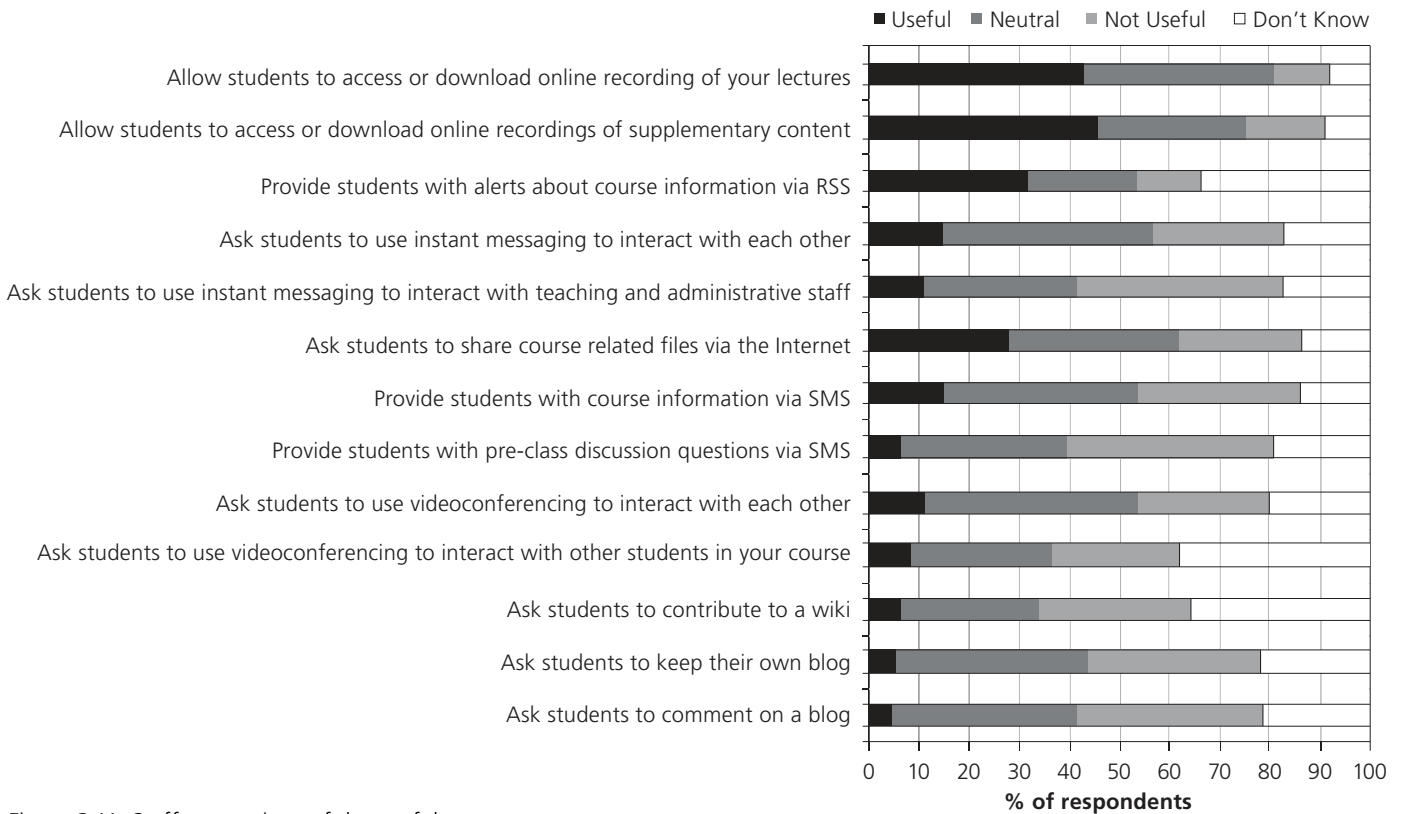


Figure 3.11: Staff perceptions of the usefulness of technology in students' learning at university.

3.5.3 Comparisons of student and staff perceptions of the usefulness of technology

When student and staff perceptions about the usefulness of technology in higher education were compared statistically, the clearest pattern of results was that staff were more sceptical and more unsure about the potential of technologies for supporting teaching and learning.

For many technologies, staff were less inclined than students to indicate that a particular technology was useful in supporting learning. This pattern of results was evident for the use of instant messaging for collaboration between either students themselves or between staff and students, using MP3 recordings of lectures, using social networking to communicate or collaborate, file sharing on the web, using RSS feeds, and contacting students via text message for either study or administrative purposes. Interestingly, this pattern was not evident with regards to course-related blogging and wikis.

For many of the technologies surveyed, staff were also more unsure, compared to students, as to whether a particular technology would be useful. This was the case for using downloadable audio recordings as supplementary course material, using instant messaging for student and staff collaboration, contacting students via text message for study, and using social networking, web-conferencing, RSS feeds and wikis.

The focus group data provides some insight into the reasons behind staff scepticism regarding the potential usefulness of new technologies for teaching and learning. Interviewees identified a number of perceived limitations associated with using technologies to support their teaching. These included: increased workload; interface or usability issues; functional limitations of the technology (that is, the technology did not do what staff had wanted it to do); inappropriate use of communication tools (by students); and loss of face-to-face interaction, for example:

"You've got more flexibility for the students but you've got more work for the lecturers." (Psychology lecturer)

"I've had a few instances where ... coming up to exams people were getting a bit stressed, a few comments, you think 'well, that's not on'. You sort of say 'look, be professional' and you take that comment off so it's not there for people to read it, so it disappears." (Chemistry lecturer)

"Certainly I would say that I'm very nervous that you would think that listening to this later [MP3 recording] is a replacement for coming in here and thinking and being active and discussing with people around you." (Education lecturer)

Despite these comments, it is worth noting that a number of interviewees also identified clear benefits associated with using technologies to support their teaching. For instance, some felt technologies improved communication, provided presentation or lecturing benefits, provided greater flexibility for students, increased immediacy of information access, enabled greater access to resources, and encouraged student engagement.

3.6 Summary

The data collected in the Implementation stage of this project paint a complex picture about the experiences first-year students and university staff have with technology. While there is a faint trace of the 'digital native' student so often talked about by some educational commentators, the data more strikingly provide strong evidence of the great diversity within both staff and student cohorts. While students reported high levels of access to and use of established technologies (such as personal computers, mobile phones, the Internet and email), emerging Web 2.0 technologies (such as blogs and wikis) were used by a relatively small proportion of students. While there was evidence that social networking and digital file sharing were popular among a small minority of students, few students were regularly using social bookmarking or creating and publishing podcasts.

Students and staff are clearly relying on core technologies for the fairly traditional purposes of communicating and information gathering, while other technologies are clearly on the fringe, used by a few but nowhere near the majority. The evidence from this investigation does not support the notion that a homogenous group of students, broadly adept with the latest technology, is now entering our universities.

The data show that students are more positive than staff about how useful technologies could be in supporting university-based learning and teaching. The most useful activities from the students' perspective were accessing university-based services and audio-visual content material via the web, while from the staff perspective, asking students to create media presentations (such as PowerPoint) and providing audio-visual content material via the web to support learning were seen as most useful. A key finding was that staff were generally more sceptical and more unsure about the potential of technologies for supporting teaching and learning. Despite these differences, it was also clear that none of the technologies surveyed was universally accepted as being useful in learning and teaching. Many students and staff – and in some cases the majority – seemed unconvinced about the relevance and usefulness of the application of particular technologies to support learning and teaching.

There was little evidence that technology usage patterns can be explained primarily on the basis of broad generational differences – the digital natives compared to the digital immigrants – although age did account for variation in two of the five technology categories considered. Comparisons between students based on their discipline areas also showed no clear differences. It seems that some of the variation in technology usage documented in this investigation can be explained by which university the students were attending and key demographic variables such as age, gender, whether the student is domestic or international, and socio-economic status. It is worth noting, however, that the magnitude of the differences between the groups being compared was small when considered alongside the overall diversity in usage patterns across the sample.

This section of the handbook was prepared by Gregor Kennedy, Barney Dalgarno, Terry Judd, and Jenny Waycott.

References

- Alexander, B. (2006). Web 2.0: A new wave of innovation for teaching and learning? *Educause Review*, 2006(March/April), 33-44.
- Australian Bureau of Statistics. (2006). Australian Standard Geographical Classification (ASGC) Remoteness Structure (RA) Digital Boundaries, Australia. Retrieved 26 April, 2007, from <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Di rClassManualsbyTopic/9A784FB979765947CA25738C0012 C5BA?OpenDocument>
- Bryant, L. (2007). Emerging trends in social software for education. In *Emerging Technologies for Learning: Volume 2* (pp. 9-18). Coventry, UK: Becta. Available from http://emergingtechnologies.becta.org.uk/index.php?section=etr &catcode=ETRE_0001&rid=14167
- Ipsos MORI. (2007). *Student Expectations Study: Key findings from online research and discussion evenings held in June 2007 for the Joint Information Systems Committee: JISC*. Available from <http://www.jisc.ac.uk/>
- Kennedy, G., Dalgarno, B., Bennett, S., Judd, T., Gray, K., & Chang, R. (2008). Immigrants and Natives: Investigating differences between staff and students' use of technology. In *Hello! Where are you in the landscape of educational technology? Proceedings ascilite Melbourne 2008*. (pp. 482 - 492). Available from <http://www.ascilite.org.au/conferences/melbourne08/procs/kennedy.pdf>
- McCarthy, C. (2008). ComScore: Facebook is beating MySpace worldwide. *The Social, C/Net News.Com* Retrieved 28 July, 2008, from http://news.cnet.com/8301-13577_3-9973826-36.html
- McCrinkle, M. (2006). *New Generations at Work: Attracting, Recruiting, Retraining & Training Generation Y*: McCrinkle Research. Available from http://www.mccrin- dle.com.au/wp_pdf/NewGenerationsAtWork.pdf
- Oblinger, D. G., & Oblinger, J. L. (Eds.). (2005). *Educating the Net Generation*: EDUCAUSE. Available from www.educause.edu/educatingthenetgen/
- Oliver, B., & Goerke, V. (2007). Australian undergraduates' use and ownership of emerging technologies: Implications and opportunities for creating engaging learning experiences for the Net Generation. *Australasian Journal of Educational Technology*, 23(2), 171-186.
- Salaway, G., Caruso, J. B., & Nelson, M. R. (2008). *The ECAR Study of Undergraduate Students and Information Technology 2008*. Boulder, Colorado: Educause Center for Applied Research. Available from <http://www.educause.edu/ecar>
- Trewin, D. (2001). Australian Standard Classification of Education (ASCED) 2001. Retrieved January 20, 2009, from [http://www.ausstats.abs.gov.au/ausstats/free.n sf/0/2D08D604CC032093CA256AAF0080766F/\\$Fil e/12720_2001.pdf](http://www.ausstats.abs.gov.au/ausstats/free.n sf/0/2D08D604CC032093CA256AAF0080766F/$Fil e/12720_2001.pdf)

4.0 Implementing Emerging Technologies

4.1 Rationale and Method

The purpose of the Implementation stage of the project was to design educational activities around particular technologies, implement these activities, and collect detailed information about the implementations. The approach was founded on the premise that the ways in which students and staff think about technology-supported learning and teaching are likely to be discipline-specific and, therefore, the development and implementation of technology-based tools to enhance learning must, in the first instance, be carried out in context. Only by first acknowledging differences among learning and teaching cultures can teaching practice and curriculum be changed, and only by acknowledging differences can strategies for improvement be exchanged across disciplines (Becher & Trowler 2001; Lueddeke, 2003).

For this reason a collective case study approach was chosen with a view to investigating technological implementations in the interrelated areas of communications, publishing and file-sharing. These were identified from an earlier literature review and featured centrally in the investigation stage of the project.

A series of potential implementations were subsequently suggested by members of the project team. These were collated and critically evaluated with regards to their educational rationale, potential pedagogical benefits, and their functional and administrative implications. Based on this review the number of implementation projects was narrowed to eight, using five technologies. Staff who had participated in the first stage of the project were invited to participate in an implementation. Some participants were also attracted through a general invitation extended through academic staff mailing lists at each institution.

The five technologies and tools were developed and trialled within eight specific learning and teaching contexts across the three partner institutions (see Table 4.1). These were chosen to ensure diversity across disciplines and institutions, and to include subjects across a range of undergraduate year levels (not only first year) and with a range of class sizes.

The members of the project team worked with teaching staff in their institutions to modify aspects of existing curricula, assessment, learning designs and activities and develop new approaches to them that harnessed the potential of emerging technologies and technology-based tools. As part of this process the project team supported teaching staff by providing educational and technical advice, and administrative

Learning and teaching context			Technology	Tool
Activity	Discipline/ Year Level	Institution		
Student reflective journal writing	Education, 3rd & 4th year	Charles Sturt University	Blogging	Sakai BlogWow http://sakaiproject.org
Student publishing	Journalism, 1st year	University of Wollongong		WordPress http://www.wordpress.com
Teacher provocateur and collaborative writing through wikis	Psychology, 1st year	University of Melbourne	Wiki	PBwiki http://pbwiki.com/
Student-generated digital photo archive	Chemistry, 1st year	University of Melbourne	Image sharing	Flickr http://www.flickr.com/
Student-generated digital photo archive	Biology, 2nd year	Charles Sturt University		Sakai Resources tool http://sakaiproject.org
Student-generated digital photo archive	Education, 3rd year	University of Wollongong		Flickr http://www.flickr.com/
Student-generated podcasts	Medicine, 2nd year	University of Melbourne	Podcasting	Problm (custom-built)
Students sharing online resources through social bookmarking	Arts, 1st year	University of Melbourne	Social bookmarking	Diigo http://www.diigo.com

Table 4.1: Overview of implementation projects.

support where needed. A small honorarium was paid to each of the teachers in recognition of the time they had committed to participating in the projects.

Each project was evaluated iteratively during the course of its development and implementation, with a particular emphasis placed on recording information about the aspects of the innovation that worked effectively (as well as what didn't work) to determine the learning processes and outcomes that were beneficial for students and teachers. A range of data collection methods was used in a mixed method design. The project team members collected relevant subject and policy documents, maintained field notes (especially as records of team discussions), and completed proforma summaries to ensure consistent data collection across all projects. Key teaching staff involved in the project were also interviewed at least once at the end of the project, and sometimes several times during the project.

Towards the end of each pilot project students were invited to complete an evaluation questionnaire that included items asking them:

- to give an overall rating of how they found the activity (confusing, difficult, irrelevant, interesting, easy to use, useful, boring, and enjoyable);
- to indicate to what extent they found the activity effective in supporting their learning (e.g. helping them understand the material they were studying, improving their ability to work in a group, improving their access to teacher feedback);
- about any technical or other problems they had;
- to identify the best and worst things about the activity;
- how it could be improved; and
- whether they would like to see that type of activity used in other aspects of their studies.

The wording of the questionnaires was tailored slightly to reflect the nature of the activity and terms used at the local institution. Overall, however, the items remained consistent. The items were developed from Reeves and Hedberg's (2003) guidelines for effectiveness evaluation and included questions about knowledge, skills, attitude, appeal and implementation. The questionnaires were made available online and administered either during or after class, in accordance with the ethics requirements of the institution. In some cases there were very low response rates because the questionnaire was optional and it was administered outside of class time.

Students were also invited to provide further feedback by participating in focus groups. A total of 103 students participated in focus group interviews across the eight cases. These interviews ran for between 20 and 70 minutes and were guided by a semi-structured protocol¹. Slight variations to the protocol were developed to suit each implementation but, again, a significant degree of consistency was maintained. These interviews were intended to provide explanatory data which would complement the survey, and the questions were designed to encourage students to communicate their understandings of the activity, their experiences with it and their frank assessment of how effective they found it to be.

The remainder of this section presents case study summaries for each of the projects that were implemented, followed by a summary of pedagogical, technical, and administrative considerations.



¹ A copy of the questionnaire and the interview protocol used is in the *Educating the Net Generation Toolkit*, available from www.netgen.unimelb.edu.au

4.2 The Implementation Case Studies

Case 1: Blogging: Student reflective journals in teacher education

1. Brief Overview	Primary Education students each created their own online blog using the <i>Sakai BlogWow</i> tool and posted to this blog while undertaking their school-based professional experience placement. The focus of the activity was the students' reflections on the applicability within the classroom of their own theory-driven approaches to classroom management as described in an earlier assignment. There was a requirement to post blog entries and to respond to other students' blog postings at specific intervals as part of the final assignment in the subject.
2. University	Charles Sturt University
3. Team	Andrea Reupert (Subject Coordinator) Barney Dalgarno Andrea Bishop
4. Subject/Discipline	Subject: Managing the Learning Environment Discipline: Primary Education
5. Students	There were 91 students enrolled in this subject, comprising 3rd and 4th year on-campus undergraduate Bachelor of Education (Primary) students.
6. Learning Activity	<p>The activity was part of an assignment requiring students to reflect on their classroom management approaches while on a five-week professional experience placement.</p> <p>Students each attended a 1.5-hour workshop on using the <i>Sakai BlogWow</i> tool midway through the session, prior to commencing their professional experience placement.</p> <p>Prior to commencing the placement, students were required to post a blog entry summarising their main ideas about classroom management.</p> <p>While on placement students were required to post at least two entries describing mini case studies of the application of their approach, as well as four comments on other students' postings.</p> <p>Upon returning to campus students were required to post one final blog entry providing an overall reflection on the use of blogs.</p>
7. Learning Objectives	<p>The following learning outcomes were assessed within the larger assessment task of which this activity was part:</p> <ul style="list-style-type: none"> • recognise and understand the relevance of a wide variety of theoretical models and approaches to classroom and behaviour management, and reflect on their application; • be able to apply theory and practice to classroom and individual management situations, including goal setting with students, questioning and listening; • be able to develop positive school and classroom ecologies with reference to physical, social and emotional development; • be able to apply a variety of classroom management strategies in different learning contexts; • understand key policy documents, resources, personal and referral agencies that assist teachers to create effective learning environments; and • differentiate between proactive and reactive strategies of classroom management.

8. Assessment	<p>The activity was part of an assignment (weighted 50% of the overall subject assessment) requiring students to reflect on the application of their personal (theory-informed) approach to classroom management, within their classroom while on professional experience placement. The main part of the assessment task required students to write a report after returning to campus from the placement. An additional requirement of the assignment was that students complete the blog activity, which included posting and commenting on blog entries before, during and after the placement.</p> <p>Students submitted printouts of their blog postings as part of their final assignment. One of the eight marking criteria for the assignment was “correct number and timing of blogs posted” and another was “blogs demonstrate insightful reflection on practice as well as the ability to provide sensitive and constructive feedback to peers on classroom management issues”.</p>
9. Curriculum Design Work	<p>One of the project team members, Barney Dalgarno, was aware of an earlier trial of blogs with Primary Education students carried out as part of a practicum subject. The results suggested that there would be value in continuing this work but integrating the task more with assessment to make it a more mainstream activity and to increase participation.</p> <p>Given that there were minimal assessment opportunities in the practicum subjects, a subject running alongside the practicum was sought, and <i>Managing the Learning Environment</i> was identified as a good candidate.</p> <p>Barney discussed the planned assessment tasks with the subject coordinator, Andrea Reupert, and the final assignment was identified as one that could be modified to incorporate a blog activity. Barney then helped to write the section of the subject outline describing the details of the blog task.</p>
10. Technologies Reviewed and Used	<p>A number of blog tools were considered, including the <i>BlogWow</i> tool within <i>Sakai</i>, <i>Edublogs</i>, and mainstream tools like <i>Blogger</i> and <i>WordPress</i>.</p> <p>Because of the need to restrict access to the blogs to the subject community, because of the potential for students to reveal confidential details about children and teachers in their schools, <i>Blogger</i> and <i>WordPress</i> were ruled out, because the desired functionality was not available in the reviewed versions. <i>EduBlogs</i> was considered, but ultimately <i>BlogWow</i> was chosen because setting up a closed community using <i>EduBlogs</i> would have required a paid subscription. Additionally, the use of a tool within the <i>Sakai</i> learning management system, the platform on which CSU’s <i>Interact</i> online learning system is built, meant manual set up of student logins was not required.</p> <p>Although <i>BlogWow</i> is somewhat restricted in the range of publishing tools provided, the mechanisms for creating links between blog postings, and the mechanisms for searching and sorting postings, the team felt that they did not need the full range of capabilities provided by the more advanced or mainstream tools and <i>BlogWow</i> had the key features needed.</p>
11. Set Up	<p>The <i>BlogWow</i> tool was originally to be provided with the CSU <i>Interact</i> online learning system as an optional tool available for pilot implementation during the autumn session 2008. Due to some delays in the development work required to remove known bugs in the system a decision was made by CSU’s Division of Information Technology (DIT) close to commencement of the session to cancel availability of the tool.</p> <p>After some negotiation with CSU’s DIT, and after Barney Dalgarno evaluated the possible impact of the known bugs, it was agreed to allow access to the tool for this subject cohort.</p> <p>Once the tool was made available within the <i>Interact</i> environment students were able to create their own blog postings and view and comment on each other’s postings without any further administrative work being undertaken.</p>

12. Staff Support Provided	Barney Dalgarno demonstrated the main features of the <i>BlogWow</i> tool to the subject coordinator (Andrea Reupert). Andrea was then able to create her own blog postings and view and comment on student blog postings without any need for further training or support.
13. Student Support Provided	Andrea discussed the task with students during lectures and workshops. Students were then provided with a 90 minute hands-on workshop on the use of the <i>BlogWow</i> tool. During this workshop they created their initial blog posting and set up their profile. Andrea also provided student support via email and phone while students were on their professional experience placement.
14. Evaluation Findings	<p>At the end of the project, four focus groups were conducted, with a total of 22 students interviewed. In addition, 40 out of the 91 students in the class completed a questionnaire. Of these students, 53% found the <i>BlogWow</i> activity easy to use, with 18% undecided. Only 30% found the task useful, with 18% neutral, and only 28% found it enjoyable, again with 18% neutral. However, 45% of students said that the task improved their ability to reflect on what they were learning with 33% undecided, and 40% said that the task improved their ability to share their knowledge or opinions with other students with 38% undecided.</p> <p>Students who found the task valuable said that it allowed them to find out about other students' experiences, to receive support and advice from their peers, and to explicitly reflect on their own practice. However, many students found the task to be an unwanted imposition during their professional experience placement.</p> <p>A substantial minority (43%) of students said that they encountered technical problems with the activity, with unavailability of the blog system due to downtime of the learning management system being the most commonly reported problem.</p> <p>Some students found that the interface made it difficult to quickly locate new blog postings or comments. The provision of a view showing a list of postings and titles would have improved this. Some students suggested they would have preferred that the task was not assessable, although earlier trials suggested that only a small proportion of students would have engaged with the task had it not been assessed. Some also suggested that they would have liked less specific requirements about the number and frequency of postings. Some students indicated that they would have liked more feedback from the lecturer on their reflections and some also indicated that they were reluctant to comment on the postings of people they did not know.</p> <p>The subject coordinator, Andrea Reupert, commented that she felt the blog implementation was a good way to connect the students to university while on practicum, as it required them to describe their placement experiences and it allowed her to support the students. She also commented that the blog provided a way for students to support each other while on placement. However, she thought that the students had some legitimate concerns about how much university work they were being expected to do while on placement across all of their subjects.</p> <p>Another issue identified was the potential for students to identify school children and teachers in other students' blog postings even though names were not used. She also commented that some students had legitimate problems obtaining access to a computer while on placement, especially with sufficient privacy to be able to post critically reflective messages about students and teachers at their school.</p>

Case 2: Blogging: Student publishing in first-year journalism

1. Brief Overview	In this activity students created a collection of news stories using a blog in a first-year journalism course. The activity introduced students to blogging as a form of journalism and provided a context for developing their research and writing skills.
2. University	University of Wollongong
3. Team	Marcus O'Donnell (Lecturer and Subject Coordinator) Sue Bennett Karl Maton
4. Subject/Discipline	Subject: Introduction to Journalism Discipline: Creative Arts
5. Students	First-year, 52 students, on-campus
6. Learning Activity	<p>Students in first-year journalism established and maintained a blog in which they published news stories about their suburb.</p> <p>Each student developed a news and resource blog for their local area that included:</p> <ul style="list-style-type: none"> • Three current news stories (300 words each) • Two short profiles of local people (400 words each) • A set of links to local resources (400 words) • A description of the local area that included a brief history and description of local attractions and/or problems (400 words) • Photographic elements that enhanced entries. <p>These were the minimum requirements and students were encouraged to add other elements to give their blog a focus and particular sense of identity.</p>
7. Learning Objectives	<p>Through this activity students would:</p> <ul style="list-style-type: none"> • develop research and reporting skills, • experience writing for an audience, and • develop an understanding of new forms of presentation available through online media. <p>This subject introduces students to news values, the '5Ws and H' and the inverted pyramid approach to news writing. Students are also introduced to fundamental news research and interviewing techniques. While the subject focuses on print news writing, students are introduced to blogging and online journalism, which are becoming essential skills for the profession.</p>
8. Assessment	<p>The blog comprised 50% of the assessment for the subject and was assessed against the following criteria:</p> <ul style="list-style-type: none"> • An ability to identify interesting news stories • An ability to research news issues • An ability to write effective news stories • An understanding of the unique characteristics of blogging and its application to news reporting. <p>The assignment is a capstone project, intended to bring together and demonstrate all the skills in news gathering and news writing that students had developed in class exercises throughout the semester.</p>
9. Curriculum Design Work	The activity was integrated into a current first-year journalism subject introducing news writing. Blogging had been introduced into this subject in the previous year and improvements were made for this implementation based on feedback from past students and the previous experiences of the teacher.

10. Technologies Reviewed & Used	<p><i>WordPress</i> was chosen because it had been successfully used in the subject the previous year and was judged by the teacher to be most appropriate. The teacher was aware that students may experience some technical difficulties but used the tool himself to ensure he could provide adequate support.</p>
11. Set Up	<p><i>WordPress</i> is a publicly available blogging tool which meant that students needed to set up their own accounts as part of the process. This was done in a tutorial session early in the semester.</p>
12. Staff Support Provided	<p>No additional staff support was required.</p>
13. Student Support Provided	<p>Students participated in tutorial activities to develop their blogging skills, including:</p> <ul style="list-style-type: none"> • the establishment of a personal reflective blog • sessions on developing effective blogs • student presentations of their preliminary blog ideas in class for peer feedback • working with the subject co-ordinator over two weeks at the end of semester to refine the blogs. <p>The teacher also maintained a class blog in which he modelled the activity for students.</p>
14. Evaluation Findings	<p>Thirty-one students took part in focus groups and one staff member was interviewed. Survey responses were received from 42 of the 52 students enrolled in the subject. Of these, all were local students and most of the respondents (79%) had little or no prior experience in creating their own blogs.</p> <p>Overall, all but three students found the activity relevant, and a majority rated it as useful, interesting and enjoyable. However, a quarter of the class did not find the blog easy to use, and slightly less than half found it moderately to very difficult to use. Nearly 60% said they had experienced some technical problems with the blog tool, mainly associated with formatting the postings.</p> <p>Respondents were positive about how the activity helped them in their studies: 76% said it helped improve their understanding in the subject, 93% that it improved their knowledge of using technology for their studies, 79% that it improved their thinking and writing skills, and 92% that it improved their independent research skills. Students were also reasonably positive about how the activity helped them get feedback from the teacher, but more neutral about its effect on enabling them to share their ideas. This was supported by comments in the focus group interviews that suggested few students took the opportunity to read each other's blogs even though they were readily available.</p> <p>Overall 91% felt the activity helped them with their studies that session, although only 53% were positive they wanted to use blogging in other areas of their studies.</p> <p>When reflecting on the blogs produced, the teacher commented that the students had exceeded his expectations, with about 80% of the class going beyond the basic requirements of the task by including extra multimedia elements like audio and video and creating their own unique designs. He also commented that for many students, the idea of blogging as a legitimate journalistic genre was challenging and as such many still needed to develop their writing to achieve an appropriate style. He also noted that he needed to be able to provide assistance to students in technical areas, because the tool being used was still being developed and, at times, problems occurred especially in areas of advanced functionality.</p>

14. Evaluation Findings (CONTD)

Comments elicited during the focus group interviews with the students revealed they found the activity interesting but challenging. One reason was that it challenged their assumptions about journalism. For example one student commented: "I had never really considered doing any online work like blogging." Another reason was that the type of assignment was unfamiliar and students sometimes had difficulty understanding the requirements of the task. Students also had technical difficulties with the blog tool, mainly associated with formatting tools not saving changes properly. Despite these difficulties, most students interviewed agreed that it was a positive and useful experience in developing contemporary journalistic skills: "I think it was relevant to the age we're in at the moment, everything's just technologically driven." And some enjoyed being able to share their work: "I enjoyed that you could show other people what you've done. A lot of my interview subjects asked to see the blog and it was nice to see them sort of approve it". Others, however, found it initially confronting to see their work published online.

When considering how the activity could be improved the teacher reflected that he could place more emphasis on the practice blog activity early in the session to help students develop their skills more explicitly. This may be a way to address the desire by students for more explicit criteria, thereby reducing students' confusion about the requirements of the activity.



Case 3: Teacher provocateur and collaborative writing through wikis in psychology

1. Brief Overview	This case study involved using a wiki to support both informal online discussion and a collaborative writing exercise among first-year psychology students. The collaborative writing exercise involved asking groups of between 20 and 30 students to produce a Wikipedia-style entry on <i>motion detection</i> , a key topic of two lectures in the course.
2. University	University of Melbourne
3. Team	Simon Cropper (First-year Psychology Coordinator and Lecturer) Gregor Kennedy Rosemary Chang Terry Judd
4. Subject/Discipline	Subject: Mind, Brain and Behaviour 1 Discipline: Psychology
5. Students	The students in this case were first-year psychology students. First-year psychology is a large class that draws students from a number of faculties across campus including Arts, Science, and Commerce. With such large numbers the cohort is relatively diverse. The implementation involved 772 enrolled students.
6. Learning Activity	<p>This case involved two activities using a wiki.</p> <p>Activity 1: Commentary and Comments</p> <p>The course coordinator posted to the wiki new ideas and perspectives, which were additional to those covered in lectures. Commentary topics were provocative, contemporary and not obviously relevant to the subject of lectures (e.g. dreams, hallucinations, mental illness, homelessness). Students were asked to read the commentary and comment on it and/or comment on other students' comments.</p> <p>Activity 2: Collaborative Writing</p> <p>Students were asked to use the wiki for a collaborative writing activity. In Week 6 of the semester, the lecturer presented two lectures on motion detection. Students in first-year psychology are assigned to a lab class for the semester and each of these 30 lab classes was asked to prepare a rich, Wikipedia-style entry on motion detection. Students were provided with guidance on the basic concepts that should be covered in the wiki entry, as well tips on how to collaboratively construct a wiki site.</p>



7. Learning Objectives	<p>The commentary provided an alternative overview of the course and sought to provoke students to think about what they were learning from the lectures. The overarching goal of the activity was to prompt students to think about how their lectures fit with psychology as a whole and, by extension, to consider what they think about psychology as an academic discipline.</p> <p>The collaborative writing task had the aim of developing students' understanding of some fundamental aspects of cognition through a collaborative group exercise.</p> <p>Together the learning objectives of these activities were to:</p> <ul style="list-style-type: none"> • help students come to an understanding of how psychology as a discipline is made up of a number of integrated areas of study and practice • help students understand motion detection, including areas such as attention, eye movements and motion detection, biological motion detection, computational, behavioural and biological approaches to vision • develop students' understanding of internal and external representations of the world and the relationship between them • develop students' skills in collaborative group writing and group work and to help students understand how a collaborative writing tool (a wiki) works • develop students' skills in thinking and learning through producing and creating content. • develop students' skills in critical self and peer evaluation
8. Assessment	<p>There was no assessment of the <i>Commentary + Comments</i> activity. A small proportion of students' final mark for the semester (4%) was based on their contribution to the <i>Collaborative Writing</i> task.</p> <p>A student's contribution was deemed satisfactory if he or she made at least two contributions to the content on the wiki by a certain date. Students were told that it was possible to make minor alterations to the wiki to fulfil the assessment requirements, but they were also told this was not in the spirit of the exercise.</p>
9. Curriculum Design Work	<p>The first-year coordinator and two members of the project team spent a considerable amount of time thinking about what specific learning activities were possible in the context of the course. A series of ideas were discussed and developed before the final two activities were decided upon. Much of the discussion centred on how best to use the wiki to encourage collaborative student work as opposed to individual student's responses and reflection.</p> <p>The <i>Commentary + Comments</i> activity replicated an activity that the lecturer had employed offline and on a smaller scale in previous years of the course.</p> <p>The majority of the curriculum design work, carried out collaboratively between the course coordinator and the project team, was associated with the collaborative task. This involved determining the specific parameters of the activity including: the number of lectures to target, the number of concepts to include, the level of contribution expected of students, the time frame for the activity, the role of tutors, the proportion of the activity to be completed in class and out of class, and how the activity should be assessed.</p>

10. Technologies Reviewed & Used	<p>The team considered a range of wiki software tools including the wiki module for <i>Blackboard</i>, <i>MediaWiki</i> (the software behind Wikipedia), <i>PBwiki</i> and <i>Stikipad</i>. <i>Stikipad</i> was the initial tool of choice because it had the best feature set and was very easy to use, but it was eventually rejected because of perceived support issues. <i>MediaWiki</i> was rejected because it lacked RSS feeds and a WYSIWYG editor. The <i>Blackboard</i> wiki module was rejected because of a general lack of features. None of the wiki tools were ideal and in the end <i>PBwiki</i> was selected because it had most of the features required (including RSS feeds and group access control).</p> <p>While the basic version of <i>PBwiki</i> is free, an annual subscription was purchased (approximately US \$300) so that RSS feeds could be accessed (this feature is now available in the free version of <i>PBwiki</i>).</p>
11. Set Up	<p>The project team created a wiki site using <i>PBwiki</i>, and created a template structure for the site. This included a home page, sections for the two activities, individual pages for each group, and a help page about using the wiki. Students were given access to the wiki through a shared password or 'key' (i.e. individual accounts did not need to be set up). Students were contacted via their university email accounts and through the LMS about how to access the wiki. This meant simply providing them the URL of the wiki's homepage and the shared password, and reminding them to enter the password and their university email address each time they entered the wiki.</p> <p>[It is worth noting that the authentication method for <i>PBwiki</i> has since changed and shared keys have been discontinued in favour of individual usernames and passwords. While less convenient than a single shared key, user accounts are relatively simple to set up and afford greater security and administrative control over the wiki].</p>
12. Staff Support Provided	<p>Initially only a small amount of support was provided to the lecturing staff involved in the subject. This involved setting up wiki accounts and log in details for <i>PBwiki</i> and some general instructions about how to view and edit pages.</p> <p>More formal support was provided to tutors and demonstrators of the practical groups. These tutors were given notes on the collaborative writing activity in particular, and were given instructions for accessing the site that were similar to those given to the students.</p> <p>One member of the project team also went to one of the regular tutor briefing meetings to explain the project and the rationale behind the activity prior to it commencing. In this forum there was a lengthy discussion, supported by brief notes provided by the project team, about how the activity could be introduced to students in the tutorials, and how to incorporate the activity into students' class time.</p>
13. Student Support Provided	<p>Students were given information about the wiki activity, support and advice before and during the task.</p> <p>This support was provided in a number of ways:</p> <ul style="list-style-type: none"> • The lecturer included a number of preparatory comments, encouragement and advice for very short periods of time at the start and at the end of some lectures during the semester. • Photocopied notes about the task, what was involved, and how to use a wiki effectively (including basic functions and etiquette) were provided to students in practical classes. These notes were also included as a PDF download via the learning management system. • Educational, administrative or technical support was provided when the first-year coordinator was contacted by students about the task. • The wiki itself contained detailed notes and help files for students, including notes about the task, what was involved, and how to use a wiki effectively. • Students could access wiki administrator help by sending an email to the wiki administrator (a member of the project team who provided technical support).

Of the 772 students enrolled in the subject, 90% participated in the collaborative writing task, contributing a total of 2715 page edits. Of the participating students, 81% satisfied the task requirements by contributing at least two page edits. However, 18% of all edits were cosmetic, resulting in no change to the content of the page and a further 11% involved changes to only one sentence.

Two focus groups were conducted, each with 10 students. The course coordinator and a tutor were also interviewed. A total of 65 students completed the online evaluation questionnaire, which focused solely on the use of the wiki in the collaborative writing task, and not the commentary task.

Generally the respondents were positive about their learning experiences with the wiki. The vast majority of students saw the task as relevant (85%) and the majority found the wiki easy to use, and the task useful and interesting. The majority of students (65%) said the activity improved their ability to share knowledge and opinions with others and similar proportions felt the activity improved their ability to reflect on what they were learning (60%) and helped them to develop their thinking skills by writing or producing study related material (60%). While many students felt the activity helped them understand the material they were studying (47%), over one quarter (26%) did not. A slim majority of students (53%) responded that they would like to use this technology again in other areas of their studies.

The positive results from the survey were supported by the interviews carried out with staff but are somewhat at odds with the focus groups carried out with students. The two staff interviewed both felt that the introduction of the wiki was a success and were happily surprised at what they saw as high levels of student engagement: "I was really surprised at how keen everyone was to participate."

Teaching staff were also pleased that the wiki allowed them to see how students' understanding was developing, opening the possibility for more responsive teaching: "I think this is a really good way to ... develop a more intimate teaching/learning relationship with them where you can pick up on things; like them maybe not picking up on a certain topic and then maybe adjust your teaching strategy for the coming week."

Staff had reservations about the steep learning curve for students. Most students reported no or little prior experience with wikis (71%), and about a quarter of students reported technical or other problems with the activity. It was not just the technology that demanded new skills of students; the collaboration and group work also was seen by staff as potentially demanding.

On the whole students in the focus group were much more critical of the collaborative writing activity than the survey responses indicated. Students felt that the activity needed to have more structure and direction. Some expressed a desire to have more information about the task earlier in the semester, a need for more specific guidelines on what was required, and to have more class time devoted to the task, preferably a computer-based class so that students could work on the wiki in class time.

Some students did not experience the wiki as a collaborative or coordinated team-based activity and had concerns about the usefulness of what was produced: "It didn't really encourage any group work as such because the task you could easily split it up into five different sections. We just went home and did the five different sections on our own." There was a tension in some students' responses about managing collaboration, workload and equity of contribution in the collaborative activity. However, for others this was clearly not seen as a problem.

Case 4: Creating a shared image resource in first-year chemistry

1. Brief Overview	In the <i>Chemistry Around Us</i> activity, students used digital cameras to capture images from everyday life that illustrated chemical processes they had learned about in lectures. The <i>Flickr</i> web site was used to publish and share the photographs, and students were also required to review other students' images and captions.
2. University	University of Melbourne
3. Team	Peter Tregloan (Subject Lecturer) Carmel Abrahams (Research Assistant) Brendan Abrahams (Director of Chemistry First-year Studies) Sarah Harvey (Research Assistant) Tom Petrovic (Technical Designer) Rosemary Chang Gregor Kennedy Terry Judd Jenny Waycott
4. Subject/Discipline	Subject Name: Chemistry A Discipline: Science/Chemistry
5. Students	The activity involved first-year students undertaking chemistry as part of a Bachelor of Science. The course is on-campus and has a broad demographic. There were 920 students in the subject and 799 students took part in the activity.
6. Learning Activity	This activity was part of a series of Independent Learning Tasks that were 'hurdle' requirements for students in first-year chemistry. Students were asked to join a dedicated private group on the <i>Flickr</i> web site and publish at least two photographs to the site. Each student was given two topics (from nine topics covered in lectures) and asked to take photographs that illustrated those topics. Students also had to write a caption, in the style of a textbook caption, identifying how each image illustrated chemical principles and they were required to 'tag' their images with appropriate keywords. Finally, students were asked to review other students' photographs and captions and to nominate the two best photos related to a specific topic. Students used a survey form on the university's learning management system to enter the title of the two photographs they had chosen and to give reasons for that choice.
7. Learning Objectives	This activity was designed to encourage students to relate their formal learning about chemistry to their everyday lives. It was hoped the activity would encourage students to continuously reflect on how chemical principles could be seen in their own experiences and the world around them. The activity was also designed to enable students to share other students' broader experiences and perceptions of the subject, complementing the details of the curriculum that are taught in formal class activities (thereby encouraging peer learning and knowledge sharing). The review aspect of the activity was designed to encourage critical evaluative thinking. The activity was also intended to enhance students' broader IT literacy and communication skills and encourage students to see these as potentially relevant to their learning.
8. Assessment	The activity was one of four Independent Learning Tasks that were hurdle requirements for the subject, meaning that students needed to complete each task in order to pass the subject.

9. Curriculum Design Work	<p>The activity was designed in consultation with two first-year lecturers, including the director of first-year chemistry, and a research assistant. Many discussions took place to determine the most appropriate use of the file sharing technology in this subject. After the idea of taking pictures of chemistry principles in everyday life was decided on as the activity, considerable effort was invested in determining the most appropriate way to structure the task for this cohort. Issues discussed included the number of topics, the number of photos, how to organise the assessment, students' workloads, the amount of time dedicated to the task, and integration with other aspects of the course. The inclusion of Independent Learning Tasks as part of the curriculum was a new initiative in first-year Chemistry and the <i>Flickr</i> activity was seen to fit well with this initiative.</p>
10. Technologies Reviewed & Used	<p>A number of photo file sharing web sites were considered, including <i>Picasa</i> and <i>Photobucket</i>. <i>Picasa</i> was rejected because it required a software download, which would have made the administration of the activity difficult with such a large cohort, and <i>Photobucket</i> did not at the time allow the creation of private groups. It was preferable that only students and teaching staff involved in the subject were able to view and post photos to the site, rather than having the site open to members of the public.</p> <p><i>Flickr</i> satisfied all the educational requirements, provided a good level of control over individual and group access, and was backed by a large company (Yahoo).</p> <p>Students used their own cameras and camera phones to take the photographs. The chemistry department purchased a small number of digital cameras that were available for students on loan; however no students borrowed these.</p> <p>Students used the university's learning management system to vote for what they considered to be the two best images identified during the peer review component of the activity. A survey form on the learning management system was developed for this purpose. Although this required students to complete the task on two separate tools, there were considerable security and administrative advantages in using the learning management system for this part of the activity.</p>
11. Set Up	<p>The project team established a private group on <i>Flickr</i> called <i>MU_Chem</i>. Students were then sent an email inviting them to join the group. This process took longer than expected due to <i>Flickr's</i> anti-spam measures, which limited the number of invitation emails that could be sent at one time to 100.</p> <p>Upon receiving the email, students were required to first join Yahoo (if they didn't have an account already), then join <i>Flickr</i>, and finally join the <i>MU_Chem</i> group within <i>Flickr</i>.</p>
12. Staff Support Provided	<p>The chemistry department's librarian was trained by project team members to respond to queries about uploading digital photographs to computers and to the <i>Flickr</i> web site. As the activity was an Independent Learning Task, tutors and lecturers did not play an active role in this activity, and therefore no formal staff training was provided. However, tutors were briefed about the activity, what was involved and were invited to view a test site, and a part-time teaching assistant was employed by the chemistry department to support the project (see below).</p>
13. Student Support Provided	<p>Students were given detailed written instructions that explained the objectives of the activity and gave a step-by-step account of the processes they needed to follow to satisfactorily complete the activity. In addition, a web site containing further information about the project and a list of answers to frequently asked questions was established. Students were able to email the assistant employed by the chemistry department whose job was dedicated to supporting the project and responding to student queries. The department librarian dealt with queries relating specifically to uploading photographs to computers and the <i>Flickr</i> web site.</p>

14. Evaluation Findings

In all, 799 students participated in the activity and contributed 1894 photos to the *Flickr* site. A total of 4262 tags were added to the submitted photos and only 45 photos lacked descriptions.

The online evaluation survey was completed by 44 students at the end of semester, and 10 students took part in a focus group. Four staff members were also interviewed in a focus group as part of the evaluation.

The quantitative results from the student survey suggested that many respondents felt the activity was not particularly relevant or useful and it did not support their learning. For example, 68% did not think the activity helped them better understand the material they were studying and 62% did not feel it improved their ability to reflect on what they were learning. While students were slightly more positive about how the activity helped improve their ability to share knowledge and opinions with others (26% agreed) and develop their thinking skills (26% agreed), overall, most respondents felt the activity did not support their learning.

Qualitative data from the survey provided further evidence of student disenchantment with the activity. Some students said they found it difficult to navigate around the *Flickr* website, some did not like having to sign up to Yahoo ("creating another email address that I didn't want"), and some experienced problems receiving the invitation email and joining the *MU_Chem* group on *Flickr*. These problems were reiterated by students in the focus group interviews. Furthermore, some students who completed the online survey felt the activity was time-consuming and did not have a practical purpose: "It wasted time that could have been spent revising important relevant topics" or "It seems an unnecessary and unhelpful hurdle that will not actually teach us anything practical."

However, some students interviewed felt the activity was enjoyable, broadening their learning experience and providing a welcome opportunity to view other students' work. For example one student said that by "look[ing] at how some people interpreted it different to you and just reading the captions, you learn a lot about how chemistry influences everyday life," while others felt it got them "thinking outside the box."

In contrast to the students, staff members interviewed viewed the activity as a success and intend to continue implementing it with future student cohorts. Staff could immediately see the effort students had put into the activity: "[it] made me feel good about the students in this class. I think they put in effort and I was tremendously impressed." Staff felt the activity successfully enabled students to make connections between their formal learning and their everyday life: "I like the connection that they are making. I am seeing it."

Students offered suggestions about how the activity could have been improved, including: linking the photos to more topics, so there are fewer similarities between photos; using a tool other than *Flickr*, preferably one that does not involve creating a new email address, possibly within the learning management system; providing more reference to the activity and instructions on how to do it during lectures and linking it more with lectures; starting the activity earlier in the semester and providing clearer deadlines; using the photo activity to prepare for a new lecture topic; and finally, providing more information to the tutors, so students can ask tutors about the activity.

Case 5: Creating a shared image resource in biology

1. Brief Overview	A 'traditional' assignment that required individual students to collect and categorise beetles was translated into an online, file sharing exercise. On-campus and distance students captured digital photos and audio files representing a diverse range of beetles, uploaded these to an online <i>Beetle Gallery</i> , and undertook some comparisons based on the shared images.
2. University	Charles Sturt University
3. Team	Andrea Wilson (Lecturer and Subject Coordinator) Barney Dalgarno Andrea Bishop
4. Subject/Discipline	Subject: Animal Systematics Discipline: Biological Sciences
5. Students	There were 25 on-campus students and 19 distance education students enrolled in this subject; these were predominantly 2nd year students (distance students are generally part-time and may be in a later year of study). Students could come from a number of degree programs, including Bachelor of Environmental Science, Bachelor of Science, and Bachelor of Applied Science.
6. Learning Activity	<p>The <i>Beetle Gallery</i> was part of a broader <i>Beetle Collection</i> exercise, which comprised three parts. For Part A, the <i>Beetle Gallery</i>, students were required to locate a total of six beetles from at least three different habitats, and upload photographs of each (taken from at least two angles or directions) along with a document containing descriptive information. Video footage and/or audio recordings of the beetles could also be uploaded.</p> <p>Images ideally highlighted diagnostic characteristics of the beetles: antennae type, leg type, thorax type, the pronotum (e.g. horns, spikes, antlers, smooth), abdomen shape (elongate, round, oval, rectangular), thorax colour, wing colour and wing patterns if present.</p> <p>Files were uploaded by students into the <i>Beetle Gallery</i> via the subject's <i>Interact</i> site (<i>Interact</i> is CSU's <i>Sakai</i>-based online learning system). A new folder was created for each beetle (i.e. a single folder for all photographs, video and audio relating to the beetle and a document containing descriptive information about the beetle). A unique descriptor was used to name each beetle folder, according to the following naming convention – student surname, followed by the antennae, leg, thorax type and then an identifying number.</p> <p>Part B of the <i>Beetle Collection</i> exercise required students to:</p> <ol style="list-style-type: none"> 1. Tabulate the diagnostic characteristics of the six beetles they had collected in Part A; 2. Compare and contrast their beetles to other specimens in the <i>Beetle Gallery</i> to become more familiar with the diverse array of species within the Coleoptera family and to emphasise the ecological basis for shared and different traits; and 3. Draw three of the beetles. <p>Part C required students to physically mount and submit their beetle specimens.</p>

7. Learning Objectives	<p>Given the large number of beetle species, not all have been described and only a handful of entomologists are able to identify most beetles down to species level. For this reason many people use “recognisable taxonomic units” (RTUs) for identification purposes. This essentially involves describing individual beetles based on observable morphological characteristics. For this assignment students were required to collect and describe the observable morphological characteristics of six beetles collected from different types of habitats.</p> <p>In completing the overall <i>Beetle Collection</i> exercise, students are expected to achieve the following learning outcomes:</p> <ul style="list-style-type: none"> • Become familiar with beetle morphology • Develop skills in insect collection, labelling and storage • Gain experience in scientific drawing and image capture to distinguish different characteristics of specimens • Gain experience in the methodical preparation of a useful reference collection.
8. Assessment	<p>The <i>Beetle Collection</i> exercise accounted for 30% of the available marks in the subject. These marks were allocated as follows.</p> <ul style="list-style-type: none"> • Part A: 20% was allocated for successfully creating individual folders for each beetle, uploading correctly named images to the <i>Beetle Gallery</i>, and including informative, useful and complete descriptions of each beetle. • Part B: 20% was allocated for comprehensively, correctly and clearly presenting information in tabular form for each of the beetles, including appropriately contrasting specimens and clearly listing the relevant diagnostic characteristics of the beetles. A further 20% was allocated for creating clear, simple and informative diagrams. • Part C: 40% was allocated for collecting beetles of appropriate condition and pinning and labelling them correctly.
9. Curriculum Design Work	<p>The activity was based on an existing learning exercise and as such the curriculum was not greatly altered. However, the exercise was enhanced by introducing a “compare and contrast” component in the task, which enabled students to gain a deeper understanding of the ecological or functional aspects of the exercise, rather than just the taxonomic aspects focused on in the original task. The project team assisted the subject coordinator with preparing the written description of the resource sharing part of the task (Part A) which was included in the subject outline.</p>
10. Technologies Reviewed & Used	<p>The <i>Resources</i> tool provided by the <i>Sakai</i>-based <i>Interact</i> online learning system used across all subjects at CSU was considered to be adequate for this activity because it provided a hierarchical store of resources of any type with functionality for uploading and viewing from a web browser. Although the tool has limited capabilities for searching for resources and for attaching meta-tags to resources, these capabilities were not considered important for the activity. Given that an adequate tool for this activity was already available within the university, no other technologies were reviewed.</p>
11. Set Up	<p>Students already had login access to the <i>Interact</i> online platform for this subject. The subject coordinator needed to set up the overarching folder framework on the <i>Interact</i> site, post sample files as examples, and set up appropriate access permissions to the folders (upload, delete, etc.) for the students.</p> <p>The majority of students had access to suitable devices to collect images, however, a digital camera and video recorder were made available during scheduled practical times and the residential school which was run for distance students.</p>
12. Staff Support Provided	<p>A member of the project team assisted with writing revised assessment instructions for inclusion in the subject outline, and worked with the lecturer to build her understanding of how the file-sharing folder should be structured.</p>

13. Student Support Provided

Detailed written instructions were provided to the students about how to create and name folders using the *Resources* tool, appropriate file formats, and uploading files to the folders.

Links to tutorial materials on the use of the *Resources* tool (where the *Beetle Gallery* was situated) were provided through the online subject forum early in the session. Optional sessions were also scheduled in a computer laboratory at the residential school to help students upload their beetle descriptions and photographs.

The subject coordinator fielded support queries via phone and email, although she reported that these were not excessive. Some students required assistance with taking suitable images and uploading them from the camera.

The CSU IT service desk was used for student support with general *Interact* problems, such as access problems for students with Apple Macintosh computers.

14. Evaluation Findings

Seventeen on-campus and eight distance education students responded to the survey. Four on-campus students participated in a focus group and a further four distance education students were interviewed individually by telephone. Overall, students evaluated the exercise positively, finding it interesting (64%), easy to use (72%), useful (60%) and enjoyable (76%). Most said the activity was neither confusing (88%) nor irrelevant (84%).

A majority of students (72%) reported that the activity assisted with their studies, and more specifically, 74% indicated that the activity improved their ability to share knowledge and opinions with others, and 65% felt the activity improved their ability to reflect on their learning and develop independent research skills. A total of 41% of students indicated they would like to see this kind of activity used in other areas of their studies (although another 52% were undecided about this).

The lecturer and numerous respondents commented on the value of the shared exercise increasing the group's exposure to a broader range of beetles, as well as showing how different people interpreted slight differences in characteristics. A clear theme was that making comparisons using the gallery made the students think more about diversity, morphology and classification, and about linking morphology to function. The lecturer also noted the potential the activity demonstrated for building greater flexibility into the subject, and for promoting student interaction between and within the distance and on-campus student cohorts.

The number of student 'actions' (post, read, revise) related to each item posted in the *Beetle Gallery* gave insight into student engagement with the activity. Distance students demonstrated higher levels of activity, roughly 20% more than on-campus students. Activity within each of the *Habitat* folders showed broad interest by students in the resources shared by others. Comments also indicated many students felt a greater sense of involvement as a result of contributing to this group activity. On average the distance students assessed the technology application more positively and reported finding the technology less confusing than on-campus students. Roughly the same proportion of students from each cohort reported technical problems (36% overall).

Students' access to appropriate cameras and software to modify their images emerged as an important issue. Many of the specimens being documented by students were small and students often needed to emphasise specific morphological characteristics. Several students commented on the difficulty they had in obtaining good images and their frustration with reviewing images of poor quality in the gallery.

The utility of the *Interact* platform also emerged as an important issue. Students were frustrated by needing to upload files one at a time and by system outages during the semester. Students suggested that this aspect of the activity and technology could be improved if thumbnail images were used. Students made a number of other suggestions for improving the activity including extending its use to other insects and animals, rocks/geology, landscapes, and cultural heritage sites.

Case 6: Creating an image collection in environmental education

1. Brief Overview	Teams of students in a 3rd year education elective collected photos while conducting learning activities with primary school children, used the photos to report on their experiences and shared the photos in a collection as a record of the different activities conducted.
2. University	University of Wollongong
3. Team	Michael Connor (Lecturer) Brian Ferry (Subject Coordinator) Tiffani Cameron (Tutor) Sue Bennett Karl Maton
4. Subject/Discipline	Subject: Environmental Education – The Natural Environment Discipline: Education
5. Students	The students were in their 3rd year, enrolled in an on-campus elective in the Bachelor of Education program. Elective classes are typically small and in this case had an enrolment of 13 students.
6. Learning Activity	Teams of students documented school-based practical exercises in environmental education by taking photos of the group activities they conducted with children to create an image database for the class. The students took photos and recorded notes during their visit to the school, later uploaded the photos to a group space for the class, added text descriptions and tags, and then reviewed the full set of images. Finally, students voted on which of the class' images should be developed into a presentation to be provided to the school as a record of the activities.
7. Learning Objectives	<p>This activity aimed to:</p> <ul style="list-style-type: none"> • Enable students to create a collaborative record of the practical experience for later reference • Develop students' understanding of the use of images as a means of recording and analysing experiences • Develop students' appreciation of image sharing as a collaborative educational activity. <p>The activity enabled students to record their teaching activities using images in addition to written notes. It was anticipated that this would provide learners with a richly detailed record as a basis for analysing and reflecting on their activities. The sharing of the images also enabled students to appreciate the experiences of other groups in the class.</p>
8. Assessment	The activity was part of the students' final assessment task for which they had to produce a report of their team's activities, worth 25% of their overall mark for the subject. Each team had to select at least two images per team member from the ones they had taken to integrate into their final report.
9. Curriculum Design Work	The teaching team re-designed the final assessment task to incorporate digital image collection. Images had been used previously in the report section, but this was extended to include the creation of the class database. This also required the inclusion of an introductory practice session scheduled early in the semester.

10. Technologies Reviewed & Used	<p>The team considered a number of image collection options and chose <i>Flickr</i> because it allowed the creation of a private group for sharing the photos. This was essential because the images might include school children and it was important that their identities were protected. An option was included for the teacher to moderate the content of the group, allowing any photos that included the faces of children to be removed. This was an important consideration because even though students were aware of the need not to include photos with the faces of children, some may have been uploaded unintentionally.</p> <p>A private group also made the process of sharing more manageable because it ensured that only images for that group would be included. Other image sharing sites did not offer the private group option and other options for sharing images (e.g. using the learning management system) did not allow for tagging and searching.</p>
11. Set Up	<p>Prior to the first class a private group site was established and all of the students in the class were invited to join via an email sent to their university email accounts. During a tutorial early in the session, students created <i>Yahoo</i> accounts and their own <i>Flickr</i> accounts, and then joined the private group.</p> <p>The teaching team also scheduled two tutorial classes in the computer labs, one for the practice session and another to enable students to upload their images, construct their reports, and book cameras from the audio-visual unit for the practice session. Students were advised to bring their own camera or book a camera from the audio-visual unit for the school visit.</p>
12. Staff Support Provided	<p>The teaching team worked together to develop a plan and test the software. No specific technical assistance was required.</p>
13. Student Support Provided	<p>The full activity was modelled in a hands-on workshop during a tutorial session early in the semester. During the workshop the students: set up their accounts; practiced adding an image which was available on the computer; practiced using a digital camera in the computer lab; went out to the local botanic gardens to take photos; and returned to the lab to upload, tag and describe their photos. No other support was required.</p>
14. Evaluation Findings	<p>Seven students took part in focus group interviews, and one staff member was interviewed. In addition, 11 of the 13 students enrolled in the subject completed the evaluation questionnaire all of whom were full-time domestic students.</p> <p>Overall, the students indicated that they found the activity easy, but were divided on whether it was relevant and useful. As a group, the respondents were also neutral about the learning benefits, with the most positive responses indicating that the students felt they had improved their technology skills, but not their knowledge of the topic or other academic skills. Only three students felt that the activity assisted them with their studies, and only two indicated they would like it to be integrated into other areas of their studies.</p> <p>Only one student had used <i>Flickr</i> prior to the class, but in the focus groups some students indicated that they had uploaded and commented on photos before in social networking tools. Students also said that they found the practice exercise useful and straightforward, helping them to prepare for what they would have to do on the school visit. One student commented that the process was “a lot easier” than she imagined.</p> <p>In contrast to the neutral ratings students gave the activity on the evaluation survey, several commented positively on the value of being able to see other groups’ photos. For example, “It was good to see what other people did and get like a full scope, rather than just what we did” and “I was shocked at the diversity actually in the school because when you first walk into a school you just sort of see some trees and a few gardens, but when I actually saw the individual photos of the other schools it actually opened my eyes.”</p>

14. Evaluation Findings (CONTD)

Another common observation in focus groups was that the activity had given the students some ideas for their own future teaching. Several commented specifically on how they could use a similar image sharing activity with their own classes in future.

The discussions also revealed a number of practical problems with the overall task which impacted on the image collection and sharing. Almost all students felt they did not have enough time to complete the audit, although some admitted to not being well enough prepared, and just going along with the task without really thinking about it. There was also some confusion about the overall task plus a reflection by the students that they lacked background knowledge in science which would have enabled them to complete the task more satisfactorily.

The teachers were pleased with the overall outcome, observing that the students were highly engaged with the task and that the quality of the final report was better than in previous years. There was some reflection on the extra time and preparation needed, for instance working with cameras (charging and batteries) and setting up the site for sharing. No technical problems were identified in either the student or staff feedback.

The activity could be improved by focusing more on the benefits of sharing the photos amongst the group. This would require the design of activities to extend beyond capturing, uploading, viewing and discussing the collection.



Case 7: Student-generated podcasts in medical education

1. Brief Overview	This implementation was a semester long project in which a podcasting system was created to support peer learning in a problem-based medical curriculum. Students could create short podcasts that communicated their understandings, difficulties or opinions about the weekly clinical problem under investigation and they were also able to comment on and rate other students' podcasts.
2. University	The University of Melbourne
3. Team	Steve Trumble (Medical Education Unit) Tom Petrovic (Technical Developer) Greg Nelson (Technical Developer) Wai Chan (Technical Developer) Gregor Kennedy Rosemary Chang
4. Subject/Discipline	Students completed two subjects in this semester as part of their studies in the Medical Degree: <ul style="list-style-type: none"> • Cardio-respiratory & Locomotor Systems • Health Practice 3
5. Students	The full cohort of 319 second-year medical students were invited to participate in this study, although only a subset decided to do so (approximately one-fifth of students). All students were campus-based and the medical degree is comprised of approximately 25% international students and 30% graduate students (students with a previous degree).
6. Learning Activity	<p>The context for the implementation was the problem-based learning curriculum at the University of Melbourne. As part of this curriculum students investigate problem-based cases across the 14-week semester. A critical learning activity of each week is a sustained period of self-directed learning.</p> <p>A podcasting system was developed to support both students' investigation of the problem and their self-directed learning. The system, called <i>Problm</i>, consisted of a web database application, which allowed students to create, upload, publish, subscribe to, listen to, rate and comment on podcasts. The podcasting activity was designed to minimise technological impediments associated with the use of the system and was loosely based on the features offered by <i>YouTube</i>.</p> <p>Students were asked to create podcasts in one of three areas:</p> <ul style="list-style-type: none"> • Aha! I get it! - podcasts that offer an explanation of some aspect of the problem of the week. • Huh? I don't get it. - podcasts that express a difficulty about the problem of the week. • IMHO. In My Humble Opinion. - podcasts that offer a comment on something related to the problem of the week or the course in general. <p>Students could upload their podcasts for others to listen to, comment on or rate. Students could also access other students' podcasts via podcast software such as <i>iTunes</i>, and were able to subscribe to syndication of podcasts through RSS.</p>

7. Learning Objectives	<p>This activity was designed to encourage and develop:</p> <ul style="list-style-type: none"> • Students' abilities to review and analyse course content • Students' thinking and learning through producing and creating content <p>Synthesis of course work</p> <ul style="list-style-type: none"> • Collaborative learning by providing opportunities to converse with other students and to share other students' perceptions of the topics covered • Students' speaking and presenting skills • Opportunities for students to demonstrate what they have learnt and their thinking about the topics in the course.
8. Assessment	<p>This activity was not part of the formal assessment of the course. It was provided as an additional forum, akin to the text-based discussion forums provided on the learning management system, through which students could engage in discussion and reflection on their studies.</p>
9. Curriculum Design Work	<p>The learning activity and software were designed by the faculty's Biomedical Multimedia Unit, in association with the Medical Education Unit. The activity was designed to fit into the problem-based learning curriculum, providing a further opportunity for students to take part in a self-directed learning activity.</p> <p>A number of discussions were held with staff from the Faculty's Medical Education Unit about the design of the activity and how it could be integrated with the course. Given that students were already provided with the opportunity to engage in text-based discussion forums as part of their course, the use of a podcasting activity was regarded by course conveners and the project team as pedagogically similar, albeit employing different media.</p>
10. Technologies Reviewed & Used	<p>The technology that was best suited to student-generated podcasts was <i>iLecture</i>. However, when the project was originally conceived there was no facility in the University's installation of <i>iLecture</i> to allow students to create their own podcasts.</p> <p>The <i>Problm</i> system was built to enable students in a single cohort to generate and review peer-based podcasts in a relatively closed environment.</p>
11. Set Up	<p>Students' details (first name, last name, email, login) were exported from the student administration system and uploaded into the <i>Problm</i> system. This allowed <i>Problm</i> to recognise students who were potential participants in the implementation. A generic default password was allocated to all students and an email was sent to them giving details of the URL for <i>Problm</i> and how to login. Students were required to change the allocated password to one of their own preference at login.</p>
12. Staff Support Provided	<p>Problem-based learning tutors were informed that the implementation project would be trialed in the semester. They were given a briefing about what was involved for the students, but as the podcasting system was not open to staff they were not provided with support.</p>
13. Student Support Provided	<p>Extensive help files and instructions were developed for this project which were available from the website in HTML and PDF form. Help included assistance with: recording equipment, downloading and setting up the recording software, editing sound files, uploading files to the website, commenting on recordings, rating recordings and subscribing to recordings.</p> <p>Students could access technical support via an email link from the website. A project team member responded to students' emails.</p> <p>In addition, a drop-in session was scheduled each week to provide face-to-face support to students.</p>

14. Evaluation Findings

Initial interest in peer-produced podcasts was relatively high with 54 sessions logged by 33 participants in the first week of the activity. However, over the first five weeks of the implementation no podcasts were produced by students, and as a result interest quickly waned. The team then decided to offer an incentive for students to participate in the activity which resulted in an overall increase in participation, with an average of just over two podcasts per week in the last eight weeks of semester.

Of the cohort of 319 second-year students, 85 participated in the podcasting activity but only six students actually made a podcast. For the 85 participants, 442 sessions were logged with a total of 3749 hits across all pages of the *Problm* site. Forty-eight podcasts were created by the six podcasters and, of the different categories of podcast, 28 were 'Aha!', six were 'Huh!' and 14 were 'IMHO'. The majority of participants (65) were 'listeners', the majority of whom played podcasts online and listened to individual podcasts more than once. Only eight of the 85 students commented on a podcast.

Only six students completed the online questionnaire and four students took part in a focus group. None of those surveyed had previous experience with podcasting. One member of staff who provided technical and educational advice in the implementation was interviewed.

While these students felt the activity was interesting and easy to use and there were few technical problems, there was a tendency to see the activity as irrelevant and not that useful. Three of the six students surveyed felt it helped them reflect on their studies and share material with others, but the other three students who responded did not feel this was the case. When asked if they felt the activity helped with their studies, three students said it did not and three said it 'maybe' helped. Only one student said they would like to see this activity used in other areas of their studies.

Students expressed various likes and dislikes about podcasts. Likes included the opportunity for self expression and the novelty and fun associated with making podcasts. Dislikes included difficulties in using the recording software and understanding the instructions. There were positive aspects of podcasts in relation to support for learning because they "helped reinforce some of the stuff we're learning. Like, it helped me put it into words." One student felt she was making a positive contribution to student learning. Along the same lines another student reported "...in med, often you find that by teaching someone else a concept... you're learning as well to revise the concept..."

However there was some suspicion about the quality of the content produced by other students, with one student commenting: "But listening to other people's, not so much [use in reinforcing knowledge], depending on obviously if you know anything about what they're talking about." There was a sense that podcasts were a poor use of time: they took time to produce and there was no easy way to skim and evaluate the content before deciding to listen to it, compared to text-based discussion.

The staff member interviewed was disappointed in the lack of participation but articulated several reasons for this, including: medical students are strategic in their use of time; students did not have the time to participate in this activity; and there were other communications media available to students which were arguably more efficient. Integrating the activity more closely with the curriculum and assessment was seen as a clear way to improve the implementation and students' engagement with it.

Case 8: Students sharing online resources through social bookmarking

1. Brief Overview	First-year Arts students used social bookmarking to create and share information resources online in preparation for essay writing. Social bookmarking is based on a website where users can create lists of links to web-based resources ('bookmarks'), add keywords ('tags') and notes about items in their list. Users can also see others' bookmarks and read and add to others' lists and notes.
2. University	University of Melbourne
3. Team	<p>Marion Campbell (Faculty of Arts Assistant Dean, Curriculum & Teaching) Matt Carter (Faculty of Arts Online Learning & Web Officer) Roland Burke (Tutor Coordinator) Alicia Coram (Tutor Coordinator) Klara Hansen (Tutor Coordinator) Radha O'Meara (Tutor Coordinator) Mary Coghlan (Information Literacy Librarian) Mary Stone (Information Literacy Librarian) Rosemary Chang Kathleen Gray Terry Judd</p>
4. Subject/Discipline	The activity was implemented in the four inter-disciplinary foundation subjects in the inaugural first semester of a redeveloped Bachelor of Arts degree: <i>Democracy; From Homer to Hollywood; Knowing Nature; and Philosophy, Politics and Economics</i> .
5. Students	<p>This activity was offered to the entire cohort of first-year Arts students, comprising approximately 1700 students, all of whom were campus-based.</p> <p>The Melbourne University Bachelor of Arts is a highly competitive degree to enter and, given its size, has great diversity.</p>
6. Learning Activity	<p>As part of the social bookmarking activity students were asked to:</p> <ul style="list-style-type: none"> • join an online group for their subject • build a collection of links ('bookmarks') to online research resources they searched out that were relevant to their major research essay • assign subject-related keywords ('tags') to each online resource they bookmarked • evaluate the quality of each resource they bookmarked and annotate each bookmark accordingly • share their bookmarks and annotations with the other students in their subject • review and critique the annotated bookmarks of other students, and add feedback about resource quality to other students' bookmarks. <p>Students started the activity in either week 8 or 9 of the semester, and the activity ran over the four-week period prior to the due date for the major research assessment task.</p> <p>Tutor coordinators each set up a subject group for their students and added brief instructions and guidelines that had been mutually agreed among the project team. Beyond this, tutor coordinators and library staff were invited to engage with student content, add content and provide feedback as they felt appropriate.</p>

7. Learning Objectives	<p>The activity aimed to enable students to:</p> <ul style="list-style-type: none"> • develop skills in the use of emerging information technologies • develop an increased capacity for locating and evaluating research resources • develop a capacity for critically analysing the evaluations of others • recognise the value of cooperative scholarship.
8. Assessment	<p>All students were required to participate online in the first-year Arts community in some way. The social bookmarking activity was one of five ways that students could choose to meet this requirement. It was not directly assessed.</p>
9. Curriculum Design Work	<p>The project team drafted the educational design of the activity, which was developed in consultation with the subject's academic managers at a number of planning meetings. The activity design was further discussed and refined following briefings with Tutor Coordinators and Information Literacy Librarians.</p>
10. Technologies Reviewed & Used	<p>Initially staff selected the <i>Blackboard Scholar</i> social bookmarking tool available within the university's learning management system. After a pre-semester trial, staff decided not to proceed, based on the inability of this tool to support closed groups, or to generate summaries of the activities of each group member.</p> <p>This project went ahead using a generic social bookmarking tool available free on the web, <i>Diigo</i> (www.diigo.com).</p>
11. Set Up	<p>The educational developers established a private group on <i>Diigo</i> for each of the four subjects. Staff and students were invited, either in a hands-on workshop or via a do-it-yourself guide, to first create an account in <i>Diigo</i>, and then to join their respective subject group. This involved navigating from the <i>Diigo</i> Web site to their email inbox, then back to <i>Diigo</i> twice, to verify their account/group membership following <i>Diigo</i>-generated instructions and links. Teaching staff were allocated administrative rights for their own groups, to add/amend students and postings. New <i>Diigo</i> members are automatically prompted by email to do such things as activate a browser menu add-on, create a user profile, add friends, etc., although these functions were downplayed in this activity.</p> <p>No provision has been made for continuing, archiving or otherwise marking the end of semester in the <i>Diigo</i> groups, so the content remains in each group at the discretion of the individual member who added it or the group administrator/s.</p>
12. Staff Support Provided	<p>Staff were provided with:</p> <ul style="list-style-type: none"> • A hands-on workshop and supporting documentation for tutor coordinators and academic managers and administrators • Individual and group demonstrations for the Information Literacy Librarians • Technical advice (e.g. about features of the various tools available on the bookmarking site) and pedagogical advice (e.g. how to integrate bookmarking into library resources and services) for university information services staff • Mobile phone support for faculty administrators provided by one of the educational designers.
13. Student Support Provided	<p>Students were provided with:</p> <ul style="list-style-type: none"> • Hands-on workshops and drop-in sessions (12 in total) in the university library during first two weeks of implementation • Student self-help instructions posted on the university's learning management system • Student learning skills notes, which included advice on how to improve your essay by using social bookmarking, how to find and evaluate web-based information for academic purposes, and points about student conduct when using social bookmarking for academic purposes. • Email support for students from the Online Learning and Web Officer.

14. Evaluation Findings

The level of student participation was extremely low and the activity did not achieve critical mass despite a communication campaign being conducted online and in lectures. Only 55 students (approximately 3% of the cohort) took part in some fashion, well below the target of engaging 10% of the student cohort. Students added only 27 bookmarks to the four subject groups and the calibre of student work – resources chosen, tags, evaluations and interactions – was judged by the tutor coordinators to be poor.

Eight students responded to the questionnaire and one student was interviewed as part of the evaluation. Observations of student workshop activities and subsequent online activities, and the findings from the questionnaire and interview data suggested that students were divided or ambivalent about most aspects of the activity.

They generally agreed that the activity had the potential to help to develop thinking and group work skills, and was not difficult or confusing. They tended to be more positive about individual benefit (“It has certainly helped me to organise my resources more effectively”) and less positive about community benefit (“It follows that virtually no-one will put any effort into ‘group’ activities when the group does not truly exist”). Four of the students surveyed indicated that the activity helped to develop their independent research skills while four said it did not. Interestingly, while two-thirds of students (63%) indicated that the activity did not help them with their studies, the same number indicated that they would like to use the activity in other areas of their studies.

Five staff members (three tutor coordinators, two academic managers and one librarian) were interviewed over the course of the activity. The data collected from staff suggested that they were generally interested and intrigued about the educational potential of social bookmarking but felt that the activity was unrealistically ambitious, citing the degree of complexity and the shortness of the timeframe. In comparison to the other hurdle tasks offered to students, the social bookmarking activity might have seemed onerous and student participation may have reflected this. Some staff indicated that the social bookmarking activity might be more suited to students in later years at university.

The evaluation also revealed staff members’ mixed views about whether it was academically appropriate to make use of non-scholarly forms of online information – some advocated the use of the whole web, while others wanted students to use refereed sources only. To some extent staff members’ views on this was subject-dependent.

The degree to which staff engaged in the activity was, to some extent, affected by underlying contextual issues. At the time of implementation, major curriculum changes were being undertaken at the university which competed for the attention of staff and also had raised industrial issues about increased workloads and changing staff roles.

Only one student, two academic staff and three librarians involved in the implementation had any prior knowledge or experience of social bookmarking. The relatively poor participation in the activity may be a reflection of both staff and students’ insufficient familiarity with the concept of sharing bookmarked resources. More time and experience may have been required for individuals to truly integrate this activity with their current learning and teaching experiences.

Technical issues with the tool selected, *Diigo*, were negligible; it was easy to use and it performed well. Even so, it did not work consistently in *Internet Explorer* and it did not allow PDFs or images to be bookmarked, which were the file formats that students often wanted to bookmark. Completing the activity in university computer labs was at times challenging as one of the two ways in which bookmarks can be created in *Diigo* required downloading and installing a program (which the university did not allow).

4.3 Implementation Considerations

This section draws together the findings of the evaluations to discuss issues grouped into three broad areas that need to be considered in any implementation of a new technology in higher education – pedagogical, technical and administrative.

4.3.1 Pedagogical considerations

Findings from the evaluations highlight the low levels of prior exposure many students have had to the technologies implemented. Although, in most cases the students were quick to develop competence with the tools, this does suggest that caution should be exercised when making assumptions about what students already know. For example, the wiki-based activity made apparent how unfamiliar this type of collaborative writing is to most students. Furthermore, even when students are familiar with a technology or tool in everyday life, for example with blogging or image-sharing, they may have preconceptions about that activity which need to be addressed when asking them to adapt their skills to an academic task. This may require modelling or explicit instructions to help students to see the academic purpose and relevance.

It is also clear that although a tool may be easy to use and even engender a high level of engagement, students do not necessarily feel that using it helps them with their studies. This was demonstrated in several evaluations in which only a minority of respondents were positive about the benefits of the particular technology-supported activities for their learning. Further, in other cases a large minority of students indicated they did not find the activity helpful for their learning. In some cases, respondents highlighted the value of being able to see other students' work and experiences, with the caveat in the case of the podcasting implementation that this should be of high quality to be useful. Evaluation findings also suggest that the benefits for improving individual critique and research skills can be more significant than those arising from collaborative components. This appears to be the case in both the podcasting and the wiki-based activities.

The challenges for students may lie in the unfamiliar nature of the learning activities they experienced in the implementations, which meant they were not able to draw on previously successful strategies or experiences. This is supported by the types of criticisms students made of some of the activities; for example, that the activities did not help them to prepare for exams or assist with assessable components. In these cases students suggested that more structure and greater focus would improve

these activities. In cases when the activities were relevant to developing students' knowledge and skills (e.g. the journalism blogs and the *Beetle Gallery* image sharing), students' evaluations tended to be more positive. Students were also critical of activities that required a significant time investment for little apparent benefit. These calculations also reflect the low take-up when activities were voluntary, further emphasising the need for close alignment with assessment.

The cases also highlight some important design and planning issues for teachers. First of all is the need to consider the effort required to design or re-design an activity to effectively incorporate these types of emerging technology tools. For example, finding a pedagogically appropriate tool may not be straightforward. In several cases the need for a private space in which students could interact was not supported by some of the tools available. Also consideration must be given to integrating new activities in ways that do not significantly increase student workloads, for example by enhancing or replacing an existing activity rather than adding a new one. The social issues of collaboration are also highlighted in the reticence some students expressed in commenting on, editing, or critiquing other students' work, and in negotiating the workload associated with shared tasks. These need to be handled sensitively to enable students to realise the benefits of using these technologies to work with their peers.

4.3.2 Technical considerations

The cases illustrate several key technical choices when implementing learning activities using emerging technologies. One relates to the level of support available depending on the extent to which the institution supports the chosen technology. The CSU blogging activity was implemented using a tool within the existing learning management system; however the tool itself was new and not well supported at the time of the implementation project. Also at CSU, the image sharing activity in biology was implemented in the learning management system, adapting existing functionality for the task and having the advantage of being secure and private. This implementation ran more smoothly from a technical perspective but did not have all of the features of some of the external image sharing tools, thus demonstrating the compromises which might need to be made. Other implementation projects used external Web-based tools like *WordPress*, *Flickr* and *Diigo*. In choosing these tools teams made decisions about the pedagogical suitability, often based on the ability to create private groups, a feature which was often limited in tools more focused on open sharing of content. External freely-available

tools have the advantage of being easy to use without prior experience, but require students to set up and manage additional accounts, limit the amount of control teaching staff can have over the environment, and sometimes offer irrelevant functions which detract from the activity. The final option, chosen in the University of Melbourne's podcasting project, was to custom make an application, inspired by publicly accessible external tools, but tailored to the educational context.

A further issue made apparent by the use of external tools is that many of these tools are new and still undergoing development. This accounts for the sometimes high levels of technical difficulties experienced in some implementations. Furthermore, these tools are constantly evolving such that their functionality changes during the teaching session. Although no negative experiences were recorded during the implementations in this study, this nevertheless raises the possibility of changing technical support needs throughout the semester.

4.3.3 Administrative considerations

The experiences in this project demonstrate the need for new processes to be established within and beyond the immediate context of implementation. In some cases, processes needed to be established to invite students to set up an account for an external service and also to join a private group. In these cases the group needed to be created and appropriate privacy and moderation settings established. Even when an existing internal tool is used, this may mean creating new structures to manage the learning activity, for example the folder structure in the Beetle Gallery activity.

The impact of support also needs to be considered. In some cases the scale of the implementation was sufficiently small and the technical skills of the staff sufficiently well developed that little additional support was required. However, in most implementations significant effort and expertise was required to design, develop and maintain the activity. Furthermore, all of the implementations were undertaken by volunteers interested in investigating the potential of these new technologies, and therefore may not be representative of the wider population of university teachers. Such issues highlight the need for a realistic assessment of support requirements and availability prior to commencing these types of activities. Without an appropriate level of institutional investment it is unlikely that these activities can be supported on a large scale or be sustainable into the future. Furthermore, a frank

assessment should be made of the benefits to student learning, because if these are marginal or mixed then the costs of such implementations may outweigh the benefits.

This section of the handbook was prepared by Sue Bennett, Karl Maton, Gregor Kennedy, Jenny Waycott, Barney Dalgarno, Andrea Bishop, Kathleen Gray and Terry Judd.

References

- Becher, T., & Trowler, P. R. (2001). *Academic Tribes and Territories: Intellectual Enquiry and the Culture of Disciplines* (2nd ed.). Buckingham: Open University Press/Society for Research into Higher Education.
- Lueddeke, G. (2003). Professionalising teaching practice in higher education: A study of disciplinary variation and 'teaching-scholarship'. *Studies in Higher Education*, 28(2), 213-228.
- Reeves, T. C., & Hedberg, J. G. (2003). *Interactive Learning Systems Evaluation*. Englewood Cliff, NJ: Educational Technology Publications.



5.0 Guidelines for Practice

This section of the handbook provides guidelines and recommendations for the practice of teaching with emerging technologies. The guidelines are based on the evidence that has been gathered predominantly from the implementations and evaluations of the eight cases that were described in Section 4 and, to a smaller extent, on the results of the Investigation stage of this project presented in Section 3. Each of the six sections below contains a review of the relevant findings that emerged from the implementations, followed by a list of recommendations based on those findings. The six sections overlap considerably and should be read alongside one another.

We envisage that these reviews, and the guidelines and recommendations they contain, provide insight into, and are useful in informing, every day learning and teaching practice with emerging technologies. This notwithstanding, we are aware that the decisions that teachers, curriculum developers and support staff make about innovations in learning and teaching will be greatly influenced by the local context.

5.1 Developing Knowledge & Understanding

While there are a number of reasons to use technology to support teaching and learning, ultimately one of the more important educational goals is to improve students' knowledge and understanding. And while a range of learning outcomes can be considered in any learning and teaching context, here we are particularly concerned with what we have learned from the case studies and their evaluations about how the use of emerging technologies impacted on students' development of discipline-based and technological knowledge and skills.

When all 239 student responses to the online evaluation of the eight cases are combined, the number of students who reported that the activity helped them understand the material being studied was only slightly higher than the number who didn't (see Table 5.1). Similarly, just over one third of students felt the activity improved their general technology based skills while one third did not. However, close to half of the students surveyed felt the activity helped them understand how to use technology in their studies. Clearly there is a diverse range of opinion here and, as we will see below, this is apparent both within and across the eight implementations.

	Percentage		
	Disagree	Neutral	Agree
Helped me better understand the material I was studying	35.3	26.7	38.0
Improved my knowledge of how to use technology in my studies	33.9	19.0	47.1
Improved my general technology-based skills	33.5	30.3	36.2

Table 5.1: Summary of students' responses to questions about knowledge and understanding.

There were clear examples where students reported that the learning activity they engaged in helped them develop their understanding of the content material. Sharing photo images in biology (Case 5), writing a blog for a journalism course (Case 2), and using a wiki for a collaborative writing project in psychology (Case 3), were the three activities that yielded the most positive responses from students. For example, in Case 5 there was evidence that students improved their understanding of morphology and its relationship to function, as well as developing skills in classification. The lecturer noted the former in particular was improved, relative to the 'traditional' collection exercise.

To a certain extent the 'learning' success of each activity was dependent on the degree to which individual students engaged with it. Clearly in the wiki activity (Case 3), there were different levels of engagement: some students opted out completely, others did a bare minimum, while some were highly engaged with the activity (see Section 5.5). When students did engage they seemed to accrue benefits as reflected in this comment from one student: "I probably contributed 700 to 1,000 words ... It was really interesting and I learnt lots about it and I knew that I wasn't going to get any extra marks for doing that..."

Similarly, while few education students who took part in the education blogging activity (Case 1) felt the activity helped them better understand the material they were studying, one student mentioned that because her own blog and the comments she made on others' blogs often contained relatively impromptu thoughts on the management of classroom behaviour, she was able to later reflect on the degree to which these comments matched the philosophies she had earlier expressed in a written assignment. This led the student to a deeper synthesis of her thoughts on the theoretical and practical aspects of classroom management. Clearly

the interest and motivation of individual students is an important factor in the success of an implementation and simply introducing new technologies does not guarantee their effectiveness when it comes to improving students' knowledge and understanding.

Aside from developing content- or discipline-based knowledge, it was apparent that in many implementations students were developing technical skills associated with the use of technologies for learning. In fact, the evaluations of most implementations showed that more students reported developing an understanding of how to use technology in their studies and general technology-based skills, than reported developing discipline-based understanding. This is consistent with the findings reported in Section 3 that questioned the common assumption that Net Generation students are highly experienced in using an array of emerging technologies. In fact, both our investigation and implementation findings suggest that many students are inexperienced in using common Web 2.0 tools such as blogs and wikis.

It was interesting to note that in some of the implementations there was a clear discontinuity between students' overall rating of the activity and their more specific ratings of the educational benefits afforded by the activity. For example, in the psychology wiki implementation (Case 3), only one third of students who responded to the survey felt the activity "helped with their study this semester". Yet a relatively high proportion of respondents felt the activity improved their ability to share knowledge and opinions with others (65%), improved their reflective abilities (60%), and developed their thinking and writing skills (60%).

This may have something to do with the specificity of the questions students were asked. For example, if students are asked to reflect generally on a learning task that they did not see as immediately relevant to their assessment, they may perceive the activity to be of little value to their studies. However, when asked about more specific components of the same task (such as reflective practice or writing skills), students may more easily be able to see the value of the activity.

More broadly, when students are presented with an innovative learning activity with educational aims of fostering generic learning skills, they may not see the value of the activity if it is not explicitly related to their studies and aligned closely with the core curriculum and assessment. A comparison across cases reveals that the implementations that tended to be rated as

more "irrelevant" by students also tended to be seen by a higher proportion of students as not "helpful" to their studies.

As mentioned in Section 4, students were most positive about the learning benefits of implementations that were clearly integrated with curriculum and assessment, such as the journalism blogging activity (Case 2) and the biology photo-sharing activity (Case 5). For the latter activity, greater engagement and perceived learning benefits seemed to derive from the fact that the activity was tightly integrated with the assessment, the content created by students contributed to a larger shared artefact, and the task required students to engage in a meaningful way with the material created by other students. In contrast, while the chemistry photo sharing activity (Case 4) involved similar tasks, its completion did not contribute to students' final mark in the subject and as a consequence many students may have seen it as less relevant to their studies.

Differing perceptions of the general and specific educational value of the implementations may also account for the finding that, for some implementations, teachers and students held different views on whether the activities being trialled contributed to students' learning. For a number of cases (e.g. Cases 3, 4, and 7) the activity was generally seen more positively by staff than students. Staff who participated in the psychology wiki (Case 3) and chemistry photo sharing (Case 4) implementations were intending to use the activity again, despite the majority of students who responded to the survey indicating that they felt the activity did not support their learning. This may be due to the different expectations of staff and students, as highlighted above, or to do with students' perceptions about the role of ICT in learning and teaching.

As we discussed in Section 2, previous research into students' perceptions of the use of ICTs in higher education has shown that many students perceive learning and teaching to be a didactic process, involving the transmission of 'expert knowledge' and thus feel the main benefits of learning technologies are in facilitating students' access to information resources (e.g. Ipsos MORI, 2007). The following quote from a student taking part in the psychology wiki implementation (Case 3) illustrates a lack of understanding that students may have about the potential of using learning technologies to facilitate new methods of learning through interacting with peers: "This is what I don't understand: In naming all these things, what is the difference between getting me to do that on a wiki and getting me to go away, type it up on my PC and print it out and hand it in as an essay?"

While what we know from this project about the development of students' knowledge and understanding is based primarily on students' own perceptions, rather than the measures of learning outcomes, the potential of emerging technologies to improve learning and teaching practice is clear. It is apparent from our research that improving students' learning and understanding through the use of educational technologies will depend on a number of factors, including students' motivation and understanding of the potential educational benefits offered by new learning activities.

Guidelines

The following guidelines outline the key lessons we can draw from our research to promote best practice for implementing learning technologies in higher education:

- *Offering students the opportunity to use new technologies does not guarantee student engagement with the task. Additional steps may need to be taken to encourage student engagement.*
- *Learning technologies need to be clearly integrated with curriculum and assessment.*
- *The learning objectives of the activity and its educational value should be made explicit to students to help align differing expectations.*
- *Implementing new technologies and learning activities requires students to develop new skills in using the technology and often in participating in new types of learning activities. Students will therefore need both time and guidance to develop these skills, and educators should allow for this when planning the timing and length of the implementation.*

5.2 Creating Content & Independent Research

It has long been recognised in constructivist theories of learning that creating knowledge artefacts is an important element of learning (see Dalgarno, 2001). Developing skills in undertaking independent research is a central component of many higher education courses, and one of the key features of Web 2.0 technologies that aligns well with constructivist views of learning is the possibility for users to create and share content: online publication spaces such as blogs and wikis enable individuals to both read and contribute to the body of information.

As mentioned in Section 2 of this handbook, a number of commentators have suggested that students increasingly want to be active participants in the creation of learning content (e.g. Oblinger & Oblinger, 2005; McLoughlin &

Lee, 2008). While students have created content as part of their studies for some time (e.g. essays, theses, designs, performances), newer technologies offer the opportunity for student-created content to be easily disseminated among peers, and this sharing of student work is seen as a valuable activity to be used alongside traditional 'expert' information sources such as textbooks and lectures.

A primary pedagogical advantage of students creating their own content in learning and teaching contexts is that by creating material, students generate their own internal representations of knowledge consistent with cognitive-constructivist theories of how people learn. And by presenting, articulating and disseminating their own knowledge and understanding to their peers, students will potentially benefit from a broader conversation about their ideas within the learning community, leading to further knowledge construction and reconstruction consistent with social constructivist theories of learning. Aside from these advantages, McLoughlin and Lee (2008) argue that by encouraging students to generate content using Web 2.0 technologies, there is great potential to motivate and engage them more fully with their studies, and foster a sense of community (although see our comments in Section 5.1). Moreover, it is not unreasonable to expect that by creating content using Web 2.0 technologies students would develop important generic skills associated with writing, editing and publishing using different web-based media (see Section 5.1).

The following discussion concentrates particularly on the degree to which students and their teachers felt the creation of content assisted with students' learning, especially in relation to the development of students' thinking skills. Of the eight case studies, five had a particular emphasis on the process of 'learning by creating': the two blogging implementations (Cases 1 and 2), the wiki implementation (Case 3), the biology file-sharing implementation (Case 5), and the podcasting implementation (Case 7). The other implementations – photo sharing and social bookmarking – included an element of content creation, although the expected benefits of 'learning by creating' were not as central to these activities as they were to activities that involved writing or producing content.

It appears from the evaluation findings that some students found the process of contributing to blogs and wikis helped develop their thinking and independent research skills. Students who took part in Cases 2 and 3 were particularly positive about this aspect of the activity, with 79% and 60% of respondents, respectively, agreeing

with the statement that the activity helped them to develop thinking skills by writing or producing study related material. While many students responded positively to this question, it is not clear how well these activities helped students better understand the materials they were learning (see Section 5.1).

While there was some support for the notion that blogging supports the development of thinking and learning (Case 2), students who took part in the education blogging activity (Case 1) were less positive about this aspect of the activity (23% suggested it did, while 38% suggested it did not). Nevertheless, as reported in the evaluation of this case, some students who took part in this activity did find it useful for reflecting on their practical placement experiences.

Few students responded to the evaluation for the podcasting activity (Case 7). However a number of focus group and survey comments indicated the activity did involve a positive element of 'learning by creating'. For example, one student suggested: "[it] helped reinforce some of the stuff we're learning. Like, it helped me put it into words." This suggests that the key learning objective of developing students' thinking and learning through producing and creating content may have been realised had more students participated in the activity. In addition, a staff member involved in the implementation suggested that students who did participate in the activity benefited from being able to create and share their knowledge:

"two people have put up podcasts today and the first one was really quite good in the way that they articulated the nature of their lack of understanding ... and the second one was a response to that. So ... there was a dialogue being created from one podcaster to another through the podcasting media."

With the use of Web 2.0 technologies, the creation of public representations of knowledge, as distinct from the relatively private representations that students would normally create for traditional assessment tasks, may motivate students to improve the quality of their work. While it is difficult to draw conclusions about this from the implementations and their evaluation findings – students were not specifically asked about this – there was evidence from the qualitative data that this certainly was the case for some students. For example in the wiki implementation (Case 3) one student, when asked about the best aspect of the activity, commented that: "The idea of having other people have free access to the wiki made me want to do a better job of it. Explaining something to someone else in

my own words made the concepts more clear to me." As mentioned above, it could be expected that many implementation activities would have helped students develop skills in online writing, publishing or editing through the process of creating media-based content. The ways in which these skills were perceived to be developed by students for specific discipline areas and in general has been described above (see Section 5.1). However, it is worth noting that for one case the development of these skills was a central learning objective. In Case 2 (blogging in first-year journalism), students were expected to develop writing skills within the blog genre, which are becoming increasingly important for graduate journalists. While students were not asked whether the activity provided them with valuable professional skills, the fact that 93% of the questionnaire respondents thought that the activity "improved my knowledge of how to use technology in my studies" suggests they did find the activity had an important skill development aspect to it.

In addition, 93% of the journalism students who responded to the survey said they felt the activity assisted them to develop independent research skills. This was supported by focus group comments that indicated many students valued the opportunity to pursue stories of personal interest and to individually develop their skills. This is consistent with a main component of the task, which required students to interview people for their stories and collect images and other media from their communities. A smaller percentage (45%) felt the activity also developed their ability to critically evaluate study related material. This result that may reflect the task's focus on skill development in the individual rather than on content or engaging with other students' work. This contrasts to the education blogging task (Case 1) that was focussed on students' recording their own experiences while on teaching practice placements. Independent research was not the focus of this task and so, unsurprisingly, students did not, in general, rate this aspect of the task highly. This illustrates how the nature of the task and not the technology supports particular learning outcomes.

Overall, the findings from the case studies reviewed here suggest that creating information and artefacts, and conducting independent research, can be a valuable way for students to enhance their thinking and share their knowledge with both peers and teachers. With the advent of Web 2.0 technologies, such as blogs and wikis, the possibilities for the publication and sharing of student-created content are seemingly endless.

Guidelines

The following guidelines draw on our research, and the implementations reviewed above, to highlight particular factors that educators should be aware of when implementing new technologies with the aim of facilitating 'learning by creating':

- *Content creation can be a valuable component of some learning activities. Technologies that enable students to publish and share their work can enhance the value or the motivational aspects of content creation activities for some students.*
- *Students may benefit from gaining skills in creating, editing and publishing digital materials, and this should be made explicit to students. The skill development aspect of the activity should be aligned with the professional skills that students may need, as in the journalism blogging case described above.*
- *Students will create and share their own content if the activity is a central part of the subject but in general they will not choose to do so if the activity is seen as an optional add-on. Students are more likely to engage in activities that are integrated well with the curriculum, and that have a clear educational value.*

5.3 Evaluating Others

Social learning theories (e.g. Vygotsky, 1962, 1978) and many contemporary pedagogical models emphasise the important role of interaction, knowledge sharing and social context in individuals' construction of knowledge and understanding (see Lave & Wenger, 1991; Brown, Collins & Duguid, 1989). Critical components of social learning theories are collaboration and peer-based learning in which students are asked, either explicitly or implicitly, to review and evaluate the work, opinions or ideas of others. Emerging technologies, particularly social technologies, offer great potential to support this kind of learning activity.

A clear theme that emerged across the case study evaluations was that many students realised unexpected benefits from an exposure to diverse ideas and experiences captured in their fellow students' work. For example, many students who took part in the education blogging implementation (Case 1) commented that the best thing about the activity was the benefits associated with reading about other students' experiences. This was borne out in focus group sessions in which a number of students commented on the benefits of reading

about other students' practical placement experiences and noted specific benefits of receiving classroom management advice from their fellow students.

This case can be seen in direct contrast with the journalism blogging activity (Case 2): the focus group data suggested that few students took the opportunity to read each other's blogs, even though they were readily accessible. In this case, although the medium clearly supported the evaluation of other students' work, few students appear to have engaged in this aspect of the activity. A key difference between these two examples is the assessment requirements. Students in Case 1 were required to provide comments on other students' blog postings as part of the assessment while students in Case 2 were simply provided with an opportunity to comment on their colleagues' work. Clearly this difference may have impacted on the degree to which students engaged in the peer review component of the activity.

The cases that involved file-sharing activities (Cases 4, 5, and 6) also allowed or required students to review other students' submissions. In the evaluations of these activities, students again noted the value of being able to view other students' work. Typically these comments were not couched in terms of students formally evaluating their peers' work; rather students commented on the benefits inherent in individual self-reflection when provided with an opportunity to compare and contrast their own work with that of others. For example, a student from the chemistry photo sharing activity (Case 4) noted "it's interesting to see other students' perspectives on your topic ... You sort of looked at it and you're like 'oh, so that's what they thought' whereas I might have thought something completely different." Students clearly used the work of others to gauge their own progress and the standard of their own work, for example: "being able to see everyone's work and comparing it with my own, to see that I was on track." (Student comment, Case 5). Many students commented on the value of seeing how other students interpreted and applied concepts. It appears, from the comments that students made in these cases, that there are clear learning benefits to be gained from evaluating other students' work.

The chemistry photo sharing activity (Case 4) aimed to create a stronger sense of context for students by linking the content material being covered in first-year chemistry with students' everyday life experiences. The open-ended comments from questionnaires suggested that many students enjoyed having the opportunity to view other

students' work, despite the quantitative survey data indicating that many did not feel the activity directly supported their learning (see Section 5.1). When asked about the best features of the project, while a number of students questioned the overall value of the task, a number also mentioned that it was good to "to see everyone's contributions" and that "some of the photos uploaded were interesting to look at. A few were really good finds." Similarly, some of the students interviewed felt that the activity had broadened their learning experience, particularly by providing an opportunity to review other students' work: "look[ing] at how some people interpreted it different to you and just reading the captions, you learn a lot about how chemistry influences everyday life." Similar comments were gleaned from the environmental education photo sharing activity (Case 6) where students perceived value in seeing other students' images that provided them with exposure to a greater diversity of student experiences.

Several students from the biology file-sharing activity (Case 5) similarly reported that being exposed to a broader range of specimens through the shared gallery, as well as seeing how different people interpreted slight differences in characteristics, enhanced their overall learning and understanding. The assessment requirement that students compare and contrast particular morphological characteristics of beetle specimens within the online beetle gallery, encouraged them to engage in a meaningful way with the contributions of other students and allowed them to more easily see the purpose of the file-sharing activity. According to both staff and student evaluations, this successfully promoted more thinking and understanding about the underlying concepts (diversity, morphology and classification), and about linking concepts (e.g. morphology to function).

The psychology wiki activity (Case 3) was an explicitly collaborative implementation. The staff involved were happy with the level of engagement and one commented that the activity certainly "got them thinking". There was clear evidence from this implementation and its evaluation that students were critically reviewing and evaluating each other's work. This evidence was gleaned from the open-ended responses in the questionnaire (e.g. "When completing the group project, seeing how others understand the material. It really helps getting another perspective/explanation. Got me thinking about what we were learning."), from the number of online 'comments' that students made on the wiki pages (109 in total), and from the survey responses in which almost half the students surveyed suggested that the task promoted critical evaluation of study materials and two-thirds felt the activity helped them share material with others in the class.

Guidelines

Evaluating the work of others can be an important and valuable component in a learning activity, exposing students to a broader array of experiences and encouraging them to reflect on their own learning. The lessons drawn from our research with regards to using new technologies to facilitate peer review for learning can be summarised as follows:

- *Being able to view other students' work, in and of itself, can be a valuable learning tool for students and can be facilitated through the use of Web 2.0 tools, such as Flickr, wikis, and blogs.*
- *To encourage students to engage in critical peer review activities, an explicit instruction to view or review other students' work may be necessary. Tasks such as 'compare and contrast,' 'comment on,' or 'nominate the best representative submission(s),' can be built into the activity in order to expose students to a range of other students' work.*
- *Formal, assessable peer review critiques may be embedded within a learning activity; however even a simple requirement to 'nominate the best item' that requires students to browse each others' work can have an impact on students' engagement in the peer review component of an activity.*
- *It may be necessary to make explicit to students what the potential learning benefits are of participating in peer review activities (both through being the subject of peer evaluation and through the act of evaluating other students' work).*



5.4 Critical Self-Reflection

The ability to critically reflect on one's learning is seen by some theorists as an important aspect of student engagement and central to student learning (see for example, Boud, Keogh & Walker, 1985). There are numerous examples of tools such as blogs that have been employed in higher education with the specific purpose of encouraging students to reflect on their developing knowledge, skills and experience (e.g. Farmer, Yue, & Brooks, 2008; Instone, 2005; Wagner, 2003). Critical self-reflection was an articulated learning objective for five of the case studies: using a blog in education (Case 1), using a wiki in psychology (Case 3), photo sharing in chemistry (Case 4) and education (Case 6), and creating podcasts in medicine (Case 7).

As we have discussed above, in Section 5.1, the blogging activity undertaken by education students (Case 1) was seen as valuable by some students for encouraging them to explicitly reflect on their practical placement experiences. Of the 40 students who responded to the survey, 45% indicated that they felt the activity improved their ability to reflect on what they were learning, with one-third of the respondents undecided. At least one student in the focus group session mentioned the way in which she was able to develop her understanding of classroom management by reflecting on her blog postings and comments. However, it appears that for many students who took part in this activity, the main value of the activity was in facilitating peer review: in survey and focus group comments students seemed to focus on the value of reading and commenting on each others' reflections rather than the value of undertaking the reflective process themselves. Some students did comment in the survey and focus group sessions that the activity gave them the opportunity to 'vent', possibly implying the use of the blog as an emotional outlet rather than as a place for deep critical self-reflection.

Of the 65 students who responded to the survey associated with the wiki collaborative writing activity (Case 3), 60% said that the activity did help them reflect on what they were learning. This is consistent with the nature of the activity, which aimed to help students develop specific content knowledge, but did not necessarily assist them in reflecting on other aspects of their skills and knowledge. Comments from the focus group sessions also suggested that while the collaborative writing task was not particularly valuable for self-reflection, the 'commentary and comments' activity, which involved using the wiki as a forum for a public discussion, was more closely aligned with this learning objective. One student,

for example, said, "I found that [the commentary] was actually more beneficial because it actually started me thinking about the topic not just in terms of what I had to memorise or learn for the exam but just thinking of it in more of a day-to-day sense and relating it to my general thoughts." This was supported by comments made by staff, who were impressed by students' engagement with the 'commentary and comments' activity: "They engaged in the non-assessed conversation task really well; particularly thoughtful and open I thought, in their comments about a variety of things." The two staff members who were interviewed suggested that the task was successful because the conversation topics were linked to a high profile television documentary that was broadcast at the time, and because the lecturer actively contributed to the conversation. It is interesting to note that despite this activity not being assessed it was still considered a success in terms of student participation and the quality of students' contributions.

One of the key learning objectives of the photo sharing activity for first-year chemistry students (Case 4) was to encourage students to reflect on how chemical principles could be seen in their own experiences and the world around them. Some students who took part in the focus groups and responded to the survey clearly felt that the activity achieved this aim. For instance, one student commented, "It was interesting because we had to relate to the world around us," while another said, "I think learning by an analogy is very, very helpful. So if you go out there and find an example of something and then you're always going to be able to refer to that later." Despite these comments, of the 38 students who responded to the survey for this case study, only 5 (13%) agreed that it helped them to critically evaluate what they were learning. While, this activity was successful in terms of participation rates (see Section 4.2), with such a low response rate to the questionnaire, it is difficult to gauge how successful the activity was in meeting the learning objective of encouraging students to reflect on their learning.



The photo sharing activity for environmental education students (Case 6) aimed to enable students to develop a collection of images that provided richly detailed records of students' practical placement experiences, which could then be used as a basis for reflecting on their placement activities. Students' comments about the reflective aspect of this activity were mixed. Some students in the focus group interviews felt the activity did not help them develop their knowledge of environmental science or give them an opportunity to consider how it improved their teaching skills, for example: "I remember being a bit confused as to what exactly we were doing and kind of what the point of it was."

In the podcasting activity (Case 7), the response rate in the survey and focus group was very low and participation was limited. As a result caution must be exercised in interpreting the evaluation results. However, some students did identify positive aspects of podcasts in relation to support for learning, such as facilitating 'learning by creating', as discussed above in Section 5.2. Another student reported, "...in med[icine], often you find that by teaching someone else a concept... you're learning as well to revise the concept....". It is also worth noting that the content created by students often was clearly reflective. For example, there was one podcast about the advantages and disadvantages of problem-based learning as an instructional method, which was well articulated and reflective.

Guidelines

Drawing from this research we can offer the following recommendations for incorporating critical self-reflection into learning activities that involve the use of new technologies:

- *Designing activities that encourage students to reflect on their learning and their experiences in the world can be a useful way of engaging students to think about the concepts they are learning.*
- *Students may not recognise the value of critical self-reflection. It may be necessary to link self-reflection tasks to assessed outcomes to demonstrate their value and encourage students to reflect on their learning.*
- *Students may need guidance in developing skills in critically reflecting on their learning, particularly if those skills are important in a professional context, as in the case of student teachers reflecting on their professional practice.*

- *Reflective learning activities can be incorporated in a number of ways that don't necessarily involve students writing critically reflective comments in a public forum such as a blog. The file-sharing implementations, such as chemistry students taking photos of chemistry principles in the world around them, show that students can be encouraged to reflect on their learning in a way that is not explicitly self-reflective.*

- *One case (Case 3) clearly showed that by linking student generated content and discussions with contemporary local and world events, lecturers can successfully promote critical self-reflection.*

5.5 Working in Groups

A key feature of many Web 2.0 technologies is their social nature. Web 2.0 social technologies are able to facilitate collaborative group work (e.g. through a wiki) and file sharing between individuals (e.g. through photo sharing sites such as *Flickr*, social bookmarking or podcasting). While only one of the implementations explicitly asked students to work in groups (Case 3), all implementations either required or allowed students to share content and comment on material prepared by other members of their cohort. This distinction (between group work and sharing material between group members) is clearly reflected in the evaluations across the cases with many showing evidence of supporting knowledge sharing and few showing evidence of supporting or developing students' abilities to work in groups. The analysis presented in this section will predominantly be based on the psychology wiki implementation (Case 3) but other file-sharing implementations will be drawn upon where relevant.

The main task for students in the psychology wiki implementation was to create a Wikipedia-style entry on *Motion Detection*. Each lab group (typically 20-30 students) was required to come up with a single website using the wiki, but in order to complete the activity students in each lab class were asked to form small groups (4-5 students) and work collaboratively to create a section of a wiki site. While 65% of the students who responded to the online questionnaire felt the activity improved their ability to share knowledge and opinions with others, only 40% felt the activity helped them improve their ability to work in a group. While many were neutral on this point (35%) a quarter of the students felt that the activity did not help them develop group-work skills. So despite designing an activity that explicitly encouraged group work and employing a technology that explicitly supported group authoring, the majority of the class did not feel that the activity helped them in this area. Why was this the case and what can we learn from it?

As mentioned in the evaluation of this case in Section 4.2, despite being asked to work together on the activity and being given guidance on how to do this, many students simply divided the 'writing' that needed to be done among their small group and worked independently. For some of these groups there was evidence of coordinated group activity that was more functional than educational, which was sometimes reflected in the output: "...the way our wiki read was very fragmented. It was like people's perspective – they were good and they were valid – but when you read it, like in a page, they didn't fit together nicely." Potentially some of these issues could be alleviated if tutors and students were given more time to prepare for a collaborative exercise – limited time was given in lab groups for the activity – and if there was more explicit recognition of the value of group work, possibly even reflected in the task's assessment. While the activity was well planned, both staff and students indicated that more structure and direction could have been provided in the implementation.

It was clear that many students were not only unfamiliar with the technology of collaborative writing, but were also unfamiliar with managing collaboration among themselves. Staff recognised that this was a key challenge for students in undertaking the activity: "people essentially had to quickly, in class ... be given a topic and then work out roughly how they were going to chop that topic up, who was going to do what. Then it was solely up to them to keep in touch with each other to get it done." (Tutor comment) There was notable tension in some students' responses in the focus group about this. Take, for example, this exchange between a student [S] and focus group interviewer [I]:

	We had segregated the entire workload among five of us. I had to wait for someone else to put up their piece so that I could elaborate on that; I was supposed to give examples. And she just wasn't interested, and I had other assignments due as well. It kept on getting postponed.
S:	I couldn't go ahead with doing it; even after sending her emails as well to put it up. And when she did put it up, it was haphazard and it had a lot of errors and so on. So first I had to go on and edit her piece and after that I had to go and put my section on it. I asked her later on why she put on such a pathetic piece on the weekend.
I:	Right, and what was the answer?
S:	She just said it was last minute or something and she was just not interested in the entire act really. So I guess, really, in a group activity, you're with people who may or may not be interested in the subject ... suppose the entire group is not interested, then it doesn't matter. But if there is a mix in the people involved then it created problems for the others.

This response shows how managing time and tasks across a number of peers can present students with difficulties, particularly in a loosely bound team comprising individuals of different motivations. The difficulties that interdependency among group members can create should not be underestimated. Moreover, such difficulties may be particularly apparent when students are ascribed to groups.

One common solution to this type of problem is to assess each student according to their contribution to the group task, either by requiring each student to identify their contribution or by asking students to each suggest a weighting for the contribution of each student within their group. This adds some complexity to the assessment process, although tools such as wikis can potentially make it easier to identify the individual contributions of each group member.

Another interesting feature of this student's response is the clear disparity of expectations within the team when it came to the quality of what was being produced. The student clearly felt that her colleague's response was sub-standard and felt obliged to edit and rework what had been provided. This was also a problem for others:



“My only problem with all that though is sometimes I question the quality of the work. Some of it ... I mean someone just puts kind of an unedited scramble of words in. It’s not, you know, nothing’s capitalised, there’s no punctuation and you just think: well this is a half formed idea, this is a rough draft. Why do I have to read this crap? I love peoples’ ideas but not in half-baked form and there was a little bit of that.”

For other students such tensions between collaboration and contribution and related issues associated with motivation and assessment were not an issue: “other people didn’t contribute as much and it didn’t bother me because obviously their intrinsic motivation on that particular topic was lower. But big deal they got their four marks, I got my four marks and we go home happy.” This comment is supported by content analyses that showed a minority of students were doing the majority of the work in terms of content creation on the wiki. It would seem prudent practice to set clear expectations with students about what their responsibilities are when it comes to collaboration and the creation of group content.

Despite questions about whether the wiki implementation assisted with the development of students’ ability to work in a group, as mentioned in Section 5.2, the activity did seem to be successful in promoting both self-reflection and the review and evaluation of other students’ work. This is well captured by one student’s comment on the questionnaire: “The best thing about the wiki was the joint effort in creating a presentable piece and sharing views with others. Some material that was found by others was also extremely interesting and helpful.”

It was clear from some implementations that there might be some intrinsic value in asking students in a relatively loosely bound group to share information and the content they had created as part of their studies. For example, while students who took part in the biology file-sharing activity (Case 5) worked individually, they shared content they had created with a broader group and students used this shared information to complete their own assessment task. Students noted that having immediate access to other students’ images and classifications was useful, as it provided valuable feedback on their own progress (see Section 5.3).

Moreover, a number of comments made by students during interviews and focus group sessions suggested that an additional, somewhat unanticipated benefit of the activity was that it helped to build a sense of community among students. For example in an interview one student commented: “I thought the interactive activity

made me feel like I was part of a group”, while another said that “to think that someone else is out there [at] exactly the same time as me, collecting beetles somewhere else in the state and then you come back together online and go ‘I found this’, ‘Oh well, I found that’, you know that’s pretty cool.” These comments illustrate the way that a sense of community can emerge not just from direct discussions between students but also from participating cooperatively in the joint creation of content. Distance education students in particular were positive about being more involved, rather than feeling isolated. One student commented “An interactive project will draw a distance education student more into the subject matter as they will feel that they are a part of it, as if they were in class.”

Guidelines

Our research shows that while knowledge sharing and collaboration can be supported by the use of social software such as wikis and file-sharing tools, there may be many challenges in ensuring that students benefit from the collaborative nature of these technologies. The following guidelines draw on the lessons learned from our research in relation to students undertaking group work:

- *Designing activities that are collaborative in nature does not guarantee that students will work together in creating an artefact. Students need specific guidance on how to participate in collaborative activities effectively.*
- *Students’ responsibilities and the expectations they and other members of their work group have need to be clear. Individual team members will differ in their motivation and the effort they put into the task, and students may need support in managing negotiations about this.*
- *When students work in groups it is sometimes desirable to allocate a separate mark for each student in order to ensure students are not unduly advantaged or disadvantaged by being allocated to a group containing high or low achieving students. Web 2.0 technologies have the potential to make it easier for a marker to identify each individual student’s contribution (see Section 5.6).*
- *Class time may need to be set aside for the group work activity to ensure that students have opportunities to work together to complete the task.*
- *Assessment should be weighted to reflect the value of group work.*

5.6 Assessing Learning

Designing and conducting assessment that asks students to demonstrate their learning using social web technologies raises a range of new challenges (Horizon Report 2008, p.5). The interactive and creative opportunities facilitated by these technologies may not be used to full effect if academics rely on more traditional, individual forms of online assessment. Crisp (2008) advances design principles for diagnostic, formative and summative 'e-assessment', while Elliott (2007) maps various Web 2.0 authoring forms against different assessment needs. Hughes (2008) sets out criteria for robustness in 'e-assessment' that relate to further challenges, such as how to establish academic honesty and integrity and how to manage content for moderation and reporting purposes. This project took initial steps towards addressing such challenges and the analysis that follows highlights assessment techniques that seemed to work well and areas that could be improved.

The online questionnaires asked students about the degree to which the learning activity they engaged with improved their access to feedback from the teaching staff. Roughly one-third (34%) of the students who responded (n = 239) indicated that their access to feedback was not improved, while about the same number (35%) suggested it was. This level of disagreement is perhaps not surprising in that many of the activities were not explicitly designed to promote staff-student feedback. Implementations that seemed to promote a positive response from students for this question were the journalism blogging activity (Case 2: 60% agreed), the psychology wiki (Case 3: 54% agreed) and biology file-sharing (Case 5: 44% agreed).

Many of the learning designs trialled in this project used emerging technologies that allowed students to create study-related material in relatively open and flexible ways. The design of these learning activities provided staff with opportunities for continuous formative assessment and allowed them to evaluate students' needs and engage in more contingent teaching and learning activities. This was clearly demonstrated in the psychology wiki implementation (Case 3). Staff mentioned that an unanticipated outcome was that the student-generated content on the wiki showed staff how students' understanding of the subject material was developing: "Another benefit of the way that we've done the wiki is that they're really getting to show how comfortable they are with the concepts without being examined." This opened up the possibility for more responsive teaching in both lab classes and lectures.

Similarly, the chemistry photo sharing activity (Case 4) appeared to facilitate informal assessment of learning by providing lecturers with an opportunity to observe how students' were engaging with the course. One staff member commented, "We don't often get an opportunity to see the students express enthusiasm for chemistry ... I think you do get a feeling that some people have really embraced the task which draws upon what they are learning in chemistry." There was clearly a perceived value in having an open activity in which students created content that allowed teachers to see how students' understanding was progressing, thereby providing an opportunity for informal formative assessment.

Not only do such activities provide teachers with insight into students' learning processes but these activities also allow students themselves to review, evaluate, compare and contrast how their own understanding and that of their peers is developing. Section 5.3 above, highlighted how some of the implementations trialled in this project were able to assist students in informal self-assessment and informal assessment of their peers. A clear example of this was the biology file-sharing exercise (Case 5) where students' capacity to share and review other students' work provided an informal mechanism to gauge their own progress.

It is often said that assessment drives students' engagement with course material and learning activities (see Biggs, 1996; Kirkwood & Price, 2008). The way in which assessment tasks are structured and 'weighted' sends a clear signal to students about the 'value' of an exercise and its components. There was great variety across the cases with regards to the degree and types of assessment employed. Some learning activities were not mandatory (or were voluntary) and were not formally assessed while for others the assessment was couched as a 'hurdle' requirement. Some learning activities were associated with relatively nominal formal assessment, while for others the task assessment carried significant weight and was well integrated with the learning task and broader learning and teaching activities within the curriculum.

Participation was low in the learning activity that was voluntary and carried no formal assessment (podcasting in Case 7). While a number of reasons could account for this low participation (see the evaluation of Case 7 in Section 4.2), if the activity had been formally assessed and was more closely integrated with other activities in the curriculum, participation could have been higher.

Student participation varied dramatically for the two activities that were assessed using a 'hurdle' requirement (Cases 4 and 8) despite students who responded to the survey from both implementations expressing concerns about the relevance of the activity and the degree to which it supported their learning. The difference in students' participation is likely to be associated with whether the hurdle requirement was mandatory or not. In the chemistry photo sharing implementation (Case 4), the learning activity was a mandatory hurdle requirement while, in contrast, in Case 8, students were able to choose between five tasks (of which social bookmarking was by far the most onerous one) in order to complete the hurdle component of the course. Regardless, it is worth bearing the comments of one chemistry student in mind when thinking about using hurdle-type assessment: "It seems an unnecessary and unhelpful hurdle that will not actually teach us anything practical."

For the psychology wiki implementation (Case 3) the assessment of the task was weighted at only four percent of the final mark in the subject. Students were given the maximum marks based on contributions, where a 'satisfactory' contribution was considered to be two additions or editorial changes to the wiki. While there was a high rate of 'participation' and satisfactory completion of the task (90% and 81% of the cohort), only about half the students participated above the minimum requirement and many students made their contributions in the final days before the activity was due to be completed. It seems likely that a significant number of students were simply logging on and making minor contributions in order to obtain the marks allocated to the task.

The education blogging activity (Case 1) was a compulsory task embedded within a larger course activity to which 50% of the subject's marks were allocated. The assessment of the blogging activity required students to make a specific number and frequency of blog postings and comments. A potential shortcoming with assessing students' reflections through diaries or journals is that students can easily circumvent the learning process by completing all their entries towards the end of the task. The time-stamping of blog postings and the specific blog entry requirements of students in this activity seemed to encourage most students to complete the activity over a sustained, reflective period rather than in an intensive burst. It should be noted that this approach might, in part, account for why many students complained that the activity impinged on their practicum placement to a great degree, despite many also seeing the task as assisting in their learning.

The biology file-sharing implementation (Case 5) built on a similar exercise that was already well integrated within an established curriculum. A key and new component of the file-sharing activity was asking students to explicitly 'compare and contrast' images drawn from those collected by the cohort of students and this component of the activity was allocated one-fifth of the available marks. We think this case provides a useful example of an activity where the assessment criteria were clearly presented for students and were carefully aligned to the learning activity and its objectives.

The use of technology in learning and teaching raises particular questions about assessment. Should the assessment of students' learning be based on the judged quality of content they generate in an online exercise, or the number of online contributions made, or the nature of their interaction with other students? What are the options for alternative models of assessment such as peer-based, group-based or self-assessment? As discussed in Section 5.5 these are perennial issues associated with assessing students' learning for activities that rely on both individual and group contributions in online (and offline) learning environments.

Online technologies can provide assessment options and opportunities that are simply not possible with traditional teaching and learning methods. Online assignment submission, especially for distance education students, has the clear potential to reduce the time taken to assess students' work and provide them with feedback. Staff and students – particularly distance students – associated with the biology file-sharing activity (Case 5) noted online work submission as a distinct advantage afforded by the technology. An additional and unanticipated advantage emerged from this implementation. Two students travelling to a residential school with a physical beetle collection were required by airport security to unpin their specimen, effectively destroying their work. However these students had also provided online submissions that could still be used for their assessment. As a result, the staff member is reconsidering the assessment requirements and the potential to have entirely online submission.

A direct contrast to some of the advantages associated with online submission of students work are the potential problems teachers or assessors have locating, accessing and assessing a variety of online artefacts (e.g. blog posts, wiki posts, podcasts, comments on others' posts, etc). Rather than simply evaluating a single written submission from each student, teachers may be required to review an array of media, located in different areas, some of which may be unfamiliar to them in presentation and form (e.g.

visual or audio work such as podcasts). This may have implications for staff time, workload and professional development requirements.

Automated alerts and monitoring tools that are available with some emerging technologies – online logs, RSS feeds, time-stamped entries – also provide lecturers with tools that could potentially be used to assist with student assessment. *Flickr*, used in Cases 4 and 6, provides a range of RSS feeds that can be useful both for alerting users to activity within a student group and for assessment purposes. However, in the case of large, active groups it can be difficult to ensure that all relevant activity is captured using RSS feeds. In such instances it is generally 'safer' to use the *Flickr* API (Application Programming Interface) to extract the required data, although this presumes a reasonable level of technical expertise. *Pbwiki*, the software used in Case 3, also provides a range of useful RSS feeds (site-wide and page-specific). However, again these are somewhat unreliable for monitoring large, vibrant group-based learning activities. Alternatively, sites can be archived to disk, and again, subject to sufficient technical expertise, archives can be 'mined' to extract a wide range of data to support both evaluation and assessment.

Guidelines

The assessment of student learning is a critical component of learning and teaching in higher education. The cases described in Section 4 of this handbook point to a wide range of assessment techniques employed, and some seemed more successful than others. Drawing on this research, the key points that emerge on how the use of emerging technologies can impact on the assessment of learning can be summarised as follows:

- *Emerging technologies can provide more flexible access to and opportunities for informal, formative self-assessment by students themselves and informal, formative assessment by the teacher.*
- *Opportunities for formative assessment have the potential to generate opportunities for 'contingent teaching' where staff tailor their classes to better suit the needs of students.*
- *When assessment criteria are explicit and clearly linked to curriculum, students are better equipped to recognise the relevance of the activity.*

- *There can be challenges with clearly communicating the requirements of assessment – what, when and how – to learners, particularly when unfamiliar technologies and learning activities are being employed.*

- *When introducing an assessment activity or technology that is likely to be new to students, practice activities, modelling and explicit criteria can help support students' learning. Ensuring that the technology is warranted and adds value rather than complexity to the learning activity for both students and markers is also important.*

- *Emerging technologies and online learning management systems can provide greater flexibility for assessment strategies than traditional methods. However, this flexibility can come at a cost, as additional effort and expertise may be required to implement these new strategies. Workload implications need to be evaluated relative to the advantages of implementing new technologies to support assessment.*

- *The technological auditing affordances of many traditional and emerging technologies provide staff with additional tools to support the completion of student assessment. However, care should be taken not to assume these tools will be easily implemented, and their effective and reliable use may require substantial technical expertise.*

- *The allocation of marks for assessment can act as both a motivator and signal of 'value' of particular learning activities. However, assessment weightings need to be designed and communicated carefully to students, as attempts to engage students by allocating them a high assessment weight, may change students' approach to the learning task.*

This section of the handbook was prepared by Gregor Kennedy, Jenny Waycott, Andrea Bishop, Barney Dalgarno, Sue Bennett, Karl Maton, Kathleen Gray and Terry Judd

References

- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3), 347-364.
- Boud, D., Keogh, R. & Walker, D. (Eds). (1985). *Reflection: Turning experience into learning*. Kogan Page Ltd., London.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.
- Crisp, G. (2008). *Raising the profile of diagnostic, formative and summative e-assessments: Providing e-assessment design principles and disciplinary examples for higher education academic staff*. ALTC Fellowship Report. <http://www.altc.edu.au/carrick/go/home/pid/342> (accessed on February 1, 2009).
- Dalgarno, B. (2001). Interpretations of constructivism and consequences for Computer Assisted Learning. *British Journal of Educational Technology*, 32 (2), 183-194.
- Elliott, B. (2007). *E-assessment: What is Web 2.0?* Glasgow: Scottish Qualifications Authority. <http://www.sqa.org.uk/sqa/22941.html> (accessed on February 1, 2009).
- Farmer, B., Yue, A., & Brooks, C. (2008). Using blogging for higher order learning in large cohort university teaching: A case study. *Australasian Journal of Educational Technology*, 24(2), 123-136.
- Horizon Report. (2008). Stanford, California, USA: New Media Consortium / EDUCAUSE Learning Initiative. <http://www.nmc.org/pdf/2008-Horizon-Report.pdf> (accessed on February 1, 2009).
- Hughes, J. (2008). Open accreditation – a model. *Pontydysgu – bridge to learning blog*. <http://www.pontydysgu.org/2008/10/open-accreditation-a-model/> (accessed on February 1, 2009).
- Instone, L. (2005). Conversations beyond the classroom: Blogging in a professional development course. In ASCILITE 2005: *Balance, Fidelity, Mobility: maintaining the momentum?* (pp. 305-308). Available from http://www.ascilite.org.au/conferences/brisbane05/blogs/proceedings/34_Instone.pdf
- Ipsos MORI. (2007). *Student Expectations Study: Key findings from online research and discussion evenings held in June 2007 for the Joint Information Systems Committee*: JISC. Available from <http://www.jisc.ac.uk/>
- Kirkwood, A. & Price, L. (2008) Assessment and student learning: a fundamental relationship and the role of information and communication technologies. *Open Learning: The Journal of Open and Distance Learning*, 23 (1) 5-16.
- Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge; New York: Cambridge University Press.
- McLoughlin, C., & Lee, M. J. W. (2008). Mapping the digital terrain: New media and social software as catalysts for pedagogical change. In *Hello! Where are you in the landscape of educational technology? Proceedings ascilite Melbourne 2008* (pp. 641-652). Available from <http://www.ascilite.org.au/conferences/melbourne08/procs/mcloughlin.html>
- Oblinger, D. G., & Oblinger, J. L. (2005). Is it age or IT: First steps toward understanding the Net Generation. In D. G. Oblinger & J. L. Oblinger (Eds.), *Educating the Net Generation* (pp. 2.1-2.20): EDUCAUSE. Available from www.educause.edu/educatingthenetgen/
- Vygotsky, L. S. (1962). *Thought and Language* (E. Hanfmann & G. Vakar, Trans.). Cambridge, MA: MIT Press.
- Vygotsky, L. S. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.
- Wagner, C. (2003). Put another (B)log on the Wire: Publishing Learning Logs as Weblogs. *Journal of Information Systems Education*, 14(2), 131-132.



6.0 Policy Guidelines

6.1 Preamble

The developmental and emergent nature of information and communication technologies (ICTs) in education raises particular issues for academic policy-makers. Policy-making occurs on at least three levels – at the level of the Commonwealth government in the form of public policy (e.g. the digital education revolution), at university level in the form of institutional policy (e.g. IT systems security) and in faculties, schools and departments in the form of local policy (e.g. electronic submission of assignments). This section of the handbook primarily addresses policy-making at the institutional level, although it also draws out some implications for analysing and operationalising policies at the local level.

This section addresses six key areas of university governance and management where academic policy needs to attend to issues raised by learning and teaching with technology:

- *Student learning*
- *Diversity, equity and access*
- *Curriculum and assessment*
- *Academic integrity*
- *Staff development and capacity building*
- *ICT infrastructure.*

It outlines the scope and focus for each of these areas, provides an overview of the challenges and opportunities facing policy-makers, and concludes with policy guidelines. It uses selected examples from the Investigation stage of the project, which surveyed and interviewed incoming first-year students and teaching staff about their technology uses and preferences, and draws on further examples from the Implementation stage, involving eight different trials of new technologies in undergraduate learning and teaching. Policy implications have been developed based on a variety of data and sources including the experiences of project team members, an analysis of institutional contexts, project processes and the immediate outcomes of the Implementation stage.

Those involved in developing policy associated with the use of technology in learning and teaching (hereafter referred to as 'learning technologies') in universities are encouraged to consider the six areas together rather than in isolation and to adapt the guidelines as appropriate to their institution, bearing in mind general considerations in this checklist:

- *What is the need for this policy in relation to the university's mission, governance priorities, strategic directions and management structures?*
- *How, through its uptake across the university community, will this policy change the way the university works, including its resourcing requirements and interactions with other policies?*
- *Who is responsible for engaging stakeholders in policy-making, identifying issues, analysing options, developing instruments, implementing, reviewing and reporting?*

These questions are uniquely shaped by the academic implications of emerging technologies. Policy-making about the use of learning technologies must be:

- *cognisant of commentary and scholarly discourse in the disciplines, the professions and the wider community about learning generally, and learning with technology specifically;*
- *responsive to empirical evidence about learning technologies, the lessons learned from reflective practice, and educational benchmarks and trends;*
- *forward-looking with regard to the nature of knowledge as it is being shaped by complex and dynamic technologies for communicating, sharing and publishing.*

6.2 Student Learning

Scope

Policy that focuses on student learning in the area of learning technologies needs to consider a broad range of learning activities and behaviours, social interactions between students, and individual student experiences that may occur in various modes of learning and teaching, including campus-based, distance or part-time study. Such policies may also need to accommodate a range of attitudes about learning and technology in different student cohorts and disciplinary contexts, and should be mindful of diversity in the way students approach 'personalised' and group-based learning environments, and the tools that support and facilitate these.

Opportunities and challenges

Many of the new and emerging technologies considered in this project held out the promise of both enhancing university education with activities that students value and improving students' learning experiences in ways that they themselves recognise. As international reports like that from the British Educational Communications and Technology Agency (BECTA) suggest, "...emerging technologies can make a major contribution to the development of a 21st-century education system – one which places learners at the heart..." (Becta ICT Research 2006, p. 4). The challenge for universities is to develop policies that take a proactive approach to this technology-rich vision for student learning, when many students do not seem to expect or demand it.

Findings from the Investigation stage of the project showed that a sizeable proportion of students did not believe that popular technologies such as instant messaging and social networking would be useful for their university study. Furthermore, a majority saw little or no educational value in technologies such as blogs and wikis.

Findings across the eight cases in the Implementation stage of the project showed that students were relatively evenly divided about whether the technology-based activities involved in these cases had helped them improve their understanding of the material they were studying.

Many new and emerging technologies include a range of features whose intention is to let individuals personalise their experience of technology use or to let groups customise a tool to suit their particular purposes. University policy may seek to encourage this burgeoning of difference and uniqueness in technologies for learning, however it may inadvertently create a climate of disorganisation or confusion unless students are prepared properly for the choices such policy raises for them.

Findings from the Investigation stage of the project showed that very few students had extensive experience of social web technologies. Findings also showed differences among students according to the university where they were enrolled, suggesting that ICT orientation must be matched to the characteristics of the university community and that off-the-shelf or one-size-fits-all approaches will not work.

New and emerging technologies present an opportunity for universities to provide 'mobile' and 'ubiquitous' learning that caters for the needs of Net Generation students who are – supposedly – always connected, multi-tasking and on-the-go, aided by their personal portable digital devices (Oblinger & Oblinger, 2005). The challenge for universities is to develop policies that allow the boundaries between formal and informal learning, campus-based and work-based learning, and student life and private life to be blurred, but not to be intrusive or disruptive for learning. Some policy issues in relation to mobile phones, for instance, include their use for private communications while students are in class sessions, their incorporation into learning and assessment designs and their use to replace other channels of communication in student management and administration (Fielden & Malcolm, 2008).

The Investigation stage of the project showed that while almost all students were equipped with at least basic mobile phones and were highly reliant on them for voice and text communication, not all students wanted to use them for university ("...my phone is like my personal life and my education is separate...").

Some new and emerging web-based technologies are essentially social, promoting and supporting the establishment of online communities. These technologies may be useful to strengthen a sense of belonging for students who are in large classes, off-campus or studying part-time. Without clear policies setting out when and why (other than

for assessment) students should be active in online communities if they want to enhance their university experience, the use of such technologies may be ineffectual in fostering student engagement and may even become an annoyance.

Findings from three implementation projects (Cases 1, 4 and 8) suggest that students may be cynical about forming online communities (“it follows that virtually no-one will put any effort into ‘group’ activities when the group does not truly exist”) or they may consider the expectation to be an imposition, unnecessary and unhelpful to them as individual learners.

On the other hand in Case 5 (file-sharing in biology), distance students contributed 20% more than on-campus students, and some students commented that they felt a greater sense of involvement in the class as a result of taking part in the activity. In Case 8 (social bookmarking in arts), a few students were observed in workshops to immediately realise the benefit of using the tool in other subjects and with other students than those intended by teaching staff.

One of the hallmarks of social web technologies is their (typically) free and public access. This may enable students to take part in so-called ‘open education’ (Brown & Adler, 2008), that is, to be active on web sites that are relevant to their field of study but not sponsored or moderated by university staff. University policy must attend to factors that may impinge on students’ identity and security in these environments, and consider students’ potential vulnerability as novices in their fields of study when they are working in open online environments.

In one learning activity that involved students blogging while on work placements (Case 1), one student had problems gaining computer access with sufficient privacy to be able to post critical reflections on the workplace. A second student posted an account of workplace behaviour that a qualified professional could be required by law to report to authorities. If this blog had been public rather than available only to a closed group of students, the student (and their supervising staff member) may have been open to accusations of unprofessional conduct.

All of the eight cases had in place measures that would enable the university to take responsibility for students’ learning via the social web but would, at the same time, limit the degree of openness of its use – namely, running activities in password-protected, membership-limited groups where students’ identities could be linked with their activities and where their activities could be moderated by an academic.

Policy guidelines

- Establish and maintain a range of options for students to use personal and social technologies within the mainstream student services and facilities of the university.
- Ensure that students receive clear information about what the university offers them and expects of them in terms of their use of learning technologies while they are students.
- Mandate needs-based induction and periodic re-orientation of students about the variety of ways in which learning technologies may shape their learning and university experiences.
- Extend existing policies to cover student safety, privacy and appropriate conduct in mobile, social and open communication environments.
- Include student consultation, feedback, suggestions and concerns in decision-making about new and emerging technologies for learning.

6.3 Diversity, Equity and Access

Scope

University policy-makers must take account of how a diverse student population will use new and emerging technologies in different ways to support learning, considering factors that may unintentionally be discriminatory in relation to age and gender, (non-) English speaking background and international or domestic residency status. Policy about learning technologies in Australian universities must also address issues relating to ICT use among specific equity groups targeted by the Commonwealth government: students from Aboriginal and Torres Strait Islander backgrounds, students with disabilities, and students from low socio-economic backgrounds (only the last group was represented in this project in numbers large enough to

analyse).¹ A related aspect of learning technology policy is access, which includes both the *availability* of hardware, software and networks for students and the degree of *accessibility* of material via these technologies.

Opportunities and challenges

The higher education sector in Australia has changed dramatically in the last 50 years with a large and sustained increase in student numbers and greater participation of professional, part-time and international students. Recently there has been growing interest in leveraging new and emerging technologies to facilitate richer experiences that internationalise university learning and teaching (e.g. Ferdig, Coutts, DiPietro, Lok & Davis, 2007). It is imperative that policy-making in this area not overlook linguistic and cultural differences that may have various impacts on student interactions in online communities.

The Investigation stage of the project found that international students in Australia were much more inclined to share digital media, publish using Web 2.0 software and use advanced features of mobile phones than domestic students – although, on average, neither group of students did any of these things more often than once every few months. This suggests that domestic students may need additional help to engage in sophisticated communication, including intercultural communication, using new and emerging technologies.

A variety of uses of new and emerging technologies may be helpful in meeting the expectations and needs of mature-age students. Many of these students are returning to study after a long absence, need to balance study with family and work responsibilities or find themselves with a need to work with a younger student population. Universities must tread carefully with policy in this respect, so that prospective and new mature-age students do not form the impression of a Net-Generation-oriented learning environment that they perceive as marginalising or confronting.

The Investigation stage of the project found that students 25 years old or younger were more likely than older students to share media, use the advanced features of mobile phones, and, to a lesser extent, publish using Web 2.0 technologies. They were also

¹ For more comprehensive information about equity groups in Australian higher education visit: (http://www.dest.gov.au/sectors/higher_education/programmes_funding/programme_categories/special_needs_disadvantage/default.htm)

slightly more likely to engage in traditional uses of the web, and create and use media. However, apart from traditional web uses, on average neither group did any of these things more often than once every few months. So universities should not assume that only mature-age students need encouragement to engage with technologies for learning, or that promoting the use of advanced technologies for university services and learning will appeal greatly to students of a particular age.

Similar caveats apply to learning and technology policies that may appear to reinforce gender differences.

The idea that universities should tap into the technology habits of Net Generation students may rest on the assumption that students privately own all the latest devices and have up-to-date software to drive and interconnect them. If a university determines that the use of new and emerging technologies is essential in learning and teaching, then university policy must make provision for students to have conveniently personalised forms of access to tools and connectivity.

The Investigation stage of the project found that nearly one in four students did not have unlimited access to broadband internet and over one in five students reported having no access to an MP3 player.

In Case 4 (photo sharing in chemistry) the department involved made a number of digital cameras available to students. However, these cameras were not utilised and it appears that students who did not own their own equipment chose to borrow cameras from family or friends.

While very few students with disabilities were represented in the project as a whole, it is important for policy-makers to note that most of the learning activities implemented in this project relied on student-created web content in forms that would not meet international web usability standards or comply with Australian legal requirements for accessibility of university-created web content. Further work would be necessary to enable students with visual, hearing, mobility or cognitive impairments and certain other disabilities to participate in particular activities.

While this section has highlighted issues of diversity, equity and access for students, policy-makers need to recognise that many of these issues apply equally to the staff of Australian universities.

Policy guidelines

- Recognise diversity in the learning technology preferences and needs of students from certain demographic and equity groups and seek to use new and emerging technologies in ways that capitalise on student diversity as a resource for learning.
- Advocate and enable broad community access to the learning technology culture and resources of the university in order to assist the students from equity groups to make the transition to new ways of learning and engaging in mobile, social and open learning environments at university; and establish schemes to equip incoming students with essential personal technologies and connectivity.
- Extend existing policies to avoid overt or implicit stereotyping and discrimination on socio-economic or other grounds, in the design and conduct of technology-facilitated learning activities and in university communications about them.

6.4 Curriculum and Assessment

Scope

New and emerging technologies can have academic policy repercussions for curriculum and assessment – the formal instantiation of university study – in several broad respects. These include technology-related influences on the content and form of what is studied, the design and conduct of learning and teaching activities and the specification and evaluation of academic outcomes and achievements.

Opportunities and challenges

New and emerging technologies raise opportunities and challenges not only for universities but also in the wider social context for which universities aim to equip students. Curricula and assessment techniques that are closely matched to technology uses and trends in particular disciplines can provide learning experiences that are authentic and produce graduates who have relevant skills and attributes.

Findings from the Investigation stage of the project showed that incoming students in Arts, Science and the Professions all had similar low or modest levels of experience and skill with several major types of technology-based activities, indicating that students

in all degrees need formal opportunities to learn how to use technologies in ways that are appropriate to their field of study.

In one implementation (Case 6 – photo sharing by education students) some students said that they planned to replicate the activity with their own students when they themselves became teachers. In another case (Case 2 – blogging by journalism students) students who were interviewed agreed that blogging was a positive way to develop contemporary skills in their journalism studies, although the lecturer thought that other students found it hard to accept blogging as a legitimate journalism genre.

University policy-makers should take care that consistent and clearly defined terms are used to describe and explain technology-facilitated learning and teaching in curriculum documentation. For example 'online learning' or 'e-learning' is often interpreted to mean off-campus, self-directed forms of study, or the blending of these forms with bursts of conventional campus-based study. While learning technologies can be used to support these forms of study, they are not restricted to these activities and learning designs. Learning technologies can be used to extend students' and teachers' reach beyond the lecture hall or laboratory while they are actually in class (or vice versa) by, for example, using technology to mine and process web-based data sets or to web-conference with remote sites. These different meanings of 'online' or 'technology-facilitated' learning need to be made explicit to students.

Several implementations (Cases 1, 4, 5 and 6) used technologies to share individual students' experiences while doing field, practical or work-based learning and to help students make stronger connections between such learning and their on-campus whole-class study. Students might have been misled or unprepared if subject guides had described these activities simply as online learning and not been explicit about their rationale or purpose.

New and emerging technologies afford an array of interactive tools that can fire the imagination of academics who wish to develop and teach their curricula innovatively. Without a policy requirement to maintain an overview of such innovation in relation to the whole course of study, there is a risk of clogging the curriculum and overloading students with work, which may undermine the overall educational quality of the course. The policy aim should be to offer a coherent suite of technology-facilitated learning across a whole program of study.

This was a recurring theme in the Implementation stage of the project. In Case 1 (blogging by education students), the activity added to students' concerns about how much university work they were being expected to do while on practical placement. One student said of Case 4 (photo sharing in chemistry), "It wasted time that could have been spent revising important relevant topics." In Case 6 (photo sharing by education students), almost all students felt that they were not given enough time to complete the activity. In Case 7 (podcasting by medical students), students expressed the view that creating podcasts and listening to those of other students was an inefficient use of their time. In Case 8 (social bookmarking by arts students), staff felt that the activity was overly complex for the timeframe and year-level.

Assessment is said to drive learning in particular ways. Kirkwood and Price (2008) suggest that with online learning, "Assessment influences not only what parts of a course get studied, but also how those parts are studied [...] Appropriately designed assessment that exploits the potential of ICT can change students' approaches to learning" (p. 5). Policy must be used to support the translation of academics' interest in implementing new technologies for learning into purposeful, assessable learning activities without exposing students to over-assessment or assessment not aligned with learning objectives.

As the Implementation stage has shown, academics cannot assume that students of the Net Generation intuitively believe that new and emerging technologies will help them with their studies, or that they have enough experience with such technologies to know how they might be used. As a result, students are not likely to initiate negotiations about new forms of assessable work, and must be led by staff and policy settings.

In the Implementation stage, staff in many cases regarded the activity as important and successful, yet students frequently did not see it this way. The activity in Case 4 (photo-sharing in chemistry) was seen by many students as an unnecessary and unhelpful hurdle requirement. In Case 8 (social bookmarking by arts students), the activity appeared to be more onerous than the alternative hurdle tasks that students could choose from.

Collaborative and team-based work can be encouraged and empowered using emerging technologies. However, even without factoring in new technologies it is difficult to design and conduct group assessment within a primarily individual-oriented assessment system. Practices for assessable group work using new technologies should be guided by policy especially considering, on one hand, the ease with which individual contributions can be copied, edited or deleted by other individuals in an online collaboration and, on the other hand, the facility that some tools have to capture the history of individual contributions in the evolution of a collaborative piece of work.

In Case 3 (wiki-mediated collaborative writing in psychology), some students said that they would like more structure and specific guidelines ("It didn't really encourage any group work as such because the task you could easily split it up into five different sections. We just went home and did the five different sections on our own."). A few students also expressed concern about how equitably the work had been shared within student groups.

Policy guidelines

- Determine that every degree program will explicitly educate students in both generic and profession- or discipline-specific learning technology skills and knowledge and that every program will be routinely reviewed and updated in this respect.
- Map the use of technologies for assessable learning activities across subjects and years, to provide an overview of when, why, how and how much students can expect to use learning technologies to demonstrate their achievement of intended learning outcomes.

- Clarify the university's principles of assessment and minimum assessment requirements so that these apply not only to the learning outcomes but also to the learning processes that students are expected to demonstrate, when they are asked to participate or collaborate online to produce work for assessment in whole-class groups or small groups.

- Extend existing policies governing assessment validation, moderation and appeals to make adequate provision for circumstances where students are permitted or required to use new and emerging technologies in the development or presentation of assessable work.

6.5 Academic Integrity

Scope

Many of the affordances provided by Web 2.0 technologies to create and publish content online for others to access and amend, have implications for policies that are designed to uphold academic conventions of producing original work and attributing the influence of ideas and works of others on its creation. Issues relevant to academic policy in this area include the evaluation of web content, moral rights of authors and content creators, ownership of copyright, and forms of permission to reproduce and re-use content.

Opportunities and challenges

The Internet provides an abundance of convenient and relevant resource material for learning and teaching. However, with some new and emerging technologies the ways in which content is created, compiled and formatted often make it difficult to reference and appropriately describe the provenance, authority or relevance of the resource. University policy must set down standards and acceptable options in relation to paraphrasing, quotation, referencing and citation for drawing on web content in assessable academic work.

In Case 3 (wiki-mediated collaborative writing in psychology), a staff member observed, "Some students do not reference, some have clearly copied from Wikipedia, and some are referencing in an ad hoc way ('I found this on YouTube'). Others are treating the wiki page like a formal document and using a 'conventional' referencing system at the end."

Similarly, students involved in Case 8 (social-bookmarking by arts students) received conflicting instructions about whether they should choose and critique web resources from non-traditional non-scholarly sources such as blogs, or whether they should limit their selections to web resources derived from academic publishers' databases.

The tools and the products of social web publishing have given rise to philosophical debates about individual freedoms and responsibilities in re-using web content created by others – or even content that individuals themselves have contributed to a multi-authored web page – and pragmatic concerns that "...institutions may be challenged on the quality and legality of learner-produced artifacts..." (Collis & Moonen, 2008; p.102). The variety of perspectives on what it means to be both a 'producer' and a 'consumer' of web content presents new ways in which students are able to plagiarise and self-plagiarise, whether intentionally or inadvertently, for ideological reasons or for expediency.

In Case 4 (photo-sharing in chemistry), it was difficult for staff to monitor students' contributions to ensure that they were not using photographs they had merely downloaded from the web rather than taken themselves; one student was asked to remove a photo that might have caused offence.

In Case 7 (podcasting by medical students), current plagiarism detection tools could not assist staff to ensure that students would not simply recite content from textbooks instead of from their own case notes.

Learning activities that are centred on student-created content can cloud students' rights in relation to original content that they create, including their right to change content over time or to remove it from the Internet altogether. A number of complex factors need to be considered in policy making in this area. For example, some new and emerging technologies (e.g. photo sharing and wikis) may allow content to persist after a course has finished while in other cases the content produced may be transient (e.g. instant messaging). If third party software is being employed, as was the case in several of the implementation projects, license agreements may stipulate ownership and copyright clauses which may impact on students' rights, educators' ambitions to use students' content for research purposes, or course accreditation standards for recording and retaining assessed work.

In Cases 3 and 4, students' assessment was partly based on an analysis of logs of activity in a third-party proprietary online environment that was external to the institution.

In Case 5 (file sharing by biology students), the instructors wanted to be able to reuse and expand the current photo collection with future student groups, which raised questions about whether explicit consent from students would be required and in what form.

The human research ethics application at each university governing the Implementation stage of the project differed in the provisions required for re-use of student-created content. Almost no project made administrative or technical provision for what would happen to students' work after the pilot semester; few of the teaching staff involved raised this as an issue of importance.

Policy guidelines

- Describe and explain plagiarism-related academic misconduct in a way that is applicable to students' re-use of digital media for assessment purposes.
- Set out the rights and responsibilities of the institution, the individual student, and other interested parties regarding the ownership of externally hosted content produced by students as part of their university work.
- Promote digital information literacy that encompasses fundamentals of academic integrity associated with the use of new forms of content, and support collaboration between students and staff to address emerging issues and produce examples of good practice.

6.6 Staff Development & Capacity Building

Scope

Staff development aspects of learning technology policy take into account the roles that academic and professional staff play in realising the university's vision for the use of learning technologies, and consider the leadership and workforce development required for this. Learning technology policy needs to accommodate different attitudes and approaches to this area given the diverse complement of staff within universities. Moreover, policy should consider the interests of staff in relation to their disciplinary and professional affiliations and in relation to the security, satisfaction and stimulation of their working environment.

Opportunities and challenges

This project demonstrates that there is no basis for assuming that every academic staff member is a 'digital immigrant', hopelessly out of step with students in technology use and habits or preferences for using emerging technologies at university. This seems partly because the overall level of enthusiasm for new and emerging technologies among students is not as advanced as some technology 'visionaries' would claim. An institution's commitment to 'living and learning in the digital age', mobile learning, 'Education 2.0' and so on, will depend on flexible and adaptive policies and policy-making, balancing what is known about current staff as technology users with emerging evidence about the impacts of using learning technologies in universities.

While the Implementation stage of the project found no significant differences between staff and students, there were significant age-based differences in two of the five technology-based activities considered. Older individuals (over-25 years of age) were less likely than younger individuals (under-25s) to share media or use the advanced features of mobile phones. But even under-25s were, on average, only doing these things every few months. On average both age groups were creating media every few months, and using the web for browsing, searching, email and pastimes a few times a week.

The prospect of using learning technologies in new ways to enhance student learning appears to offer an avenue for some individual staff members to find satisfaction through teaching more effectively and flexibly. Incentives for adopting innovative approaches to teaching and learning may need to be reinforced more strongly in policy before the majority of staff are willing to embrace the challenges associated with redesigning or modifying current curricula.

The Investigation stage of the project found that many staff – often the majority – were unsure or sceptical about the potential of many new and emerging technologies for supporting learning or teaching. Interviews with staff raised some benefits (communication, presentation, access to information and student engagement) but more concerns (workload, loss of face-to-face interaction with students, student misconduct, and interface, usability or functionality limitations of technologies).

In contrast, for most cases in the Implementation stage of the project, staff were very positive about their experiences with learning and teaching with emerging technologies. For example, in Case 2 (blogging by journalism students) the teacher commented that students had exceeded expectations in their uptake of the activity; in Case 3 (wiki-mediated collaborative writing in psychology) teaching staff felt they had gained deeper insights into student learning; and in Case 5 (file-sharing by biology students) the lecturer saw benefits for subject knowledge, group interaction and flexible learning.

A core proposition of learning and teaching with new and emerging technologies is that it will improve student learning and the student experience, but isolated staff experimentation in this area does not often translate into organisational learning. Staff need to be supported to observe and learn lessons from the effects that different approaches to technological innovations have on students, and to apply these in keeping with their own university's academic mission and strategy. Policy makers must ensure that relevant quality-of-teaching measures, institutional research and independent evaluations of technology implementations are in place and are used sensitively to encourage staff efforts.

As has been noted previously, even though staff involved in many of the implementation cases felt that the activity was important and often successful, independent data showed that the students often did not see it this

way. For example, in Case 6 (photo sharing by education students), while teaching staff were pleased with the level of student engagement and the quality of student work in the subject, the participating students were neutral about the learning benefits and more positive about the effect of the activity on their ICT skills.

Designing and developing learning materials, learning activities and learning environments that integrate new and emerging technologies can be creative and scholarly academic work which is one mode of learning and development for academic staff. This is typically multi-disciplinary work that requires the coordinated effort of a range of staff. This effort must be developed and managed systematically to make innovation in learning and teaching sustainable. In order to make the best use of the disciplinary and professional expertise of teaching academics, and of educational development specialists, policy should explicitly consider accountability and complementarity of roles.

In every case in the Implementation stage of the project, subject specialists worked closely with one or more educational technology researchers and developers. Different types of subject specialists were involved, including lecturers, tutors, demonstrators, year coordinators, research assistants and subject librarians. In Case 4 (photo sharing by chemistry students) the success of the project was attributed in part to the nature of the team: "I think the group of people involved were all committed to making it work and I think we did bring some complementary views." Staff also expressed concerns about how the initiative would fare beyond the Implementation stage without the same team. In Case 8 (social bookmarking by arts students), information literacy librarians were inducted into the pilot project but chose not to partner with subject teaching staff in any further rollout of the technology.

The level and type of training needed by teaching staff varied from case to case. All cases involved team-based workshopping of the learning design. In some cases, (Case 4 – photo-sharing and Case 7 – podcasting) the design of the activity meant there was no active role for lecturers or tutors, so they were briefed but not trained. In other cases (1, 2 – blogging; 5, 6, photo-sharing), very little further support was required beyond a demonstration of how to use the software tool. In other cases (3 – wiki; 8 – social bookmarking), tutoring staff needed detailed notes and periodic coaching.

Policy guidelines

- *Acknowledge within the existing staff development framework how the introduction of new and emerging technologies in learning and teaching creates both opportunities and challenges for academic and professional staff performance. Make provision to recognise and reward the implementation of new practices that improve student learning based on these technologies.*
- *Monitor ICT skills and gaps in all university staff, as well as strengths and limitations in specialised educational technology expertise, to guide recruitment, training and succession planning in relation to the institution's strategic directions for learning and teaching with technology.*
- *Establish mechanisms for routine collaboration by academic staff, educational developers, student learning advisors, librarians and ICT infrastructure staff to improve uses of new and emerging technologies for student learning.*
- *Promote and support research and development by staff to explore and evaluate creative approaches to using new and emerging technologies for learning and teaching.*

6.7 ICT Infrastructure

Scope

Although these policy guidelines make it clear that many aspects of academic policy must address the use of learning technologies, policy-making in this area is most often associated with the ICT infrastructure and expertise of the university. The focus of this aspect of policy is on how computer systems and services support the use of technology in learning and teaching at universities. Issues to be considered here can include hardware and software purchasing and licensing, testing and implementing, networks, enterprise IT systems and their integration, access and security, facilities planning, and total cost and economies of scale.

Opportunities and challenges

When designing and running a learning activity centred on student-created content, it seems that in the absence of policy directions to the contrary, an individual academic or a teaching team may choose among dozens of software tools and services that suit their needs (blogs, wikis, photo-sharing, etc.). Many of these tools are freely available on the Internet or are part of a wider web-based service (such as the services offered by Google). However,

the free tool or an externally licensed tool with additional features often requires additional time to set up, administer and manage groups. Moreover, even with testing by individuals involved in the teaching program, the tool may not meet the needs of a student group when it is finally implemented.

In the Implementation stage of the project, there were some unforeseen technical issues with using free or licensed versions of 'free' software tools that required extra technical work to resolve. For example, in Case 4 (photo sharing by chemistry students) the class consisted of over 900 students, yet the tool (Flickr) did not allow a group administrator to sign up more than 300 new users per week. In both Case 4 and Case 3 (wiki-mediated collaborative writing by psychology students) using RSS feeds to capture student online activity was more difficult than the project team expected. In addition, in Case 3, the service went down for several hours on the final day of activity and correspondence with the US-based service about this outage was more limited than could have been expected from a local or university-based provider. In Case 8 (social bookmarking by arts students) the website prompted users to download and install a utility program, yet they were not permitted to do this on university computers.

Some of the free tools went through upgrades or changes during the course of the implementations, which in some cases necessitated one or more design changes to be made 'on the run' (e.g. Cases 3 and 8). This resulted in inaccuracies in some instructional materials developed for staff and students and was a source of confusion, particularly among new or inexperienced users.

Many university enterprise learning management systems encompass tools to support student-created content that, when in full production release, are already technically tested and supported. This would seemingly be very convenient as "...the whole campus community benefits from the integration of systems, single sign-on, and coherent interface design..." (Kuhn, Brookes & Bellos 2008, p. 70). However, evidence from this project suggests that such systems are not always responsive to the needs of a specific learning design (e.g. see Cases 2, 3 and 8 in Section 4.2). Policy determinations about the degree of flexibility a university allows in regard to going outside of enterprise systems must be clearly reasoned and justified.

The Investigation stage of the project found that over 60% of first-year students had used a student portal or learning management system weekly or more often; while 68% of staff were using a learning management system more often than weekly. So there is a significant level of familiarity with these kinds of systems, and arguably an expectation of further encounters with them. The investigation also found a sufficiently high level of use of a range of web-based services to suggest that students and staff were comfortable with multiple usernames and passwords. However, qualitative feedback suggested that the convenience of single log-in access to web-based services and activities is highly valued.

The limitations of enterprise systems were noted in several projects. In Case 2 (blogging by journalism students), the blog tool was de-activated temporarily by the learning management system administrators who were unaware of the pilot project; in Case 7 (podcasting by medical students), the university's lecture capture tool was able to support recordings by staff but not by students; in Case 8 (social bookmarking by arts students) the tool integrated in the learning management system was not adequate in supporting either closed groups or teacher review of student group activity.

Some parts of the infrastructure for technology-facilitated learning, such as Internet-connected computer rooms, on-campus wireless Internet provision and wired classrooms, are in place on most university campuses. However these do not provide for all circumstances where students and staff may be expected or required to use learning technologies – when out and about on fieldwork or while working across multiple campuses or universities, for instance. Shared provision with workplace learning hosts may need to be arranged. Policy direction is needed to determine levels of provision of tools and networks for students and staff in the diverse settings where they may be required to work online.

In Case 1 (blogging by education students), students' use of the blog tool while on professional placement was hampered by lack of access to the Internet from placement sites. In Case 7 (podcasting by medical students), even those students who did show the initiative to create a podcast found it complicated to record and upload MP3 files.

Policy guidelines

- *Articulate the university's approach to staff members' freedom to choose appropriate learning technologies as opposed to the mandated use of enterprise ICT systems for learning and teaching.*
- *Prescribe frequent review and reporting to the university community of levels of demand for and quality of provision of educational technology infrastructure, and prioritise improvements and innovations in consultation with student and staff user groups.*
- *Provide an ongoing system of technical supports and standard evaluation protocols for student and staff trials of new and innovative tools for learning and teaching.*
- *Plan to monitor and revamp learning and teaching spaces and other campus infrastructure services so that they respond to new and emerging forms of technology use by students and staff.*

6.8 Conclusion

Much of what is described in the literature as educational ICT policy is actually description and analyses of strategies and management plans. There is a dearth of literature reflecting high-level, evidence-based, whole-of-institution approaches to learning technology dimensions of academic policy, particularly with the flexibility to encompass developments in mobile and social computing. Two exceptions recommended for further reading are Jacobs (2007) and Wallace (2007).

This section of the handbook was prepared by Kathleen Gray, Kerri-Lee Krause, Gregor Kennedy, and Rosemary Chang

References

Becta ICT Research. (2006). *Emerging Technologies for Learning*. Coventry, UK: British Educational Communications and Technology Agency. Available from http://emergingtechnologies.becta.org.uk/index.php?section=etr&catcode=ETRE_0001&rid=14181

Brown, J., & Adler, R. (2008). Minds on fire: Open education, the long tail, and learning 2.0. *Educause Review*, 43(1), 16-32.

Collis, B., & Moonen, J. (2008). Web 2.0 tools and processes in higher education: Quality perspectives, *Educational Media International*, 45(2),93-106.

Ferdig, R., Coutts, J., DiPietro, J., Lok, B., & Davis, N. (2007). Innovative technologies for multicultural education needs. *Multicultural Education & Technology Journal*, 1(1), 47-63.

Fielden, K., & Malcolm, P. (2008). Towards a deeper understanding of cell phones in schools: Aligning school policy. *International Journal of Mobile Learning and Organisation*, 2(3) 216- 236.

Jacobs, N. (2007). Summary of JISC response to the recommendations in the 2007 report 'Web 2.0 for Content for Learning and Teaching in Higher Education', by Tom Franklin and Mark van Harmelen. [4pp.] <http://www.jisc.ac.uk/media/documents/programmes/digitalrepositories/web2-content-jiscresponse-1.pdf>

Kirkwood, A., & L. Price. (2008). Assessment and student learning: A fundamental relationship and the role of information and communication technologies. *Open Learning: The Journal of Open and Distance Learning*, 23(1), 5-16.

Kuhn, R., Brookes, K., & Bellos, N. (2008). A policy-based approach to technology systems. *Educause Quarterly*, 31(2), 70-74. <http://net.educause.edu/ir/library/pdf/EQM0829.pdf>

Oblinger, D. G., & Oblinger, J. L. (2005). Is it age or IT: First steps toward understanding the Net Generation. In D. G. Oblinger & J. L. Oblinger (Eds.), *Educating the Net Generation* (pp. 2.1-2.20): EDUCAUSE. Available from www.educause.edu/educatingthenetgen/

Wallace, L. (2007). Online teaching and university policy: Investigating the disconnect. *Journal of Distance Education*, 22(1), 87-100. <http://www.jofde.ca/index.php/jde/article/viewFile/58/471>



Notes

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