RCEE & RHEd2010
Kuching,Sarawak
7 – 9 June 2010

Patterns in Student and Staff Access to, and Attitudes Towards Usefulness of, ICT in an Australian University

Peter R. Albion[a]
Jerry C. Maroulis[a]
Romina Jamieson-Proctor[a]

[a]Faculty of Education, University of Southern Queensland, Australia

Abstract

New information and communication technology (ICT) enables new opportunities for learning. However, for these opportunities to benefit students and staff, they must have ready access to ICT and positive attitudes toward its usefulness for learning and teaching. This paper reports some initial results from analysis of data obtained from surveys of ICT access, and attitudes toward ICT usefulness for learning, of students and staff at an Australian university in late 2009 and early 2010. The surveys were conducted as part of a larger project to identify ICT likely to be of most benefit for student learning. The survey data will be used to inform decisions about adoption of new digital technologies for learning and teaching and the provision of professional development to staff.

Keywords: digital natives, ICT in education

1. Introduction

The University of Southern Queensland (USQ) has built a strong reputation for excellence in distance education that has been underpinned by application of Information and Communication Technology (ICT). This is reflected in the USQ vision for the next decade, which is *to be recognised as a world leader in open and flexible higher education*, an outcome that is likely to be dependent to a substantial extent on continued effective application of ICT for learning and teaching.

Providing learners with access to the interactions that promote effective learning has been a challenge in distance education but contemporary digital technologies provide new opportunities for learning through interaction with content, instructors, and peers [1]. However, before students can take advantage of these opportunities they must have access to the relevant ICT and must possess the attitudes and capabilities necessary to use it for learning. Equally, staff responsible for designing and facilitating the courses must have access to the ICT and possess the attitudes and capabilities to use it effectively in the learning and teaching environment.

USQ has a diverse and scattered student population with a relatively high proportion from lower socioeconomic backgrounds and many who are the first in their families to enter university. Access to and experience with new forms of ICT are likely to be varied. Consequently, USQ needs to know more about what ICT students are able to access and their attitudes and capabilities for using it to enhance their learning. With this knowledge it becomes possible to design learning activities that will be accessible to students and, where necessary, to support staff with learning to use the relevant ICT in their design and facilitation of learning activities.

During 2009 USQ made available internal competitive grants for learning and teaching projects. One successful grant was for a project to identify ICT of likely interest for learning and teaching and to implement a cascading peer mentoring approach to developing the relevant capabilities among USQ staff to use it with students. The project commenced by administering surveys to USQ students and staff to obtain data about access to ICT and attitudes and capabilities for using various forms of ICT for learning and teaching. The intent was to identify forms of ICT widely available to students and favoured by them for use in learning so that those forms of ICT could be prioritised for use at USQ. Relevant staff development through the mentoring program was to be informed by the same data.

This paper presents selected data from the student and staff surveys with a focus on data from the USQ Faculty of Engineering and Surveying, one of five faculties at USQ. The analysis of data from the surveys is still in an early stage so the presentation here is descriptive and without tests of statistical significance but does point toward areas for future more detailed analysis and investigation.

2. Literature review

Over the past decade or more there has been a widespread conversation about how education should change in response to the developments in ICT. Some key ideas from this conversation cluster around what are described as 21st Century Skills, which are the skills thought to be needed by today's students for success in the coming decades. They include core subjects linked with themes such as global awareness and citizenship; learning and innovation skills; information, media and technology skills; and life and career skills [2].

The argument runs that in the future people are likely to have serial careers and will need to learn new skills throughout their lives. With information expanding and changing rapidly there is less importance attached to "learning about" and more to "learning to be" [3] which is likely to be accomplished by engaging students not in listening but in doing, solving authentic problems in modes similar to apprenticeship. Such ideas have strong resonance with the Problem Based Learning (PBL) approaches being more widely adopted in the education of professionals such as engineers.

The global analysis of PBL in engineering education by Hassan et al. (2004) demonstrated that the principles of PBL are pedagogically defensible and have consequently been implemented at various scales from single course to complete programs of study [4]. At USQ, work by Brodie [5] demonstrated the successful delivery of PBL in a single online course within an undergraduate first year engineering degree where students worked entirely in online mode using a variety of ICT to communicate and solve authentic engineering problems. Furthermore, PBL can be an important vehicle for delivering key graduate attributes that engineers require to address the future challenges in the profession. For instance, the literature suggests that desirable graduate attributes for engineering graduates (such as working globally in multicultural environments; working in interdisciplinary, multi–skilled teams; sharing of work tasks on a global and around–the–clock basis; working with digital communication tools and working in a virtual environment) will require attention to significant changes and refinement in teaching methodologies in engineering education that will hasten the incorporation of what are currently regarded as innovative or even radical approaches to teaching and learning [6-8].

Especially for a distance education university such as USQ, the role of ICT in achieving these changes in learning and teaching is likely to be considerable. The 2010 Horizon Report [9] identified four trends as key drivers of ICT adoption over the next five years. They were the changes to the role of educators resulting from the abundance of resources on the Internet, the growing expectation of being able to engage in activities irrespective of time and location, the increasing prevalence of cloud-based ICT and accompanying decentralisation of support, and the new emphasis on collaboration among students and interdisciplinary working. Among the challenges identified in the report the most pertinent for this study were the need to adapt teaching and learning to better meet the needs of current students and the importance of digital media literacies as a key skill in every discipline. Among the technologies identified by the Horizon Report as most likely to affect higher education in the near future, mobile computing was the most notable.

In order to appropriately manage the adoption of new ICT for university learning and teaching it is important to know about the access that students have and their preferences for using ICT in learning. Prensky [10] has argued that the current generation of students are "digital natives" who, because they have grown up with ICT, are comfortable with it and may even think differently than previous generations.

It was considerations such as this that underpinned the work of Kennedy et al. [14-16] on a project funded by the Australian Learning and Teaching Council. Their study collected survey data from 2588 first-year students and 108 staff across three Australian universities. In brief they reported six key findings:

1. The rhetoric that university students are Digital Natives and university staff are Digital Immigrants is not supported.
2. There is great diversity in students' and staff experiences with technology, and their preferences for the use of technology in higher education.
3. Emerging technologies afford a range of learning activities that can improve student learning processes, outcomes, and assessment practices.
4. Managing and aligning pedagogical, technical and administrative issues is a necessary condition of success when using emerging technologies for learning.
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.
6. The use of emerging technologies for learning and teaching can challenge current university policies in learning and teaching and IT. [14] (pp. 5-6)

Despite the superficial appeal of the digital native/immigrant dichotomy, Waycott et al. [11] noted that there is a relative dearth of empirical studies comparing student and staff use of ICT in higher education. In fact, the authors found that there was little or no evidence for the claim that a gap exists between technologically-savvy students and less-technologically adept staff members. Furthermore, a study by Thinyane [12] involving 290 first year students at two South African universities investigated one of Prensky's key tenets that that the

digital natives are excited by Web 2.0 technologies and found that students did not use, and were not interested in these technologies, apart from the mobile phone. Newton and Ellis [13] found a similar situation in a regional Australian university where first year students did not wish to engage with these technologies in their studies.

3. Methodology

The instruments used in this study were derived from those originally developed by Gray et al. [16] for use in a large study of staff and first-year students conducted across three Australian universities in 2006. The student instrument has been used as the basis for other studies [12, 13] and its adaptation for this study offered the opportunity for comparing results with those obtained by other universities.

In adapting the instruments for use in this study most items were retained in their original form or as near as possible to it. Changes were made to the items collecting demographic data to suit the structure of USQ and some sections were updated to reflect changes in technology or to clarify specific technologies such as distinguishing between mobile phones capable of receiving or capturing video. A small number of items were added, such as those about quality of broadband access, in order to obtain more detail where it was considered necessary in the particular multi-campus USQ context.

The questionnaires were administered online using LimeSurvey® (http://www.limesurvey.org/) which permitted data to be downloaded in a format suitable for import into SPSS 18 for analysis. Student participants were recruited in November-December 2009 using a short notice in the USQ student portal inviting students to visit a web page for more information about the survey and the opportunity to win one of five iPod Shuffles or other prizes of equivalent value for completing the survey. Academic staff participants were recruited in January-February 2010 through a global email message sent by a senior USQ academic administrator inviting them to complete the survey with an opportunity to win one of five shopping vouchers for completing the survey.

4. Results

Completed usable responses from the surveys totalled 623 students and 69 staff. Total enrolments at USQ in 2009 were 25 657 and there were 419 full-time equivalent academic staff. Respondents represented all faculties and campuses of the university with 68 students (10.9%) and 11 staff (15.9%) from the Faculty of Engineering and Surveying (FoES). Because the data were collected online it is likely that the respondent groups for both students and staff were skewed toward those who are more comfortable with ICT. Despite this limitation the responses were sufficient to provide useful insights into the access, capabilities and attitudes in relation to ICT in learning and teaching. The following results will focus on the survey items that investigated access and attitude to usefulness for learning of various forms of ICT.

Table 1 displays the proportions of student respondents by gender for the Faculty of Engineering and Surveying (FoES) as well as other sections of the university. As is typical, the FoES students were predominantly male but the proportion of female FoES students who completed the survey is high compared to the 7% of female students who are enrolled in FoES programs.

Table 1. Percentage distribution of student respondents by gender

Gender	FoES (%)	Other (%)
Female	14.7	76.0
Male	85.3	24.0

Table 2 displays the proportions of student respondents undertaking study at different levels. The majority of respondents were enrolled in undergraduate programs and about 85% were in the first or second year of their degree (typically four years equivalent full-time study).

Table 2. Percentage distribution of student respondents by level of study

Level of study	FoES (%)	Other (%)
Undergraduate	92.6	69.7
Postgraduate coursework	5.9	26.3
Postgraduate research	1.5	4.0

As is evident from the data in Tables 3 and 4, the majority of student respondents were studying part-time and in external mode. This is consistent with the age data presented in Table 5, which shows that the FoES students had a substantially higher proportion (76.4%) in the 21-40 range compared to the other faculties (59.5%). This indicates that the majority of FoES students are mature age and studying part-time at a distance from the physical campuses. These results align closely with other research that characterises FoES students at USQ [17-19]

Table 3. Percentage distribution of student respondents by attendance

Attendance	FoES (%)	Other (%)
Full-time	20.6	37.1
Part-time	79.4	62.9

Table 4. Percentage distribution of student respondents by location and mode of study

Location/Mode of study	FoES (%)	Other (%)
On campus at Fraser Coast	-	6.5
On campus at Springfield	2.9	4.9
On campus at Toowoomba	14.7	15.7
External	77.9	51.0
Online	2.9	18.4
With a USQ partner	1.5	3.6

Table 5. Percentage distribution of age groups among student and staff respondents

Age group	Students (%)		Staff (%)	
	FoES	Other	FoES	Other
< 21	11.8	14.3	-	-
21-30	42.6	30.1	9.1	5.2
31-40	33.8	29.4	36.4	29.3
41-50	8.8	18.9	18.2	27.6
51-60	2.9	6.5	9.1	29.3
>60	-	0.9	27.3	8.6

Table 5 also presents comparative age data for staff respondents. Not surprisingly, given the requirements for qualifications and experience among university academics, the majority of staff are in the 31-50 age range. Staff respondents from FoES also include a higher proportion older than 60 but the percentage of respondents is small (15.9%) and the proportions in this sample may not be representative of the FoES as a whole.

Compared to other groups for which data collected using a comparable instrument have been published, the student respondents in this study are, on average, significantly older and, by virtue of their distance education enrolment, possibly somewhat less concentrated in major urban areas. The students in the original Australian study by Kennedy et al. [14] were all in their first year at university, with 85% younger than 25 and 67% in urban locations. A South African study [12] using a comparable instrument collected data from first year students aged between 18 and 20.

ICT cannot be used effectively for learning and teaching unless it can be accessed conveniently when it is needed. Students were asked to indicate their level of access to a variety of forms of ICT beyond any access provided by USQ through on campus laboratories or other means. For each form of ICT the choices were “access exclusively for my own use”, “access any time I need it, shared with other people”, “limited or inconvenient access”, “no access”, or “not sure”. The staff survey included the same question to gauge staff levels of personal access to ICT away from their USQ campus. Table 7 summarises the responses to this item as the combined percentage of respondents in each group who selected the first two options. That is, the percentages indicate those for whom access to each form of ICT was exclusive or available any time on a shared basis.

Table 7. Percentage of respondents reporting exclusive or convenient access to ICT

ICT	Students (%)		Staff (%)	
	FoES	Other	FoES	Other
Desktop computer	80.9	77.4	90.9	79.3
Portable computer	89.4	80.9	54.6	82.8
Desktop and portable	67.6	60.0	54.5	63.8
No/limited computer	7.4	1.6	9.1	1.7
MP3 player	57.4	58.4	45.5	46.5
MP3 player with video	45.6	37.3	36.4	31.0
Digital still camera	79.4	84.1	63.7	69.0
Digital video camera	39.7	42.2	27.3	58.6
Mobile phone	92.6	95.5	72.7	77.5
Mobile phone – still camera	83.8	85.0	27.3	69.0
Mobile phone – video camera	61.8	70.6	27.3	51.8
Mobile phone – MP3 player	69.1	58.0	36.4	48.2
Mobile phone – receive video	60.3	55.7	27.3	41.4
Portable data storage	92.6	95.9	90.9	87.9
Game console	55.9	53.7	36.4	32.7
Web cam	50.0	64.3	63.7	67.2
Printer	80.8	90.1	91.0	93.2
Scanner	78.0	78.9	91.0	79.3
Dial-up Internet access	19.1	13.5	9.1	15.5
Broadband Internet	86.8	95.3	81.8	84.5
Dial-up & Broadband	14.7	12.1	9.1	6.9
No/limited Internet	8.8	3.2	18.2	6.9

The low proportion (7.4% for FoES and 1.6% for others) of students reporting no or limited access to at least one computer is consistent with the demands of the distance education mode in which most of them are engaged. It compares favourably with 78% of Australian households that reported having a computer in 2009 [20]. Further analysis will be needed to determine whether the small proportion of students reporting no convenient access to computers beyond the university represents on campus students who rely upon laboratory access or can be explained in some other way. By comparison, the study by Kennedy et al. [14] reported unrestricted access to desktop computers and portable computers by 83% and 65% of students respectively. The higher proportion of access to portables among respondents in this study may indicate a trend toward increased mobility in recent times and is consistent with the trend identified in the Horizon Report [9].

The reported rates of access to MP3 players (iPods or equivalent) seems low, especially compared to the values reported by Kennedy et al. [14] for data collected in 2006. They reported 63% unrestricted access to MP3 players among a younger group of predominantly urban first-year students. The group represented in this study is older and three years may not be long enough for the uptake of MP3 players to extend to a more mature group.

The proportions of students (92.6% for FoES and 95.5% for others) reporting convenient access to a mobile phone are comparable to the proportion (95%) reported by Kennedy et al. [14] but the rates of mobile phone access among staff are notably lower

than for students in this study. This may reflect an age-related difference, with the generally younger student body being more attuned to recent trends to increased mobility with technology and/or a greater desire to stay connected at all times. Alternatively, it might also indicate that staff have access to an office phone and find less need for a mobile. At 69.1% and 58.0% the proportions of students with MP3 capable mobile phones is noticeably higher than the proportion (40%) reported by Kennedy et al. [14]. This probably reflects the launch, and resultant popularity, of the iPhone and similar devices since Kennedy et al. collected their data in 2006.

The high proportion of respondents with broadband Internet access (and correspondingly low proportion with dial-up) reflects the shift in Australian domestic Internet access in recent years. The number reporting both dial-up and broadband access may reflect overlap following upgrade to broadband or the retention of a dial-up account for use with a portable computer. Further analysis may lead to an explanation. In 2009, 72% of Australian households had Internet access and 62% had broadband [20]. The higher proportion of access among respondents on this survey is consistent with the long-term Australian trend for higher levels of access in households with students. That trend may be reflected in the higher levels of access reported by students compared to staff. Kennedy et al. [14] reported that data collected across three Australian universities in 2006 showed 75% of students with unrestricted access to broadband and 33% with unrestricted access to dial-up. The higher proportion of broadband reported by USQ students probably reflects a combination of the societal trend from 2006 to 2009 and higher needs for quality Internet access to support distance education, which is the dominant mode of study among these respondents.

Respondents who indicated that they had broadband access to the Internet were asked two further questions about the speed of their connection and their monthly data limit. The question about Internet speed offered a choice of 5 common downlink speeds and two additional choices – "don't know but it is too slow" and "don't know but it is fast enough". Table 8 reports combined percentages of those who selected speeds of at least 1500 kbps or "fast enough". The question about data limits similarly offered a choice of five common monthly limits and two additional choices – "don't know but it is too little" and "don't know but it is enough". Table 8 reports combined percentages of those who selected data limits of at least 1 GB/month or "enough".

Table 8. Percentage of respondents reporting "acceptable" broadband Internet

Broadband Internet quality	Students (%)		Staff (%)	
	FoES	Other	FoES	Other
> 512 kbps/fast	72.6	64.3	70.0	60.0
enough				
> 1 GB/mo or enough	95.2	86.3	70.0	92.0

The majority of students responding to the survey reported access to broadband connections with sufficient speed and data capacity to handle the typical requirements of USQ courses. Given the method used to recruit participants for the survey, it is possible that the students who responded were among those more likely to have quality broadband connections and that those with less satisfactory connections may not have participated.

Students were asked to respond to an item that began with "I want to use ICT in my studies because:" and invited responses to six reasons on a 5-point Likert scale from "strongly disagree" to "strongly agree". The equivalent item on the staff version began with "Students should use ICT in their studies because:" and had the wording of the six reasons appropriately adjusted. Table 9 reports the combined percentages of staff and students who selected "strongly agree" or "agree" on each of the items.

Table 9. Percentage agreement with reasons for using ICT for study purposes

Reason for ICT use	Students (%)		Staff (%)	
	FoES	Other	FoES	Other
Better results	79.4	72.4	63.6	43.1
Deep understanding	73.6	68.6	54.6	47.3
More convenient	85.3	90.1	81.8	94.9
General IT skills	82.4	93.2	72.8	98.3
Career prospects	73.5	78.7	81.8	91.4
Essential career skills	76.4	82.9	81.8	94.8

Inspection of the data in Table 9 reveals what appear to be some interesting trends that have not yet been tested for statistical significance. On the first two reasons that relate to immediate learning goals, both students and staff from FoES reported more agreement than students and staff from other sections and students generally reported more agreement than staff. On the last two reasons that relate to longer term career related goals, students and staff from FoES reported less agreement than students and staff from other sections and students generally reported less agreement than staff. The broad trends appear to be that members of FoES and students in general see the most important contribution of ICT as being for immediate learning goals rather than longer term program and career goals. What this might mean is unclear and further investigation would need to be undertaken to determine firstly whether the differences are significant and, if so, what might the implications be in light of the need for engineering professionals to use ICT to communicate and collaborate on projects globally?

A key goal of the project was to identify student preferences for use of ICT to support study in order to

inform future developments of USQ learning and teaching systems. Students were asked to rate how useful they thought each of a selection of ICT applications might be for their studies on a 4-point Likert scale: "not at all useful", "moderately useful", "very useful", and "don't know". On the equivalent item, staff respondents were asked to rate how useful they thought each ICT application would be for students. Table 10 reports the proportions of respondents who selected "moderately useful" or "very useful" for each form of ICT.

Table 10. Percentage agreement with usefulness of ICT in studies

Usefulness of ICT	Students (%)		Staff (%)	
	FoES	Other	FoES	Other
Build web pages as part of course	41.1	60.0	81.8	82.7
Create multimedia as part of course	80.9	89.4	81.8	98.2
Create audio/video as part of course	57.4	69.9	72.8	87.9
Access recordings of unattended lectures	91.2	95.0	100.0	93.1
Access recordings of attended lectures	83.8	93.0	100.0	93.1
Access recordings of supplementary material	91.1	95.7	100.0	94.9
Web to access university services	100.0	96.4	100.0	96.6
Mobile phone to access university services	51.5	59.1	91.0	84.5
Instant messaging with other students	82.3	77.3	81.9	87.9
Instant messaging with staff	78.0	79.3	72.8	79.3
Social networking with other students	69.1	64.3	81.8	75.8
Web to share course files	82.3	81.1	100.0	91.3
Webconference with other students	73.6	78.2	81.9	93.1
Alerts via RSS feeds	82.4	85.9	100.0	87.9
Keep personal blog as course requirement	35.2	43.9	63.7	81.0
Contribute to another blog as requirement	45.5	45.9	72.7	75.8
Contribute to wiki as course requirement	58.8	49.9	72.8	84.5
SMS marks/grades	69.1	69.7	54.6	56.9
SMS pre-class discussion questions	69.1	66.1	72.7	65.5
SMS administrative information	75.0	70.0	81.9	82.8
Access web course material on phone	51.5	55.2	81.8	86.2

The data in Table 10 include some areas of apparent agreement that suggest applications of ICT for which extended use would be welcome. There are also some visibly large differences that invite further investigation and testing for significance.

Students and staff appear to agree that there is value in providing access to recorded material such as lectures presented to on campus students. USQ has provided facilities for recording lectures for several years and that facility has been extended in recent years. Clearly students and staff see value in that recorded material and further extension and enhancement would be worth investigation. The use of the web to access university services and share course materials, webconferencing with other students, RSS for alerts about course information, and instant messaging with students and staff also attracted general agreement. University services and course materials are already provided mostly on the web and these results could be read as endorsement of existing practice. Some courses have been using Wimba (http://www.wimba.com/) for synchronous interaction and there appears to be support for the use of Wimba or similar webconferencing applications. Moodle, which is the current Learning Management System at USQ, supports RSS feeds. That facility is not often used and its increased use might be promoted among staff. Moodle also provides for a simple direct messaging facility and a limited chat. Those tools or alternatives might be promoted for further use. There was also agreement, though less strong than for the items above, about the usefulness of SMS as a notification method.

Two broad areas attracted clearly different responses from students and staff. The first was that staff agreed more than students that using a mobile phone to access university services or web course material would be useful. This difference is interesting in light of the higher level of access to mobile phones among students compared to staff. Perhaps staff respondents are expressing support for what they perceive as a trend toward increased mobility without experience of accessing the USQ services on a phone, which is often unsatisfactory because the USQ website is not designed for mobile access. Students, who are more likely to have experienced the website on their phone, may be offering a more informed response to the current offering. The second area of difference was that staff offered stronger support for most items that could be described as requiring students to produce content that might be available to other students. These included building web pages, creating audio or video and contributing to blogs or wikis. Creating multimedia was the one item that would fit this group for which students and staff expressed equivalent levels of support. This trend may indicate a preference by students for "traditional" education in which content is delivered by staff rather than 21st century learning [2] in which learners are more often required to work with information to generate their own content displaying "digital media literacy" [9]. These results warrant further investigation.

5. Conclusion

The results described above represent an initial analysis of the similarities and differences between student and staff access to, and attitudes towards usefulness of, digital technologies for learning. The comparisons reported are frequency counts only and further analysis is required to identify statistically significant differences in student and staff attitudes. However, the results are sufficient to indicate some trends with respect to the usefulness of identified digital technologies to the learning of engineering students at USQ in particular.

In general, the engineering students who completed this survey at USQ were mature, male, undergraduate students, who studied by distance modes. They reported high levels of access to mobile technologies such as mobile phones and MP3 players but surprisingly did not believe that mobile phones were particularly useful when accessing university services or course materials in comparison to their lecturers who had relatively less access to mobile phones than did the students. With increasing trends towards distance education at USQ and most other universities in Australia this result needs further investigation as the most convenient and accessible mobile technology for students appears to be mobile phones with 92.6% reporting they have a mobile phone but less than 90% reporting access to a desktop or laptop computer.

The trend towards the provision of networked learning communities for students who are distanced from the university campus requires both students and academics to have ready access to contemporary digital technologies as well as positive attitudes towards the usefulness of those technologies for learning.

Overall, if nothing else, this paper has drawn attention to the need to regularly audit the ICT experiences of students and staff to ensure that appropriate and useful technologies are brought online and that staff members receive adequate professional development in order to make the best possible use of the available technologies to support learning and teaching. Student and staff attitudes towards usefulness are of paramount importance if staff are to be supported in appropriate choices and uses of the available technologies to support student learning and career aspirations.

References