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Technological diversity: An investigation of students' technology use in everyday life and academic study

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CHAPTER 5

TECHNOLOGICAL DIVERSITY: AN INVESTIGATION OF STUDENTS' TECHNOLOGY USE IN EVERYDAY LIFE AND ACADEMIC STUDY

Corrin, L., Lockyer, L., & Bennett, S. (2010). Technological diversity: An investigation of students' technology use in everyday life and academic study. *Learning, Media and Technology*, 35(4), 387-401.

Abstract

Generational generalisations regarding how students interact with technology have been used in recent times to prompt calls for radical changes to the delivery of teaching in higher education. This article reports on a study aimed to investigate first-year students' technology access and usage in two contexts of use: everyday life and academic study. A survey was delivered to first-year students across seven faculties of an Australian university during the second semester of the 2008 academic year. A total of 470 respondents met the criteria for this study. The findings suggest a wide diversity of usage of technologies with the usage rates of technology in academic study being generally lower than those in everyday life. These findings indicated that generational generalisations are not useful in informing the design of learning and teaching in higher education. However, there are questions regarding reliability of current survey-based methods to examine students' technology use and the level of diversity discovered across both contexts of use. This suggests that further in-depth research into how students shape technology to suit their lives is required to gain a greater understanding of how technology can effectively support teaching and learning.

Introduction

Recent calls for changes to teaching and learning strategies in higher education as a result of increasing access to and usage of technology have been significantly driven by generational generalisations. The 'Digital Natives' or 'Net Generation' construct is based on the idea that the majority of students who are currently taking part in our higher education system were born into a generation that has grown up surrounded by technologies and have therefore developed an inherent ability and reliance on technology across all contexts of their lives. The attributes of members of this generational group are often defined as an advanced ability to multitask, a dependence on technology to maintain

social contact, a willingness to share content and the ability to adopt and adapt new technologies to their personal needs (Dede, 2005; Oblinger & Oblinger, 2005; Prensky, 2001). However, recent studies have challenged this idea of a technological homogeneous generation and shown instead a diversity of technological experiences and aptitude – especially in relation to how students use technology as part of their academic studies (Kennedy et al., 2008; van den Beemt, Akkerman, & Simons, 2010). The extent of this diversity is still largely unexplored in the current research and questions over the reliability of the current survey-based methods of collecting information about students' adoption and usage of technology suggest that more in-depth research is needed in this area. This article presents the findings from a study examining first-year students' access to and use of technology across the contexts of everyday life and academic study. For the purposes of this study age has been used as the defining criteria of the digital natives group, including those students born in or after 1980.

Literature review

The concept of Digital Natives (Prensky, 2001) or the Net Generation (Tapscott, 1998) has developed over the past decade based on assumptions of technological propensity of students born after 1980 (Oblinger & Oblinger, 2005). These students, who are now entering, studying and graduating through higher education systems, are said to exhibit a number of new and common characteristics including a high level of digital aptitude, the ability to multitask, literacy in multiple media, constant connectivity, the need for speed in delivery of information, a culture of sharing information and a unique attitude towards education as a result of their significant level of exposure to technology over the course of their lives (Barnes, Marateo, & Ferris, 2007; Dede, 2005; Frand, 2000; Oblinger & Oblinger, 2005; Prensky, 2004). The identification of this 'radical' shift in student aptitude and behaviour has prompted many to suggest that teaching approaches in higher education need to be changed to accommodate the new learning needs of this generation and to address the divide between the technological abilities of 'Digital Native' students and their 'Digital Immigrant' teachers (Oblinger & Oblinger, 2005; Prensky, 2001).

Other researchers have cautioned that such changes to higher education need to be based, not on the rhetoric and anecdotal evidence upon which much of this digital natives discussion has been founded, but on empirical evidence derived from comprehensive research into students' interaction with and use of technology (Bennett, Maton, & Kervin, 2008; Helsper & Eynon, 2009; Kennedy et al., 2006). As a result, a number of survey-based

studies have emerged examining students' ownership and levels of common uses of technology (Garcia and Qin, 2007; Kennedy et al., 2007). These surveys have found a general increase in ownership of technologies and the rate of participation in a range of online activities, but also show that there is still a wide variance in technological aptitude and online activities of digital native students. These findings have challenged the notion of the age-based homogenous group of technological expertise and have prompted some researchers to shift to the use of levels of usage and experience as a more appropriate basis for defining who is a 'digital native' (Bullen et al., 2009; Dede, 2005). However, the diversity and complexity of the ways that students use technology make such distinctions hard to support and are therefore often ignored in discussions of generational generalisations (Helsper & Eynon, 2009).

Recent research has moved beyond studies of general uses of technology to examine the way students adapt technologies to support their learning. Kennedy et al. (2007) suggest that any discussion of changes to teaching in universities needs to be informed by an understanding of how technologies can be translated from personal technologies into 'learning technologies'. Several studies to date have observed some transference of everyday life technologies into the academic context, but to a far less extent than had been expected (Kumar, 2009; Selwyn, 2008).

It is apparent from these studies that methods of research into the factors around students' use of technology to support their learning need to delve further than the current survey-based methods have allowed. There is also a question of the reliability of these forms of surveys in terms of a shared understanding of technological terms and contexts of use that has not been addressed adequately in the current Digital Natives' literature. Whilst the findings from such survey-based research have made a significant contribution to the development of the discussion around digital natives and university teaching strategies to date, future studies need to employ more extensive research methods to explore in more detail the factors that influence students' technology adoption for learning support.

Methodology

This article is based on data collected as part of the first phase of a doctoral study examining the way first-year students use technology as part of their everyday life and academic study. An anonymous paper-based survey was delivered to 547 first-year students across seven faculties of an Australian university during the second semester of

the 2008 academic year. The survey collected demographic data including age, gender, degree and enrolment-specific data (full/part-time, domestic/international). These data were collected to determine if respondents met the criteria of the participant group.

Inclusion criteria for the participant group were set in order to generate a probability sample reflective of the typical first-year student in the university in which the study was conducted. The university's enrolment data indicated that the majority of first-year students were full-time, domestic students. An age limit for participants was set at those students born in 1980 or after to correspond with the most popular generalisations of the digital native/net generation literature (Palfrey & Gasser, 2008; Tapscott, 1998). Students were then asked to self-rate their ability in relation to using technology as either beginner, intermediate or advanced.

The next section of the survey asked students to indicate the technologies to which they had access. Students were asked to indicate their level of access to a range of common technologies as either exclusive use/ownership, shared access, limited access or no access at all. The list of technologies presented to respondents included technologies that could relate to either the contexts of everyday life or academic study or both including desktop computers, laptop computers, electronic organisers, portable music players, digital cameras (still and/or video), mobile phones, memory drives, games consoles, GPS navigators and internet access (dial-up and/or broadband).

The next two sections of the survey examined usage of technologies across the contexts of everyday life and academic study. Reference to previous Australian and UK-based studies (Kennedy et al., 2007; Trinder et al., 2008) contributed to the design of two lists of common technology-based activities, one of activities most commonly undertaken as part of everyday life and the second of activities most commonly associated with academic study. To ensure that the survey was an appropriately short length, it was necessary to be selective taking into consideration technology available in the institution. Whilst some items were specific to a particular context, where possible equivalent items were included in both lists to allow for comparative analysis between contexts. To get a sense of how regularly students use technology they were asked to indicate the frequency which they undertook the activities on a four-point scale from daily, weekly, occasionally or never.

Prior to administration of the survey instrument, content validity (Nardi, 2006) was determined through a review by several research colleagues with knowledge across the

areas of survey design, quantitative research and educational technology. Additionally, the reliability of the survey instrument was evaluated using a test re-test reliability test conducted by using a separate cohort of 25 students. The test re-test reliability coefficients showed that the access section of the survey had a coefficient of 0.852 ($p = 0.01$) which indicates a good and acceptable level of reliability (Groth-Marnat, 2009). However, the technology activities sections showed lower levels of reliability with the coefficient of everyday life activities being 0.703 and academic studies being 0.547. One possible explanation for the low reliability coefficients is variability in students' definitions of technologies and contexts. A shared language of technology does not appear to exist which would allow for consistent responses across all students. These coefficients reflect the limitations of this kind of survey research in reliably measuring students' use of technology and these limitations will be discussed in more detail in the results section of this article.

In conducting the analysis for this article the frequency of use was recoded from the four to three categories of usage: 'high' usage incorporated both 'daily' and 'weekly' responses whilst 'occasionally' become 'low' and 'never' became 'non'. Frequencies of everyday life and academic study activities were examined and when diversity in usage levels was found cross-tabulation of demographic and usage variables was undertaken using Chi-square tests to explore relationships.

Results

Data for this study were collected during the first three weeks of the second semester of the 2008 academic year. The study took place in the second semester of the students' first year so that students had already had some experience of technologies incorporated in university-style learning and teaching and the opportunity to adopt personal technologies that they considered useful to their study. The survey was administered in lectures and tutorials in nine subjects across seven faculties of the university.

Of the 547 responses collected, 470 met the participant criteria, a representation of 16.5% of the total 2008 enrolment of students in this criteria group. In terms of demographics, the age distribution showed that the majority of respondents were born between 1988 and 1990 (85.3%). These students represented those who had recently completed high school or were entering university after a gap year. The distribution of gender was skewed slightly towards females with 64% females and 35.7% males, which was slightly higher than the university's ratio of 52% female to 48% male. A large proportion of respondents

belonged to the Education faculty which can explain in part the slightly higher ratio of females than males. In terms of disciplines, the faculties were recoded into two main groups, Humanities and Social Science (Arts, Commerce, Creative Arts, Education and Law) which made up 44% of the respondents, whilst the other 56% were from science-based disciplines (Science, Informatics, and Health and Behavioural Science).

Contrary to the assertions of several authors (Oblinger & Oblinger, 2005; Prensky, 2001) regarding the high level of digital literacy of digital native students, responses varied when respondents were asked to self-rate their general level of ability with technology. Only 23.2% of students classified their ability with technology as advanced, with the majority (67%) rating themselves as intermediate and 8.5% rating themselves as beginners. In terms of gender almost double the proportion of male respondents (34.4%) viewed themselves as advanced technology users than females (17.4%). This finding contradicts recent studies including Gunn et al.'s (2003) UK longitudinal study which found that over time (10 years) the gap in ability and confidence between males and females narrowed. However, Hargittai and Shafer (2006) found that whilst males and females had similar abilities in relation to their use of online technologies, females self-assessed themselves as having lower online skills than males.

Access

The level of access to technologies was generally high across the most common technologies with students either owning or having substantial access to desktop computers (92.4%), laptop computers (84.3%), mobile phones (100%), USB drives (96.6%), digital cameras (88.9%) and portable music players (88.6%). Computer ownership showed that students were more likely to own a laptop (73.4%) than a desktop (61.5%); however, 44.4% indicated that they owned both. These findings show that the access to computers is almost ubiquitous with only 0.4% (or two students) indicating that they have limited or restricted access to either a desktop or laptop computer.

The most popular technology in terms of access was found to be the mobile phone with 469 out of 470 students owning a mobile and the remaining one student having shared access. Interestingly 42.8% of students indicated that their phone was 3G which is substantially higher than the findings of 25% 3G phone ownership reported in an Australia-wide survey of mobile phone usage conducted around the same time by the Australian Interactive Media Industry Association (AIMIA Mobile Industry Group, 2008).

Access levels were also high (96.6%) in relation to access to broadband Internet, with only a small proportion still accessing the Internet through dial-up facilities (27.4%).

Full access levels were found to be significantly lower for other technologies including electronic organisers (5.5%) and GPS navigation (15.7%). As students, these technologies may not be seen to be relevant to their lives or, in the case of GPS, be viewed more as a luxury item rather than an everyday technology. In terms of PDAs, they have been traditionally seen primarily as a business tool which may impact their adoption rates. However, the lower adoption rates could also be attributed to the fact that many mobile phones are now offering PDA-style functionality making the purchase of a PDA unnecessary.

Everyday life activities

A large variation was observed in relation to the responses to the use of technology in everyday life (see Table 1).

Table 1

Use of technology in everyday life

Activities	n	High	Low	Non
Use a computer to create or edit audio and/or video	469	74 (15.8%)	212 (45.2%)	183 (39%)
Share photos online with friends and family	470	235 (50%)	207 (44%)	28 (6%)
Write a blog	469	34 (7.2%)	127 (27.1%)	308 (65.5%)
Build or maintain a website	465	78 (16.8%)	60 (12.9%)	327 (70.3%)
Download and listen to podcasts	467	117 (25.1%)	158 (33.8%)	192 (41.1%)
Read other people's blogs	468	128 (27.4%)	187 (40%)	153 (32.6%)
Use RSS feeds	454	28 (6.2%)	57 (12.6%)	369 (81.3%)
Use a computer/game console to play games	469	157 (33.5%)	205 (43.7%)	107 (22.8%)
Use a computer/mobile phone/PDA as a personal organiser	468	279 (59.6%)	94 (20.1%)	95 (20.3%)
Buy or sell items online	470	42 (8.9%)	238 (50.6%)	190 (40.4%)
Do your banking and pay bills online	469	192 (40.9%)	121 (25.8%)	156 (33.2%)
Send and/or receive emails	468	434 (92.7%)	29 (6.2%)	5 (1.1%)
Use a mobile phone to make calls	470	451 (96%)	16 (3.4%)	3 (0.6%)
Use a mobile phone to send text (SMS) messages	470	463 (98.5%)	4 (0.9%)	3 (0.6%)
Use social networking websites (ie. MySpace, Facebook)	470	382 (81.3%)	40 (8.5%)	48 (10.2%)
Use instant messaging or chat (ie. MSN, Yahoo Messenger)	470	293 (62.3%)	118 (25.1%)	59 (12.6%)

Communication-based activities showed the highest frequency of use, especially using a mobile phone to send a text message (98.5%) and to make calls (96%). Overall mobile communications displayed the highest frequency of use and the lowest percentage of non-use. Only slightly less in term of frequency of activity was the more traditional method of online communication via email (92.7% high usage). Interestingly 1.1% of respondents reported that they did not use email communication at all which is surprising given that the university makes use of email as a channel for the distribution of important information and that all students are given an email address upon enrolment. Communication via instant messaging tools also showed a high level of adoption (87.4%) although usage was less frequent than mobile phone and email communication.

Using social networking sites returned the third highest figure in terms of high frequency of use with 81.3% of students using social networking on a daily or weekly basis. Whilst the Digital Natives literature has reported that the need for constant connectivity is a major characteristic of the Digital Natives generation (Frans, 2000; Philip, 2007; Prensky, 2001), 10% of students reported that they had never used social networking websites. Other online socialisation activities such as sharing photos with friends and family also showed high levels of adoption (96%).

Using technology to play games was undertaken by a majority of students surveyed (77.2%) although mostly on an infrequent basis (43.7%) rather than daily or weekly (33.5%). A higher proportion of male students (90.4%) played games compared to their female peers (69.7%) in the participant group ($p < 0.001$, Chi-square = 71.5, $df = 2$); however, the strength of this relationship was relatively weak (Cramer's $V = 0.391$).

Whilst communication and social networking activities displayed high levels of adoption, activities involving the creation of content showed much lower adoption rates. Only 7.2% of students wrote a blog on a daily or weekly basis and 65.5% of students had never undertaken this activity. Similar low rates of usage were found in relation to creation and maintenance of websites with 70.3% of students not engaging with this activity at all. These findings correlate with those of a recent study of students in the Netherlands which observed production of interactive media was very low despite high levels of engagement in other technological activities (Van den Beemt, Akkerman, & Simons, 2010).

Academic study activities

In comparison to the average frequencies found for the use of technology in everyday life, frequencies of use for academic study were much lower (see Table 2).

Table 2

Use of technology in academic study

Activities	n	High	Low	Non
Use a computer to create or edit audio and/or video	469	30 (6.4%)	131 (27.9%)	308 (65.7%)
Share photos online	468	36 (7.7%)	105 (22.4%)	327 (69.9%)
Write a blog	469	11 (2.3%)	53 (11.3%)	405 (86.4%)
Build or maintain a website	464	12 (2.6%)	35 (7.5%)	417 (89.9%)
Use a computer to create presentations (ie. PowerPoint)	465	102 (21.9%)	315 (67.7%)	48 (10.3%)
Access information online	465	433 (93.1%)	29 (6.2%)	3 (0.6%)
Download and listen to podcasts	465	58 (12.5%)	129 (27.7%)	278 (59.8%)
Read other people's blogs	465	30 (6.5%)	86 (18.5%)	349 (75.1%)
Use RSS feeds	455	11 (2.4%)	31 (6.8%)	413 (90.8%)
Use a computer/game console to play games	463	21 (4.5%)	32 (6.9%)	411 (88.6%)
Use a computer/mobile phone/PDA as a personal organiser	463	215 (46.4%)	83 (17.9%)	165 (35.6%)
Access eLearning space (the University's online learning website)	465	457 (98.3%)	6 (1.3%)	2 (0.4%)
Send and/or receive emails	466	394 (84.5%)	66 (14.2%)	6 (1.3%)
Use a mobile phone to make calls	465	281 (60.4%)	111 (23.9%)	73 (15.7%)
Use a mobile phone to send text (SMS) messages	464	303 (65.3%)	103 (22.2%)	58 (12.5%)
Use social networking websites (ie. MySpace, Facebook)	465	151 (32.5%)	131 (28.2%)	183 (39.4%)
Use instant messaging or chat (ie. MSN, Yahoo Messenger)	465	121 (26%)	118 (25.4%)	226 (48.6%)

The activity with the highest frequency of adoption in the academic study context was access to the university's online learning system (eLearning Space) with 98.3% of students accessing this site on a daily or weekly basis. Jones and Healing (2010) observed in their UK study of location habituations that institutional requirements have significant impacts on the motivation of students to use certain technologies. A possible interpretation of this finding is that whilst institutional requirements had a positive effect on students' use of the university's elearning system in this study, it is possible that institutional teaching methods had the opposite effect on the engagement with other technological activities such as writing blogs or creating websites. A possible lack of learning activities explicitly

designed to use technologies within the course could explain the low adoption rates to a certain extent. However, these figures also suggest that students may not be adopting these technologies through personal choice to support their studies as suggested in the literature (Conole et al., 2008).

Accessing information online (99.4%) also showed a high frequency of adoption by students followed by emailing (98.7%) and using a computer to create presentations (89.7%). In general communication tools, which are more likely to be adopted by students for individual needs than because of the formal requirements of academic study, showed relatively high levels of adoption with 84.3% of students communicating by voice and 87.5% by text on mobile phones in relation to academic studies. Just over half (51.4%) of students used instant messaging as a method of communication for academic purposes whilst 60.7% communicated via social networking sites. With regards to social networking a statistically significant higher proportion of students from the Humanities and Social Studies Faculties (70.5%) engaged in social networking activities than those from Science Faculties (52.7%) ($p < 0.001$, Chi-square = 17.2, $df = 2$). Similar relationships were found in relation to blogging (Humanities = 20.3%, Science = 8.4%, $p = 0.001$, Chi-square = 13.9, $df = 2$) and sharing photos (Humanities = 38.8%, Science = 23.3%, $p = 0.001$, Chi-square = 15.03, $df = 2$).

Comparison of everyday life and academic study activities

An underlying assumption of the Digital Natives discussion has been a willingness and ability of students to translate their use of technologies from their everyday life to their academic study (Oblinger & Oblinger, 2005; Prensky, 2001). However, this study has found a considerable difference in the levels of adoption between comparable activities across the two contexts.

Similar patterns of frequency of use were observed in a number of activities including the creation of audio/video, writing a blog, building websites, listening to podcasts, using RSS feeds (see Figure 7), using technology as a personal organiser, and communication via email. However, in each of these activities the frequency was higher in everyday life than in academic study.

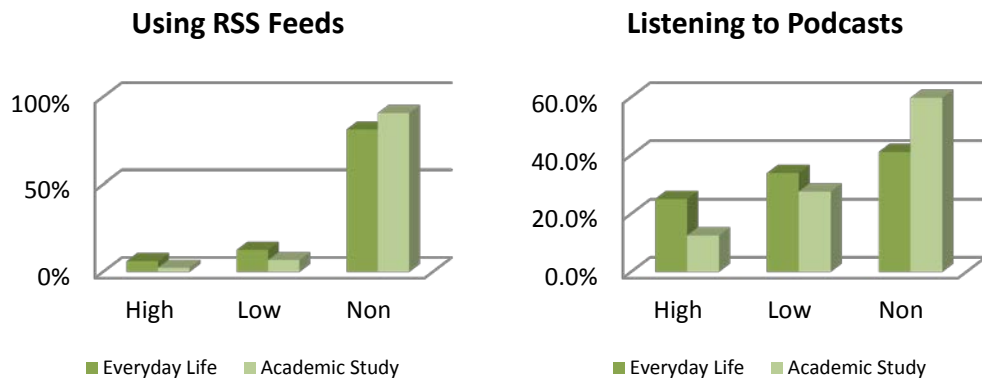


Figure 7: Everyday life and academic study frequencies of activity

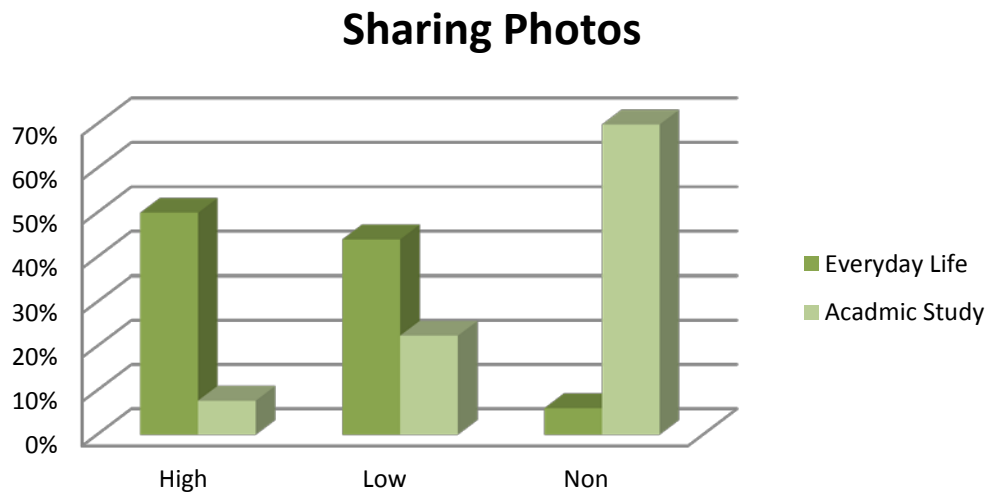


Figure 8: Inverse relationship between everyday life and academic study

In relation to reading other people’s blogs, playing games and communication via mobile phone, the patterns of frequency were found to be inconsistent. Alternatively, inverse relationship between everyday life and academic use were found for the activities of sharing photos online (see Figure 7), using social networking sites, and the use of instant messaging.

Discussion

The notion of Digital Natives has been used as a powerful generalisation in calls for changes to educational strategies in higher education. However, this study has demonstrated that there is enough diversity in ability, access and use of technology by first year university students to suggest that a technological homogenous group of students cannot be assumed. Whilst respondents indicated a high frequency of engagement with

some technological activities, they indicated that others including those most commonly associated with the Digital Native generation (e.g. writing a blog), showed low frequencies. This warns of the disparity between actual level of technological ability and use, and the assumptions of educational institutions in setting curriculum and teaching approaches (Conole et al., 2008).

Overall levels of technology access and use found in this study indicate a slight increase over those found in previous similar studies (Kennedy et al., 2007). However, it is important to note that whilst respondents indicated high levels of engagement with some activities, they noted little engagement at all with others. Closer inspection of demographic variables such as gender and faculty offered little explanation for this variance in findings. In the context of everyday life, a statistically significant relationship was found between gender and game playing ($p < 0.001$, Chi-square = 71.5, $df = 2$), but not between gender and other activities in everyday life or academic study. From a faculty perspective, relationships were observed between students of the Humanities and Social Science Faculty and writing blogs ($p = 0.001$, Chi-square = 13.9, $df = 2$), website creation ($p = 0.005$, Chi-square = 10.6, $df = 2$) and social networking ($p < 0.001$, Chi-square = 17.2, $df = 2$), but not in relation to any activities in everyday life. These intricacies of engagement with technology and online activities provide valuable insights into students' worlds and should not be overlooked when designing learning activities (Guo, Dobson & Petrina, 2008).

The analysis of the relationship between the frequency of use of technology between students' everyday life and academic study found a lower level of use of technology in the context of academic study. This finding varies from those of other studies that claim that students are actively adopting and personalising technologies to support their learning (Conole et al., 2008). In contrast, in this study several inverse relationships were observed between usage in everyday life and academic study including sharing photos, using social networking sites and instant messaging. This disparity between usage rates of technologies in everyday life and academic study indicates that whilst students have the aptitude for using certain technologies this does not automatically translate into a want and/or ability to transfer these skills to the academic context. However, the higher adoption rates of some technologies in the academic context could be seen to indicate that technologies have an increasing role to play in higher education (Kennedy et al., 2008).

An important consideration in the analysis of the findings of this and similar studies is the reliability of the survey instrument. The test re-test reliability test for the survey used in this study indicated that the activities sections of the survey had a low reliability coefficient, especially the section on usage of technology in academic study. Definitions of technologies and contexts also pose difficulties for the reliability of the survey's findings. In the study conducted by Kumar (2009) it was noted that analysis of how students adopt technologies in their academic context is complicated by how students define 'educational use' when responding to the survey. Whilst students seem to identify use of technology prescribed as part of their course as educational use, it is less clear if students also identify self-directed use of technology as part of study activities as educational use.

These reliability issues prompt the question of whether these types of surveys are providing the information needed to inform the Digital Natives discussion. There are now a number of survey-based studies that have emerged and have gone some way to dispelling the idea of a homogenous group of highly technologically literate students, but the stories behind the statistics could allow a greater understanding of influences on students' selection, adoption and adaption of technologies across both everyday and academic contexts of their lives. Only recently have studies started to emerge that go beyond surveys of ownership and activity and provide more in-depth views of students' technology use (Czerniewicz & Brown, 2010; Jones & Healing, 2010); however, the full results of such studies are (at the time of writing) yet to be published. Further research into the area is necessary to gain perspectives on how and why students use technology in the way they do (Hargittai, 2007; Lei, 2010).

The research reported in this article outlines the first part of a study aimed to gain a more detailed perspective of students' technology use across their everyday life and academic study. The subsequent phase of this study uses a case study approach to investigate students' adoption and adaption of technology to support their learning needs. A purpose sample of students was identified from the survey respondents and these students were firstly interviewed to collect more detailed information about their technology ownership and choices. The participants then took part in a three-week experience sampling method study coinciding with observation of online social networking activities. At the end of this period the students were interviewed again and given a chance to comment on their technology usage. Analysis of this data is still taking place, and it is anticipated that the findings will provide a better understanding of students' perspectives and use of

technology to support learning so that policy-makers and academics can be better placed to make more effective decisions about the use of technology in higher education.

Conclusion

The diversity of students' use of technology in both their everyday life and as part of their academic study found in this research indicates that generalisations based on Digital Native generational concepts are not useful to discussions about changes to learning and teaching strategies in higher education. It was also apparent from the findings that adoption and use of technology to support learning in the academic context was generally lower than usage levels in everyday life which challenges the assumption that students are adopting and personalising technologies to support their learning. However, questions over the reliability of the survey-based design of the current and recent studies combined with the level of diversity discovered across everyday and academic contexts of use suggests that further in-depth research into how students shape technology to suit their lives is required to gain a greater understanding of how technology can effectively support teaching and learning in higher education.

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