Laptops for a digital lifestyle: Millennial students and wireless mobile technologies

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Abstract

This paper describes findings relating to the implementation of wireless mobile computing with a small group of undergraduate students in a university setting. The purpose was to explore the 'digital lifestyle' afforded by the availability of this technology, particularly with 'millennial' students. This group is characterised by information connectedness, multitasking, and a focus on immediacy. The research built on a previous study to identify key aspects of these attributes as they emerged in this setting. It also identified issues with integrating wireless laptops into curricula, and infrastructural imperatives that need to be considered to successfully engage students in using mobile wireless technologies.

Keywords

digital lifestyle, millennial students, mobile technology, laptops, wireless network

Introduction

The millennial generation

In recent years much has been written about the unique characteristics of millennial students, a new generation of students born in or after 1982 (Howe & Strauss, 2000; Jonas-Dwyer & Pospisil, 2004; Oblinger, 2003; Oblinger, 2004; Oblinger & Oblinger, 2005; Poindexter, 2003; Raines, 2002). Millennials are described as having a focus on social interaction and 'connectedness' with friends, family and colleagues, and preferring group-based approaches to study and social activities. The characteristics attributed typically to millennial students are an information technology mindset and a highly developed skill in multitasking.

The world in which millennial students have grown up is typically rich with technology, information and digital media and they have been exposed to IT from a very young age. The millennial generation stay connected by using SMS, mobile phones, chatrooms and email while they simultaneously play computer games, listen to music and watch TV (Frand, 2000, p. 18; Oblinger, 2003; Rickard & Oblinger, 2003). They have adapted to continuous multitasking and switch from one activity to another quickly and with minimal readjustment time (Brown, 2000, p. 13). These students are accustomed to fast food, fast everything and have 'zero tolerance' for delays (Frand, 2000). Unlike previous generations of students, eg Baby Boomers (1946–1964) or Generation X (1965–1982), this generation is considered to be more comfortable with the uncertainty of experimenting with multiple career paths and place a priority on seeking personal development and growth over career building (Howe & Strauss, 2000).

In exploring millennial traits the question arises of whether a student's 'generation' is the defining factor or whether exposure to technology is a critical element in determining at least some of the characteristics attributed to millennials, or the 'Net Generation', as described by (Rickard & Oblinger, 2003). Oblinger & Oblinger (2005) question whether it is 'Age or IT' that defines the generational differences and propose that the defining factor may be partly experience with technology, 'digital literacy', as heavy users of IT tend to have similar characteristics to Net Generation or millennial students. However, they stress that 'Net Gen' students would not identify most technologies (e.g. computers, web access, mobile phones) as 'technology;' in the way previous generations would have done. Everyday applications of technology are considered to be commonplace and part of their environment and lifestyle, and only new features or gadgets would be considered to be a 'technology' by this group. Prensky (2001) describes this generation of students as 'Digital Natives', native speakers of the 'digital language' of computers, the Internet and video games.

Oblinger & Oblinger (2005, p. 2.1) emphasise that though the Net Generation (millennial) students are comfortable with technology more so than previous generations of students, these students preferred only a moderate amount of IT in their classes. Their need to be socially connected means that they want face-to-face interaction, and unlike Baby Boomers are not satisfied with fully online courses based on online communication. This generation of students prefer technological and collaborative experiences that exhibit clear goals, enhance motivation, and involve authentic learning activities (Brown, 2000; Frand, 2000; Oblinger, 2003; Raines, 2002). They gravitate towards group activity and appreciate the social aspects of learning.

For universities to meet the needs and expectations of new generations of students, consideration of the characteristics, skills and learning styles of new generations of digitally literate students will be necessary (Jonas-Dwyer & Pospisil, 2004; Rickard & Oblinger, 2003). Dede (2005) proposes that advances in IT are reshaping students' learning styles and new generations of students are developing "neomillennial learning styles" through immersion in virtual environments and augmented realities. The neomillennial learning style is characterised by social constructivist and experiential learning, including:

- fluency in multiple media utilising each for benefits it can offer
- learning based on collectively seeking, sieving, and synthesising experiences
- active learning based on experience including frequent opportunities for reflection
- expression through nonlinear, association webs of representations eg webs and mindmapping
- co-design of learning experiences personalised to individual needs and preferences.

Dede (2005) also predicts changes in university infrastructures from traditional to that which support mobile wireless devices (MWDs) and provide wireless everywhere on campus, multipurpose learning spaces replace computer labs, and the development of immersive virtual learning environments and virtual communities.

A recent paper (McMahon & Pospisil, 2005) explored the concept of the digital lifestyle of millennial students by monitoring their use of technology in both the university and social settings in the context of wireless laptop pilot project. In particular the study focused on establishing whether the students, who demographically fall into the classification of Millennial or Net Generation students, have the traits described in the literature and how wireless mobile technologies could support the learning needs of this particular group.

Specifically, the students participating in the pilot project could be characterised by:

- information connectedness
- multitasking
- a focus on immediacy.

They embraced a nomadic 'digital lifestyle' (Alexander, 2004) using laptops in their study, work and social lives. This paper reports on a followup study conducted following the initial research to explore the concepts of connectedness, multitasking and immediacy in detail and to examine how access to mobile wireless technologies over a longer period of time and in a different context impacted on the learners' experiences with the technology.

Mobile wireless computing project

The research was conducted as part the ECU Advantage Project at Edith Cowan University, a university wide initiative to establish a seamless wireless teaching and learning environment and integrate the use of wireless laptops into the student university experience. Over the course of twelve months a wireless network environment was established with the aim of achieving comprehensive wireless coverage of all four ECU campuses by the end of the project. Initially, the wireless network was available only to teaching areas involved in the project, with wider coverage provided as the project progressed.

The ECU Advantage laptop pilot project commenced in April 2004 and ran for the duration of two university semesters involving four Faculties and in excess of 100 laptops. The pilot project described in this paper provided laptops to a group of undergraduate Digital Media students for the use in and out of class.

The 'Laptops for a Digital Lifestyle' research project

The Laptops for a Digital Lifestyle research project set out to explore how students belonging to the millennial generation used mobile laptop technologies as part of their work, study and social lives. The purpose was to depict the 'digital lifestyle' afforded by the technologies and how this impacted on students' values and attitudes, their level of digital literacy, and approach to their studies. We sought to identify the extent to which the concept of millennial students was supported, and what factors we can adapt the teaching and learning environment to better cater to their needs.

The research project was conducted in the form of an ethnographic study to track patterns of use of the laptops throughout the semester to establish the extent to which they were integrated into students' lives. Eighteen students who were enrolled in a Bachelor of Science in Digital Media participated in the study. The students were enrolled in one or both of two units, IMM2226 and IMM3228 selected for this study. One unit, IMM3228 aimed to teach students project management methodologies, with a focus on authentic experience of working in a project team. The second unit, IMM2226, taught multimedia scripting using Macromedia Flash Action Script. Six of the students were enrolled in both units. Eight of the students had participated in the previous study. This extension therefore enabled the exploration of laptop use longitudinally for those students who had previous experience with laptops as well as inquiry into the potential of the devices for a broader range of activity such as collaboration and multimedia development.

Data was collected in three forms.

i.   Initial survey to gather demographic data.

        Demographic information about students was collected at the beginning of semester to attempt to characterise the subject group in terms of the extent to which they demonstrated 'millennial' traits defined by Frand (2000), Howe & Strauss (2000) and Raines (2002) as:

        •   learning preferences that tend toward teamwork, experiential activities, and the use of technology,

        •   being responsible and focused on achievement,

        •   a need to stay connected,

        •   zero tolerance for delays, and

        •   strengths in multitasking, goal orientation, and collaboration.

ii.   Students were requested to describe their patterns of use of mobile technologies throughout the semester in their units. In particular they were required to fill out a fortnightly weblog of their activity identifying the extent to which they used their laptops for:

        •   University work: web access, email, use of library, university information systems, writing, use of the Learning Management System, multimedia development, in IMM2226 and IMM3228 and in other units

        •   Social use: networked game playing, chatting and messaging, and shared resources (music device, video player, etc.)

        •   Personal use: downloading (music, videos, applications, etc.), individual gaming, personal multimedia development (video, pictures, etc.), video and music playing, personal use of web-based resources and other uses.

iii.   Students were also asked to comment on the changes being involved in the laptop project has made to their personal, social, and study lives, to identify if, and to what extent, the availability of wireless laptops enhanced activities usually attributed to millennials. We selected weblogs as the data collection tools due to the ease of use and accessibility (Downes, 2004). Students became comfortable with the process of blogging and accustomed to providing a regular snapshot of their activities, and the weblogs became a comprehensive chronological archive of student responses.

At the end of the semester, students were interviewed as a group to capture more detailed data about their traits as learners, their use of and value attributed to the laptops and other convergent technologies, and to triangulate the results gathered through the previous two forms. A project wide survey of all students from the four Faculties participating in the ECU Advantage project provided additional data.

Research project findings

The data gathered throughout the project provided a rich dataset from which to conduct an analysis of the ways in which the mobile laptop environment enabled students to engage in processes aligned with millennial attributes. A process of constant comparison was employed as advocated by Goetz and LeCompte (1981). The process (which 'combines inductive category coding with a simultaneous comparison of all social incidents observed' (p. 58)) was used to develop a picture of students' experiences throughout the project.

As with the previous study the demographic data about the students, the project survey, their fortnightly blogs, and the group interview conducted at the end of the project identified three main attributes relating to their use of the wireless laptop environment: (1) information connectedness, (2) multitasking, and (3) a focus on immediacy.

In this paper findings are discussed in two ways. Firstly, the level to which this group of students demonstrated the millennial traits of information connectedness, multitasking and a focus on immediacy are discussed in terms of how this particular group of students displayed characteristics consistent with the previous study. Secondly, differences between this study and the previous study are explored to identify issues that relate to the implementation of mobile wireless learning.

Millennial traits

As with the previous group of students, this group exhibited strong evidence of millennial characteristics. This is consistent with the fact that the group were predominantly of the millennial age group and that six of the students participated in the previous study. With regard to information connectedness, students saw themselves as highly literate users of technology in the demographic survey (Figure 1), and this was also manifested as a positive attitude to new technologies (Figure 2).
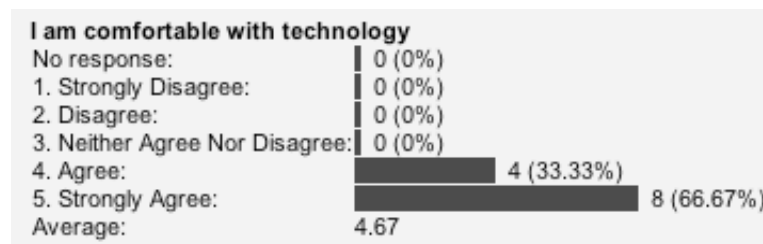
I am comfortable with technology

No response:	0 (0%)
1. Strongly Disagree:	0 (0%)
2. Disagree:	0 (0%)
3. Neither Agree Nor Disagree:	0 (0%)
4. Agree:	4 (33.33%)
5. Strongly Agree:	8 (66.67%)
Average:	4.67

Figure 1: Students' comfort with technology

I look forward to experimenting with new technologies

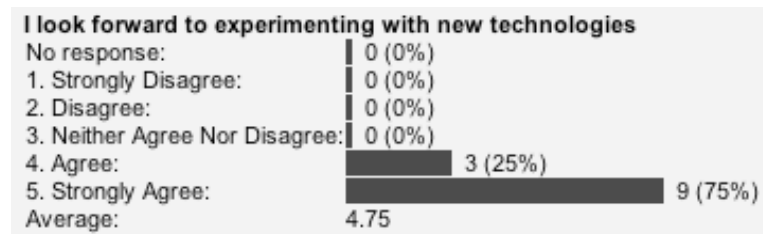|	
No response:	0 (0%)
1. Strongly Disagree:	0 (0%)
2. Disagree:	0 (0%)
3. Neither Agree Nor Disagree:	0 (0%)
4. Agree:	3 (25%)
5. Strongly Agree:	9 (75%)
Average:	4.75

Figure 2: Students' enthusiasm for new technologies

These findings could be attributed to the students' choice of degree independently of any association with millennial traits. Moving beyond the specific issues of technology, however, students' patterns of use of the laptops demonstrated the use of the technology as a tool that connected them with the broader world of information rather than simply a means of indulging in technology for technology's sake.

The project survey identified the moderately 'low tech' tool of email as the most widely used by students, followed by web access. While multimedia, chatting, messaging and downloading were all significant, it appeared that the laptops were used primarily an information tool (Figure 3).
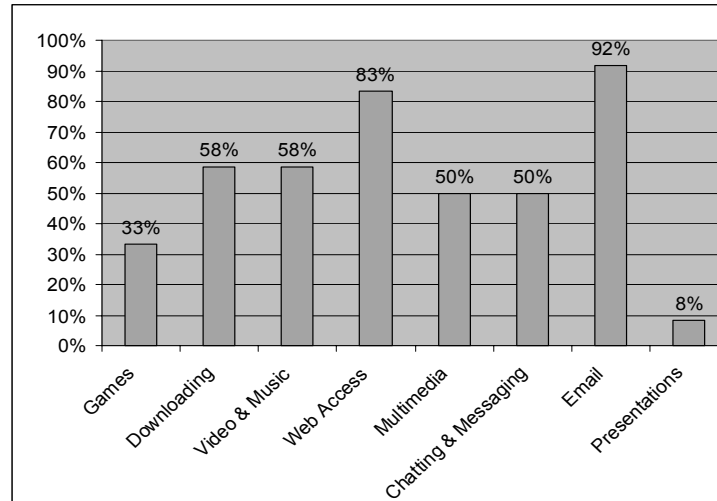
Figure 3: Students' uses of wireless laptops

Information connectedness

One student observed, 'having the laptop computers meant we had greater access to information etc during classes' but this was also a general tendency that distinguished this group from their parents. In interview, one student commented:

> Parents, they listen to the radio or they watch TV for news, but for us, (when) we want to find out information or the news we just use the Internet. We use it all the time, whereas they kind of use it for specific things.

This need for rapid access and the way in which information was integral to their lives was consistent across the group and with the previous study. When one student was asked what he used his laptop for, he said 'everything'. This finding is also consistent with the concept of 'neomillennial learning style' described by Dede (2005) as this group of students utilised the laptops and available media for a wide range of purposes, actively selecting tools that were most appropriate to their needs at the time.

Ubiquitous information access was a defining feature of the laptops. Everyone in the interview agreed that 24-hour Internet access is an essential aspect of their lives, particularly for information access. Yet when asked if they physically access the library when on campus they acknowledged that it was less important to them, to the extent that one student said he had only visited it once during the semester, while another complained of the lack of relevance of traditional texts, stating 'everything is out of date by the time it hits the shelf'.

Multitasking

The millennial preference for multitasking was very evident in the students' experiences throughout the pilot project. Generally, the students perceived themselves to have busy lives, and this tended to manifest itself as a need to manage multiple aspects of their lives at once. Two thirds of the students agreed in the demographic survey that they had lots of things 'on the go' at once (Figure 4):
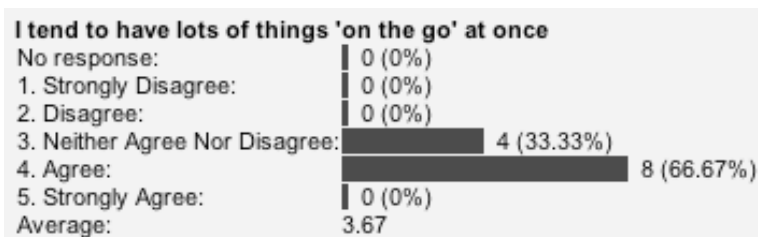

Figure 4: Students' perceptions of personal 'busy-ness'

The result of 66% in the current semester compared with the previous semesters total of 66% (41% agree and 25% strongly agree) and reinforces this finding. When combined with a generally perceived need for a sense of order (Figure 5), it was understandable that some tension could exist between the various elements of their lives.
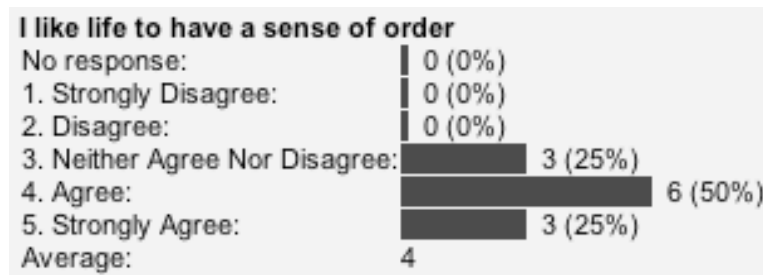

I like life to have a sense of order

No response:	0 (0%)
1. Strongly Disagree:	0 (0%)
2. Disagree:	0 (0%)
3. Neither Agree Nor Disagree:	3 (25%)
4. Agree:	6 (50%)
5. Strongly Agree:	3 (25%)
Average:	4

Figure 5: Students' perceived need for a sense of order

In the current semester a total of 75% (50% agree and 25% strongly agree) agreed to 'liking life to have a sense of order' reinforcing the previous semester's result of 58% agreeing to the same.

Clearly the findings are consistent with the previous study. It was also evident that traditional study uses of the technology were combined with other aspects such as gaming and video (Figure 3). In their fortnightly blogs students identified activities such as watching videos at friends' houses, network gaming, and downloading as main activities. Also consistent with the previous study, however, was the finding that that the wireless laptop as a social tool did not feature strongly in the data gathered despite the strong focus of social influences on millennial students' lives. For the demographic survey questions that asked whether students could live without their mobiles phones or if the students felt stressed when out of touch with their friends, the modal response was neutral.

Nevertheless, the concept of multitasking was one that was prevalent for many of the students. The project survey found that students used their laptops in a diverse range of environments, including home, cafes, friends' houses, in the car, bus or train. This appeared to liberate some students, with one commenting in the final survey:

> One main advantage of having a laptop is the ability to do work whenever you have the spare time. This creates less stress and gives you more free time to concentrate on work. It also allows you to show work to people for help and assessment. I can't think of any disadvantages of having the laptop other than making sure it is always on you at all times.

Therefore, while the social aspects of laptop use were not important, it did have value as a collaborative tool. One student in interview identified its value as a tool in the project management unit where they were able to show content to a client using the laptops.

On the whole the laptop appeared to offer greater flexibility to students. The value by one student of 'moving out of my bedroom and into the dining room where the light is better and I could talk to family members more' found its opposite but positive response in another who claimed that enabling him to work at home meant 'I have less distractions to frustrate me'.

There appeared to be a tendency for the technology to become too dominant however. While the laptop enabled students to multitask, the benefits of this were questionable. One student noted in her blog, 'my sister thinks I'm a snob when I bring it places to do work' while another found that it had a negative physical impact on him, claiming, 'the laptop made me lazy'.

This study therefore reinforced the finding of the previous one that the convenience of wireless laptops potentially negative implications. In removing some of the boundaries between work, study, and pleasure, it did not necessarily enhance them. Yet flexibility was one of the main issues for students. They wanted to be able to use the laptops whenever they wanted and wherever they were. As with the previous study there were comments in all forms of data about the need for the machines to have CD drives and burners as well as bemoaning the lack of their own wireless networks at home. This suggested that while students could see negative aspects to the breakdown of barriers between various aspects of their lives, the ability to use their machines flexibly and concurrently with other activities was a salient need. When things did fail with the laptops then students complained strongly about these failures, which emphasised the importance of another millennial attribute within this study - the need for immediacy.

Immediacy

One of the defining characteristics of millennial students is their expectations of others and general intolerance for delays (Frand, 2000). These attributes were both evident in the group of students in this study. While they displayed only a moderate impatience, more students agreed than disagreed in the demographic survey that they did not like having to wait (Figure 6):
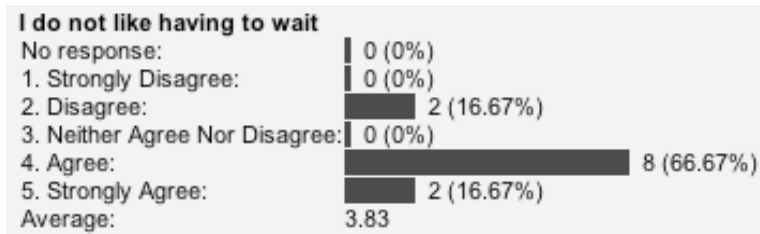
I do not like having to wait

No response:	0 (0%)
1. Strongly Disagree:	0 (0%)
2. Disagree:	2 (16.67%)
3. Neither Agree Nor Disagree:	0 (0%)
4. Agree:	8 (66.67%)
5. Strongly Agree:	2 (16.67%)
Average:	3.83

Figure 6: Students' tolerance for delays

A stronger finding was that these students had high expectations of their lecturers with regard to their own use of technology (Figure 7):

I expect my lecturers to be up to date with their own uses of technology

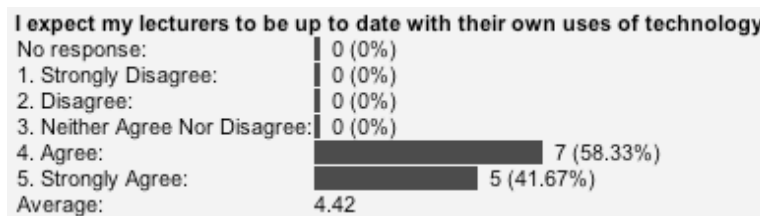|	
No response:	0 (0%)
1. Strongly Disagree:	0 (0%)
2. Disagree:	0 (0%)
3. Neither Agree Nor Disagree:	0 (0%)
4. Agree:	7 (58.33%)
5. Strongly Agree:	5 (41.67%)
Average:	4.42

Figure 7: Students' expectations of their lecturers

As with the previous study strong indications of a need for immediacy combined with a general focus on achievement and a mild tendency to feel pressure to do so (Figures 8 and 9).
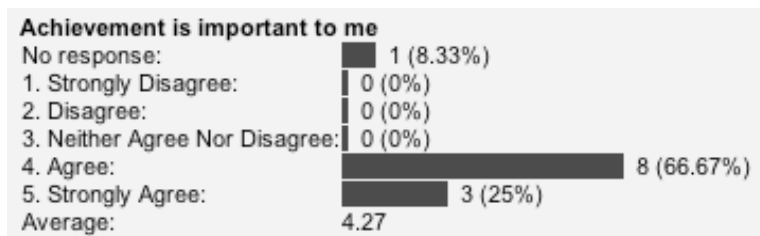
Achievement is important to me

No response:	1 (8.33%)
1. Strongly Disagree:	0 (0%)
2. Disagree:	0 (0%)
3. Neither Agree Nor Disagree:	0 (0%)
4. Agree:	8 (66.67%)
5. Strongly Agree:	3 (25%)
Average:	4.27

Figure 8: Students' value placed on achievement

I feel pressure to achieve

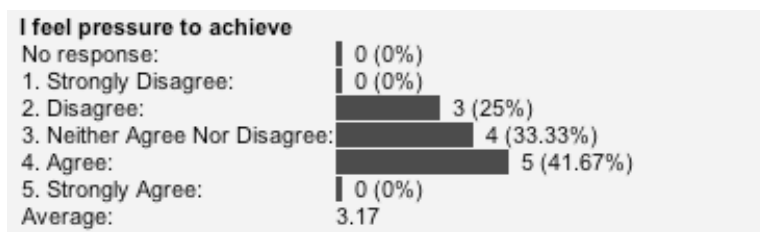|	
No response:	0 (0%)
1. Strongly Disagree:	0 (0%)
2. Disagree:	3 (25%)
3. Neither Agree Nor Disagree:	4 (33.33%)
4. Agree:	5 (41.67%)
5. Strongly Agree:	0 (0%)
Average:	3.17

Figure 9: Students' perceived pressure to achieve

When questioned in interview about their level of patience and how they responded when things went wrong, one student revisited a comment he made in the previous study:

> I think last year we mentioned that … our generation, we want everything now, immediate, and yeah, I just got so frustrated when … I want to check my e-mail and I want to get this done and now I've got to wait or try again or go somewhere else.

Such comments were particularly directed to the availability of wireless access. When it worked, students valued the immediacy it brought to them. As one student noted in the project survey:

> When I was in the canteen and about to go to the printing room to print my assignment, instead of walking to the first room, sending a file to a printer and then walking to that room I just sent it via the wireless network and was able to pick up my assignment straight away.

However, this was not always the case, with one student in the survey observing the wireless network was 'very useful to move/copy files between laptop and desktop in the lab, but I experienced frustration sometimes because suddenly the wireless network was down'.

Once again, these comments are remarkably similar to the findings of the previous study. While one of the students who had participated in the previous study noted in interview that 'the novelty' of having a laptop had 'worn off', he still found it a vital tool for keeping him connected and providing him with immediacy and flexibility in the way he worked.

This suggested that the previous study's findings about the value of wireless laptops for millennial students were equally valid within this implementation as with the previous one, not only with those participants who were involved with both studies, but also with the new ones.

Implementation issues

Despite the remarkable similarities in the way the students appeared to use and value the laptops, a number of issues grew out of analyzing the data that were related to how the project was implemented during this second phase. It appeared that despite the strong evidence of independent use of technology, their value as a tool for learning was heavily influenced by the technical support provided for the laptops and the way in which tutors integrated the technology into their teaching. The two fundamental issues that impacted on this second study's findings related to the quality of teaching and learning and the quality of the university infrastructure.

Overall the project survey indicated a strong positive response to the value of the laptops helping students with their learning (Figure 10):
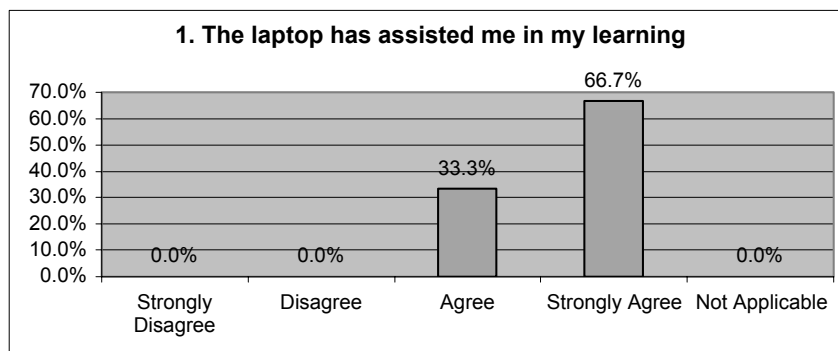

Figure 10: The laptops' role in assisting with learning

However, this positive response was not reflected in the question about the role of the teacher in this (Figure 11):
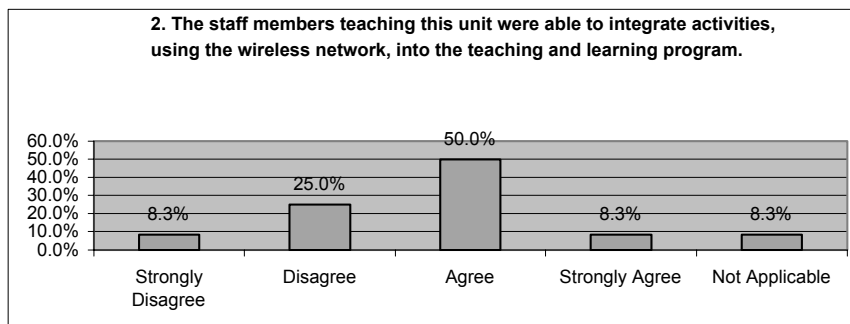

Figure 11: Integration of the laptops into teaching and learning

This differed from the previous semester where 50% responded Strongly Agree and 50% Agree for this question. When one took into consideration, the millennial characteristic of expectations of a high level of technological literacy from teaching staff, it was hardly surprising that some students felt negatively about the quality of their learning activities. This study differed from the previous one in that the lecturer in the initial phase of the project was an advocate of mobile technologies in learning and had a strong background in integrating educational technologies into teaching. Without that support, some students did not appear to make the best use of the laptop. Despite the availability of synchronous communication and the fact that one of the units was a project-based unit, little use was made of the laptops for this, with one student lamenting in interview:

> I think there should have been at least maybe the first week or the second week, a workshop directed towards our laptops, just getting us using MSN Messenger, getting us using the wireless network for reasons because I think we were never really given any encouragement to use it so it was kind of… just never really got used.

Another student noted 'none of the units were focused to use the laptop' while another student advised 'last year you actually had one of the laptops with us so you were kind of going through the teething problems and stuff'.

It would appear therefore that while these students were experienced users of technology they were still heavily influenced by their lecturers and their learning curriculum in how they used it. Without support or structure from teaching staff that made use of the tool in class, students tended not to engage fully in their use.

This issue was exacerbated during the semester by difficulties in managing the wireless infrastructure and finding appropriate teaching spaces. Once again, the lack of involvement of the principle researcher in the daily running of units meant that these issues were not addressed in a timely manner, but the issue went beyond teething problems and minor bugs. The university has been in the process of integrating a campus wide 'wireless mesh' designed to cover all teaching and social spaces but implementation issues meant that areas that previously had coverage were at times without a signal. Students' comments in the interview indicated genuine frustration with inadequate provision of wireless support. They also indicated that access to powerpoints and the fixed network was also important, even with spaces outside of the classroom One student stated that 'it would be cool to use the laptops outside but the screen is too hard to see'.

As well as technological infrastructure, physical infrastructure was also a problem. In units that were run as three-hour seminars, the need to provide a powered room with wireless access and projection facilities could not be easily accommodated by the university timetabling system. One of the units was allocated a biology laboratory for the laptop class. While one student admitted 'we could view example websites and download lecture slides during class' as well as do presentations using the data projector, he acknowledged its lack of suitability. In fact, half way through the semester, the class had to be moved to a less well-equipped area because the laboratory manager advised of potential contamination risks for the students in the area.

It would appear therefore that while the students may be ready to adopt mobile wireless technologies, their experience might be influenced by factors outside of their control. This places a strong imperative on universities and other teaching institutions to ensure adequate provision of equipped teaching spaces and reliable wireless access as well as incentives and training for staff to engage with these technologies for such projects to be successful in the long term.

The digital lifestyle of millennial students: Conclusions

The findings of this study reinforced the outcomes of the previous pilot project in showing that the characteristic requirements of millennial students for 24/7 information connectedness, environments that support multitasking and a focus on immediacy were evident throughout the studies conducted with this group of students. The availability of laptops and the wireless laptop project provided an environment that supported their needs. However, it was also evident that student expectations for the environment to be available at all times and well supported was high. The students indicated that the laptops become integrated into their lifestyles and as expressed by one student are used for 'everything'. Several students summed up the study advantage of having the laptop as a time saver:

> I have noticed I am a lot less stressed with more free time on my hands. I also produce material of higher quality as I can make changes to stuff when I see fit.

> …being able to work collaboratively with colleagues at their houses or on campus definitely freed up time later.

From the teaching perspective it is important to note the critical role of the lecturer in encouraging and supporting the students in their use of the technologies for teaching and learning. Students expect the lecturers to integrate the use of laptops into the learning experience and develop learning activities that exploit the availability of mobility and accessibility to resources. This is supports the findings of Efaw, Hampton, Martinez, & Smith (2004) that staff need to experience effective strategies and techniques for integrating laptops into classroom practice, ensuring that the laptop is used to facilitate learning. They also noted that providing lecturers with identical laptops was important, as staff were more likely to integrate laptops into classroom teaching if they had a laptop. The implications for academic staff who are teaching millennial students are that they should aim to become not only technologically competent but to also become more aware of the learning preferences of this generation of students.

The university infrastructure and support aspects of the project were another factor important to the success of ubiquitous mobile computing (Smith, 2003). Appropriate physical learning spaces with stable wireless network access, access to power and projection facilities are essential to the success of in class use of laptops. Out of class learning spaces with access to power and wireless networking were important to students. Adequate and immediate support when needed was another key requirement of this group. The challenge to educators and administrators therefore is to meet the expectations of the millennial students by supporting experiences that are immediate in terms of their access and reliability, are flexible enough to cross the boundaries of study, work, and social lives, and provide them with a connected and information rich environment in which to learn.

References

Alexander, B. (2004, September/October). Going nomadic: Mobile learning in higher education. *EDUCAUSE Review, 35*(5), 29–35.

Brown, J. (2000, March/April). Growing up digital: How the web changes work, education, and the ways people learn. *CHANGE.*

Dede, C. (2005). Planning for neomillennial learning styles. *EDUCAUSE Quarterly, 1,* 7–12.

Downes, S. (2004, September/October). Educational blogging. *EDUCAUSE Review,* 14–26.

Efaw, J., Hampton, S., Martinez, S., & Smith, S. (2004). Miracle or menace: Teaching and learning with laptop computers in the classroom. *EDUCAUSE Quarterly, 3,* 10–18.

Frand, J. (2000, September/October). The information age mindset: Changes in students and implications for higher education. *EDUCAUSE Review, 35*(5), 15–24.

Goetz, J. P., & LeCompte, M. D. (1981). Ethnographic research and the problem of data reduction. *Anthropology and Education Quarterly, 12,* 51–70.

Howe, N., & Strauss, B. (2000). *Millennials rising: The next great generation.* New York: Vintage Books.

Jonas-Dwyer, D., & Pospisil, R. (2004). The millennial effect: Implications for academic development. *Proceedings of the 2004 annual international conference of the Higher Education Research and Development Society of Australasia (HERDSA)*, Sarawak, Malaysia.

McMahon, M., & Pospisil, R. (2005). *Laptops for a digital lifestyle: The role of ubiquitous mobile technology in supporting the needs of millennial students.* Paper presented at EDUCAUSE Australasia 2005: The next wave of collaboration, Auckland.

Oblinger, D. (2003, July/August). Boomers & gen-xers, millennials: Understanding the "new students". *EDUCAUSE Review.*

Oblinger, D. (2004, May). The next generation of educational engagement. *Journal of Interactive Media in Education, 8.* Retrieved July 7, 2004, from http://www-jime.open.ac.uk/2004/8

Oblinger, D. G., & Oblinger, J. L. (2005). Educating the net generation. *EDUCAUSE.* Retrieved May 10, 2005, from http://www.educause.edu/educatingthenetgen/

Poindexter, S. (2003, January/February). The case for holistic learning. *Change, 35*(1), 24–31.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5).

Raines, C. (2002). *Managing millennials.* Retrieved February 2, 2004, from http://www.generationsatwork.com/articles/millenials.htm

Rickard, W., & Oblinger, D. (2003, June 17–18). *Higher education leaders symposium: The next-generation student*, Redmond, Washington. Retrieved November 11, 2004, from http://www.educause.edu/ir/library/pdf/NLI0425a.pdf

Smith, T. (2003, October). Ubiquitous computing in higher education. *The observatory on borderless higher education.* Retrieved November 1, 2004, from http://www.obhe.ac.uk/products/reports/