

M-LEARNING AND PERVASIVE STUDENT-CENTRED LEARNING: IS LEARNING ALWAYS 'ON' FOR NEW GENERATIONS OF STUDENTS?

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This paper outlines several of the preliminary outcomes of a study undertaken in 2008 to investigate whether the mobility afforded by laptop and tablet computers supports student engagement in pervasive student-centred m-learning. The literature indicates that many educators believe that mobility, access to wireless networks, and flexibility of learning with laptops offer students more opportunities to engage in learning and supports their learning by offering access to communities of learners, the ability to multitask and access to a wide range of online resources.

Net generation students, their laptops and tablet computers now feature prominently in many university classes. It is hoped that finding out more about how net generation students approach learning and use their mobile technologies to support their learning will assist university educators in making decisions when developing learning designs and resources for this generation yet still meeting the needs of the more traditional learners. The study focused on students involved in m-learning with laptops or tablets at three Australian Universities and this paper reports on a sample of first year net generation students and their views and experiences of m-learning.

INTRODUCTION

Australian universities have moved towards more flexible teaching and learning practices, adding multimodal courses with technology supported student-centred learning resources to the range of existing on-campus and external study options. In the years 2000-2005 ubiquitous computing (Brown & Petitto, 2003; McMahon & Pospisil, 2005a; Nyiri, 2002; Smith, 2003) emerged as a growing trend allowing for "anywhere anytime" access to networks and learning resources. The availability of mobile devices such as laptops, tablets, handheld computers, and personal digital assistants (PDAs), mobile phones, and the access to wireless networks added another dimension to technology supported teaching and learning and the term m-learning emerged to describe the range of teaching and learning activities involving mobile devices (Attewell, Da Bormida, Sharples, & Savill-Smith, 2003; Sharples, Taylor, & Vavoula, 2005).

Mobile learning or m-learning has a number of interpretations. One viewpoint defines m-learning as learning that takes place with handheld technologies, such as mobile phones, PDAs, iPods and other small mobile devices (Caudill, 2007; Rekkedal &

Dye, 2007). Mobile learning has also been defined in the terms of the mobility of learners and the mobility of learning, or in terms of devices and technologies utilised for learning (Traxler, 2007). The wider interpretation of mobile learning includes laptops, tablets, and other devices that can connect to wireless networks and facilitate learning. In these cases the definition is not only about hand-held mobility or wearable technologies, but encompasses learning with devices that support mobile connectivity of learners (Nyiri, 2002; Oloruntoba, 2006).

The mobility afforded by new technologies has enabled learners to become 'nomadic learners' (Alexander, 2004) who are able to access learning technologies and remain connected to other learners and teachers. It can be argued that learners have been nomadic and mobile for centuries and the mobility of traditional resources such as books is difficult to surpass. However, networked mobility has offered students the choice to select their place of study without compromising on connectivity and access to a multitude of resources, allowing learners to remain linked to their lecturers and other learners regardless of their location bringing forward a new age of learning, much like that envisaged by Sotillo (2003), where learners can be networked to other learners and self directed in their learning.

The literature indicates that many educators believe that the mobility, access to wireless networks, and flexibility of learning with laptops offer students more opportunities to engage in learning, and mobile devices support their learning by offering access to communities of learners, the ability to multitask and access to a wide range of online resources (Cobcroft, Towers, Smith, & Bruns, 2006; Kim, 2006; Naismith, Lonsdale, Vavoula, & Sharples, 2005).

Net Generation students in Australia

New generations of students, growing up in a computer age where electronic and mobile devices are abundant, have been the subject of much discussion. These students, born since 1982, have been described as the Net Generation, Millennials or Digital Natives (Oblinger, 2003; Oblinger & Oblinger, 2005; Prensky, 2001). Prensky (2001) described new generations of students as digital 'natives' who are comfortable with using new technologies and gadgets, whilst he portrays older generations as representing digital 'immigrants' for whom adapting to the use of new technologies can present some difficulties. However, Prensky's unsubstantiated claims have come under much criticism (eg Bayne & Ross, 2007; Kennedy, Judd, Churchward, Gray, & Krause, 2008; Sheely, 2008).

Kennedy et al (2008), reporting on a recent study of first year Australian university students on the use of established and emerging technologies, found that though Australian students tend to be highly tech-savvy and utilise a range of technologies there exists a level of diversity in their technological skills, and therefore educators cannot assume that all 'net generation' students will successfully utilise all educational technologies. Kennedy et al noted that students tend to view some technologies as 'learning technologies' specifically designed for learning purposes, and others as 'living technologies' which are considered to be primarily for their social and personal use (eg SMS) and it appears that some students are not comfortable in adopting these 'personal' technologies for educational purposes, contrary to many educators' expectations.

In response to the rapid uptake of mobile technologies by students, Litchfield et al (Litchfield, Dyson, Lawrence, & Zmijewska, 2007) highlighted the need for the development of a wider body of knowledge of m-learning and teaching principles and strategies across all disciplines to support national and international approaches to using mobile technologies to enhance learning.

Pervasive Learning – always ON m-learning?

One of the key characteristics of m-learning is the mobility allowing access to learning opportunities beyond traditional learning spaces and timetabled learning. A nomadic networked learner can engage in learning activities 24/7. Depending on their motivation and learning needs, they may be participating in learning communities, authoring in Web 2.0 environments, or multitasking, combining study with social interactions or gaming. The complex range of learning activities that may occur in and ‘always on’ mobile learning environment cannot be easily classified, quantified, or captured to inform the design of similar learning experiences.

In an attempt to provide a framework for the design, development and evaluation of pervasive learning experiences, Thomas (2005) proposed a model of ‘pervasive learning’ to describe learning in environments with technologies that are mobile and always accessible. Thomas defines pervasive learning as:

Learning that uses technology that is omnipresent (pervasive) in a learner’s every day life. (Thomas, 2005, p. 1)

At its core, pervasive learning is about using the technology that a learner has at hand to create relevant and meaningful learning situations, that a learner authors herself, in a location that the learner finds meaningful and relevant. (Thomas, 2005, p. 1)

According to Thomas (2005), the pervasive learning model encompasses many of the current trends in learning, for example, the focus on student-centred and constructivist learning, collaborative learning, multimodal learning, but overlays this with the concept of mobility and time, where learning becomes an anywhere anytime activity, pervasive and enduring.

Thomas’ pervasive learning model has four key components that overlap and interact:

- 1. Community**

The Community component involves relationship building, participating in learning communities and the development of multiple learner roles.

- 2. Autonomy**

The Autonomy component encompasses a student-centred approach whereby students take responsibility for and ownership of their learning.

3. Locationality

The locationality component reflects the flexibility in learning spaces where learning has no “on/off” switch. Learners have the choice of when and where they learn, access to rich learning resources and other learners.

4. Relationality

The Relationality component of pervasive learning includes authentic and meaningful learning experiences where learning is related to life and students construct personal learning goals, meaning and environments.

M-learning, where the location and timing of learning is flexible, where learning is learner-driven, individualised and constructivist represents an opportunity for students to engage in pervasive learning. Pervasive, student-centred learning could encourage the development of lifelong learning skills, a desirable outcome for all tertiary education students (Candy, Crebert, & O'Leary, 1994). This paper discusses some of the preliminary findings of a study on m-learning within an Australian tertiary setting and focuses only on the first year students who participated in the study.

Students and m-learning: The Study

The study was centred on students involved in m-learning with laptops or tablets at three Australian Universities to investigate student engagement in m-learning. The participants for this study were sourced from classes where the use or ownership of laptop or tablet computers was likely to be high. At one of the institutions the university provided laptops to first year education students for 24/7 use, at the second university first year university students were given access to tablet computers for use in class, and at the third institution a class was selected where students had a high level of laptop ownership. In the instances where learning activities utilising the laptops were designed, these usually focussed on in class activities, and after class use of the laptops, where possible, was at the discretion of the students.

Students were presented with an online survey comprised of a range of demographic questions, questions about m-learning and were also encouraged to provide additional qualitative input. The survey questionnaire included items to establish the level of students' expertise in using laptops (or tablets), wireless networks and their use of laptops for study and social purposes. A number of questions were included to elicit responses to establish whether there was an element of pervasive learning occurring that could be classified within Thomas' (2005) dimensions of community, autonomy, locationality and relationality (using a five-level Likert item - Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree). This paper reports only a selection of the survey items and is focussed only on the 1st year 'net generation' students.

To establish whether students were able to engage in m-learning and whether aspects of Thomas' Pervasive Learning model could be associated with their activities, answers to the following questions were sought:

Do students have the technology skills and access to engage in pervasive m-learning? Are students exploiting the flexibility in choice of time and space offered by m-learning? (Locationality)

Are the students participating in learning communities? Do they perceive that online communication with other learners enhances their learning? (Community)

Do students feel that using a laptop helps them take control of their learning experiences? Do they have ownership of their learning? (Autonomy)

Do students believe that their laptop assists them in tailoring their learning experiences to personal learning needs (Relationality)?

Overall, 119 first year students responded to the online survey that was presented between weeks 9 and 13 in Semester 1, 2008. Of these first year students, 91 could be identified as born in 1982 and later, and hence could be assumed to be part of the net generation. For this preliminary report of the study, only the sample of students identified as net generation students are discussed in this paper.

The students invited to participate in the online survey were enrolled in disciplines of Education and Information Technology. The universities of origin of individual sub-groups are not distinguished between in this preliminary report, and results are reported only by discipline, for 1st Year Education students and 1st Year Information Technology students. However, further quantitative and qualitative analysis of study data will provide a more detailed picture of the variations in students' origins, study discipline, unit variations and students' perspectives to be discussed in future publications. The summaries below show the 91 students classified in two groups, 1st year Education students (N=46) and 1st year Information Technology (IT) students (N=45).

Preliminary Findings

Laptop use and wireless accessibility

Students were initially invited to self evaluate their level of expertise in using computers and the results in Table 1 indicate that most students consider themselves to be experienced computer users.

Expertise in using computers	1 st Year Education N=46 (51%)	1 st Year IT students N=45 (49%)
Inexperienced	1 (2%)	3 (7%)
Experienced	39 (85%)	26 (58%)
Very experienced	6 (13%)	16 (36%)

Table 1: Students' self evaluation of expertise in using computers

This is not surprising as 37% of the Education students and 36% of IT students had a laptop computer in primary and/or high school so they have started their university studies as relatively experienced laptop users. Furthermore, 100% of Education and IT students indicated that they had access to internet at home of which 90% of Education students and 98% of IT students had broadband internet access.

When asked whether they knew what level of wireless access was provided at their university approximately 50% of the Education students could describe the level of wireless accessibility at their university (which was Campus-wide) and, as could be

expected, almost all IT students (91%) were aware of the level of wireless accessibility except for 4 students (9%) in the sample who were not sure (Table 2).

Wireless access at University	1 st Year Education N=46 (51%)	1 st Year IT students N=45 (49%)
Campus wide	23 (50%)	12 (27%)
Some locations on campus	2 (4%)	29 (64%)
None	0 (0%)	0 (0%)
Unsure	21 (46%)	4 (9%)

Table 2: Students’ perceptions of level of wireless accessibility at their university

However, responding to whether the university infrastructure (wireless network and access to online resources) was sufficient to meet their needs, less than 50% of all the students believed that it was satisfactory, only 43% of Education and 47% of IT students believed the infrastructure was adequate which indicates that students’ expectations for wireless access were possibly not being met.

Technology as an integral part of a Lifestyle

Students were asked whether technologies were an integral part of their lifestyle and over 90% of both Education and IT students agreed or strongly agreed (Figure 1), which is quite consistent with the expectation of high levels of technology use amongst Australian students, though there is likely to be a diversity of technological experience in the student population as found by Kennedy et al (2008) in their recent study.

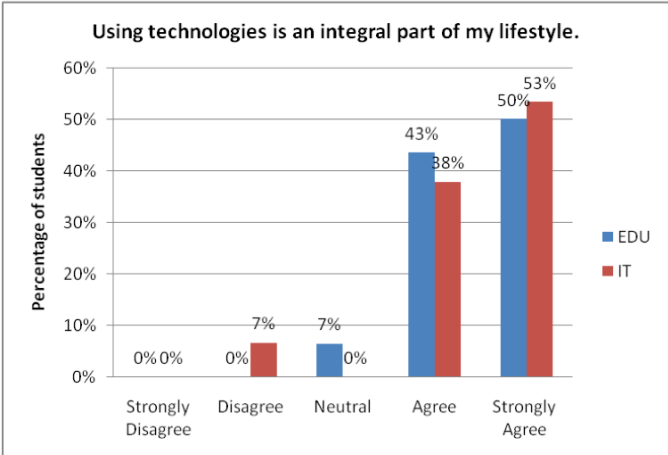


Figure 1: Technology as an integral part of lifestyle

As seen in Figure 2 only 28% of Education students used laptops for more than 10 hours per week for study purposes, whilst over 50% of IT students used laptops or tablets for more than 10 hours per week which is possibly a consequence of their area of study. However, when asked about social uses of the laptops only 11% of Education students used laptops for recreational purposes for more than 10 hrs per week even though they had access to laptops 24/7, whilst IT students reported almost identical levels of both study and social use of laptops (Figure 3).

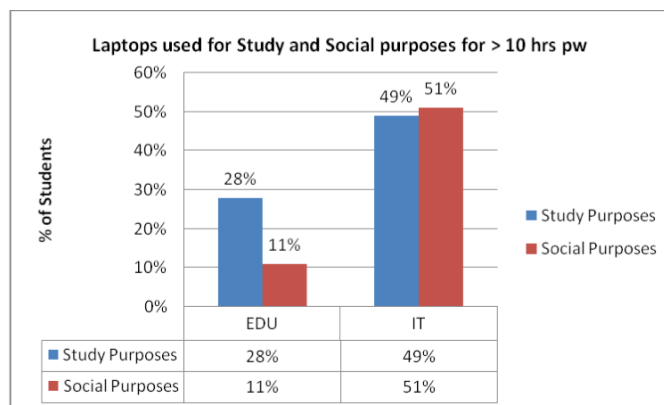


Figure 2: Laptop/Tablet use for study and social purposes for >10hrs per week

In 2005 (McMahon & Pospisil, 2005b) explored the concept of the digital lifestyle of net generation students by monitoring their use of technology in both the university and social settings in the context of wireless laptop pilot project and identified that the students participating in the study were characterised by a focus on immediacy, information connectedness and multitasking. Over 50% of students surveyed in this study indicated that they used their laptops for both study and recreational purposes at the same time; however, the level of study/social 'multitasking' was a preference favoured more by the IT group of students surveyed.

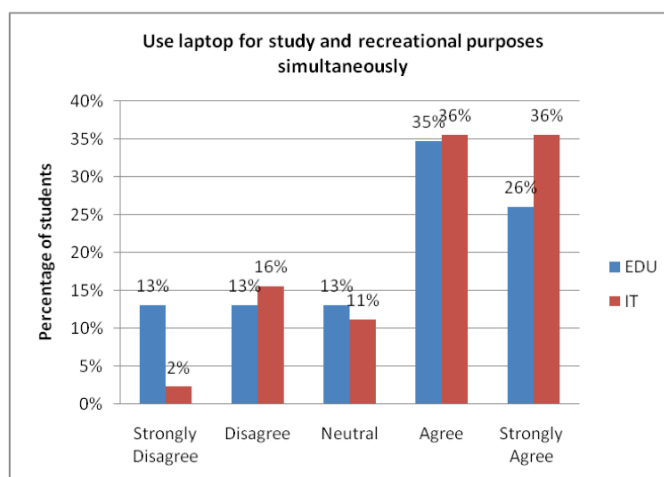


Figure 3: Use of laptops for study and recreational purposes

Student Comments on m-Learning

Students' responses and comments about m-learning experiences included a range of positive responses to studying with the aid of laptops, particularly in relation to the mobility and flexibility of access to learning:

Having a laptop as a student impacts on me positively as it means that I can do my work anywhere, from uni, to home, to a library, to a park, to a cafe or to a friend's house. Laptops are very conventional and I feel are a great impact that helps myself as a student greatly. (Education student)

Having the freedom to move around and study wherever and whenever i like is great. This allows me to be able to concentrate on my learning and do my research and activities when i want. (Education student)

Having a laptop makes a massive impact on my life as a student. When I'm learning it makes an impact because information and communication is accessible at all times. When I'm having time off work i use my laptop in a lot of my socialising and leisure activities. I use my laptop everyday for up to 10 hrs a day. It is a significant part of my life (IT student)

It makes things so much easier... can take laptop anywhere to do homework and not stuck on the computer at home can take it down the beach or in a relaxing place (not fixed in a specific place) and i believe mixing up study areas also helps as you don't feel pressured in the same spot all the time... (IT student)

Gives me freedom to study nearly anywhere, and provides me with my own time to study and do assignments, rather than have to organise it around the family PC. (IT student)

It was researching for an assignment while on an aeroplane, it was the fact that I could do that research anywhere. (IT student)

I can work in any environment I want and be able to change my environment since I hate staying in one place for a long period of time. (IT student)

Being a student, need my laptop everyday to check emails, get lectures notes etc. having a laptop means I can sit in my room and do it in peace, so i can get away from the noise of the household, where as the main computer is where there are a lot of distractions in the main area. i would die without a laptop! (Education student)

Students and pervasive m-learning

To elicit responses that would indicate whether students engaged in activities within the scope of the Autonomy, Community, Relationality and Locationality dimensions in Thomas's pervasive learning model (Thomas, 2005), the survey included a number of items to establish whether students perceived that they are directing their personal learning experiences and whether they perceived that using laptops gives them more control of their learning experiences. A sample of survey responses are included below.

Figure 4 shows a very similar result for both groups where approximately 80% of both Education and IT students perceived that their laptop assists in tailoring their learning experiences to their needs, supporting indirectly the notion of Relationality in the pervasive learning model.

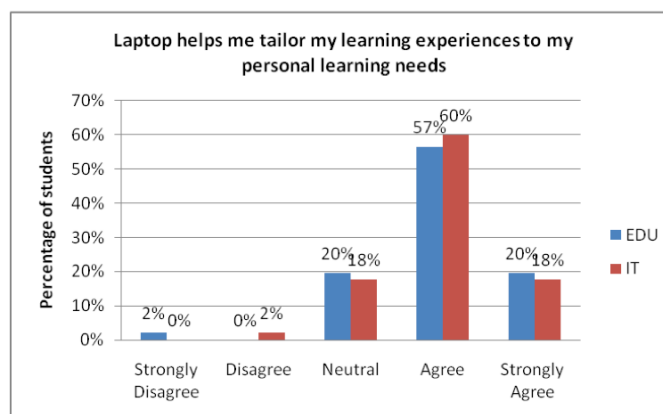


Figure 4: Laptop assist in tailoring learning experiences

Though 78% of 1st year Education students felt that having a laptop gave them greater control of their learning experiences as shown in Figure 5, 91% of IT students agreed or strongly agreed that this was the case allowing possibly for a more 'Autonomous' learning experience. Again, this is possibly a result influenced by the higher use of computers in their study discipline, but could warrant further investigation.

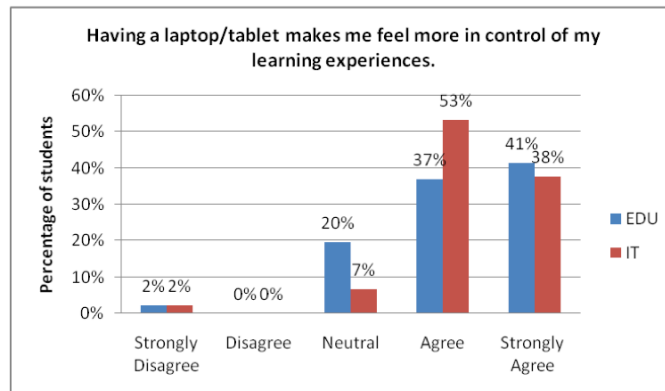


Figure 5: Laptops support control of learning experiences

The Community aspect of the Thomas' Pervasive Learning Model is based on the premise that students' learning is enhanced by a learning community which they are part of and in which they contribute to educating other students (Thomas, 2005). Hence, in the survey the students were asked whether they believed that communicating with others enhances their learning. Most students indicated that communication with others does enhance their learning, However, this item (Figure 6) does not identify whether this is student-student, teacher-student or student-teacher communication.

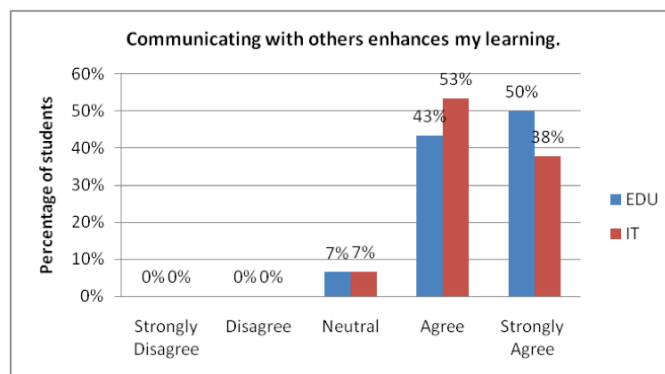


Figure 6: Communication enhances learning

Students were therefore asked whether they networked with other students for study purposes and whether they developed social networks with other students through computer based communication (Figure 7 & 8).

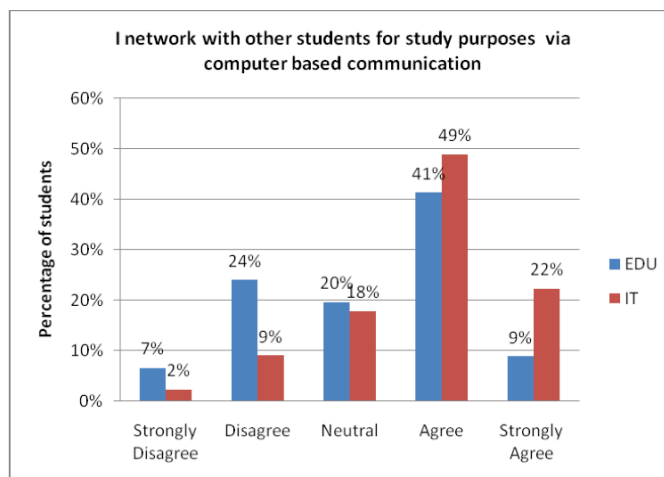


Figure 7: Network for study purposes

Both Education (50%) and IT (71%) students networked with their peers for study purposes, however IT students appeared to develop both study and social networks more so than the Education students of which approximately 30% indicated that they have not developed either type of network during the semester through computer based communication. This is a finding that warrants further investigation as to the reasons why this could be occurring and whether this is specific to discipline areas.

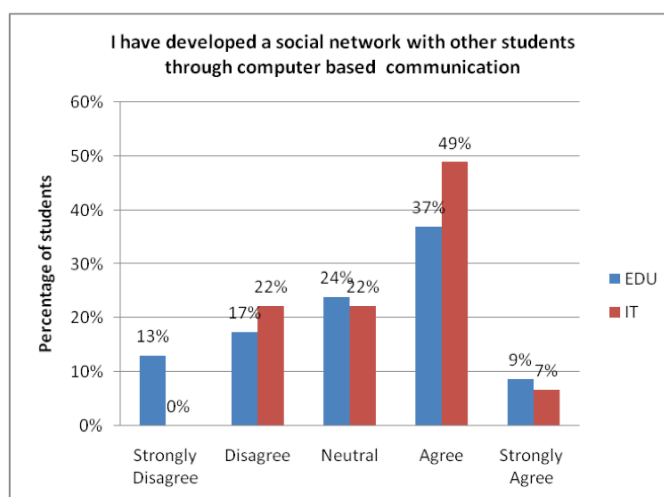


Figure 8: Developed Social Network

Student Comments on learning with others

Students generally were positive about learning with others, but also expressed a need to study independently when required. A sample of students' comments is included below:

I prefer to learn with friends. Be it face to face, or being able to discuss things over the internet. There are times however, where I would just like to sit in the library and just do my own research and writing on the laptop. (Education student)

Online group work on an out of class tutorial. It was fun because we could do the work anywhere at our own pace and have a good group discussion about it (Education student)

My preferred way of learning would be to be shown new types of technology and how to use them. Using new technologies can help further ideas. I also enjoy interactive activities. I find they are the best way of learning. (Education student)

I like learning best when i am by myself. (Education student)

In summary, comments provided by the first year net generation students in both the Education and IT disciplines surveyed indicated that many students:

- Enjoy the flexibility of anytime anywhere study
- Like to choose where to study and to change the location at will
- Depending on what work done like to be in public or secluded places to study:
- Like to feel in control of their learning
- Enjoy research activities
- Are stimulated by learning from multiple sources and media
- Created networks with other students for study and social purposes
- Like interacting and learning with others

However, individual preferences can vary and a number of students preferred to study alone and some did not see networking with others as beneficial to their learning.

Conclusions

The cost of laptops was an initial barrier to wider use of laptops in education (Peters, 2007), however, with the increasing affordability of quality wireless laptop computers mobile learning with laptops is becoming mainstreamed, and though iPods and other mobile devices appear to be increasingly utilised in educational settings, the laptop has a great following.

Preliminary conclusions of the aspects of the study reported on in this paper indicate that the groups of first year 'net generation' students surveyed are generally comfortable in using laptop computers and wireless networks, and embrace the mobility that wireless laptops support. Where laptop programmes exist, these are appreciated by students who do not have the financial means to purchase a laptop, and students who would otherwise be sharing their computers with other family members. However, it is worth noting that many of the students already own laptops and are accustomed to accessing wireless networks on and off campus. Some students appear to be dissatisfied with the level of wireless access at university which possibly is due to the extensive use of wireless networking in homes setting up an expectation for high levels of wireless coverage on campus in both formal and informal learning areas.

The results reported in this paper show that students with access to laptop computers consider laptops to be a valuable resource for learning and appreciate the freedom to choose where to study and when to change locations, the Locationality dimension of pervasive learning. Though there is some anecdotal evidence of student engagement in student-centred learning which could be classified as pervasive learning, the challenge is to develop a means of measuring the extent to which this occurs.

Overall, students were keen to utilise laptops in and out of class and appear to welcome learning activities that take advantage of the availability of mobile computers. Further development of frameworks and models for m-learning that can be readily applied to learning designs may be able to enable and encourage pervasive student-centred learning. An opportunity exists for university teachers to acknowledge the possibilities offered by mobile learning and adapt their learning designs to incorporate learning activities that tap into students' willingness to embrace learning beyond the traditional learning activities, learning spaces, timeframes, ownership and control.

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