
JISC LXP
Student experiences of technologies
Final report

**Gráinne Conole,¹ Maarten de Laat,²
Teresa Dillon³ and Jonathan Darby¹**

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¹The Open University,

²Exeter University,

³Polar Produce

1. EXECUTIVE SUMMARY	5
2. BACKGROUND	7
2.1 Related studies.....	8
3. METHODOLOGY	10
3.1 Summary overview of each subject centre.....	11
3.2 Phase one – contextual data.....	11
3.3 Phase two – case studies.....	12
3.4 Data analysis.....	14
3.5 Theoretical framework	14
4. CASE STUDY NARRATIVES	14
4.1 Learner voices	14
4.1.1 Learner one – Fabio (Economics)	15
4.1.2 Learner two – Samir (Economics).....	18
4.1.3 Learner three– Annmarie (Medicine).....	19
4.1.4 Learner four – Gary (Medicine).....	25
4.1.5 Learner five – Jack (Computer Science)	31
4.1.6 Learner six - Finbar (Computer Science)	35
4.1.7 Learner seven – Dzel (Languages).....	38
4.1.8 Learner eight – Peizhi (Languages).....	42
4.2 Commonalities and differences across the subject disciplines	46
4.2.1 Researching and retrieving information	46
4.2.2 Communication	48
4.2.3 Assignments and presentations.....	50
4.2.4 Integrated learning.....	51
5. PUTTING THE CASE STUDIES IN CONTEXT	53
5.1 Context of use: places of study and technology use.....	54
5.2 Use of technologies to support different types of learning activities.....	55
5.2.1 Tools for communication	56
5.2.2 Tools for researching and retrieving information.....	63
5.2.3 Tools for assignments and presentations.....	67
5.2.4 Integration learning	72
5.3 Students perceptions of technologies.....	73
5.3.1 Reasons cited for using technologies.....	74
5.3.2 Student opinions of e-learning.....	76

6.	APPROPRIATION OF TECHNOLOGIES, FACTORS INFLUENCING USE AND CHANGING PRACTICE	80
6.1	Appropriation of technologies and types of activities	80
6.1.1	Assimilative tasks.....	81
6.1.2	Information handling tasks	82
6.1.3	Adaptive tasks	83
6.1.4	Communicative tasks	83
6.1.5	Productive.....	85
6.1.6	Experiential	85
6.2	Types of learning.....	86
6.2.1	Thinking and reflection	86
6.2.2	Experience and activity	87
6.2.3	Conversation and interaction	87
6.3	Factors determining or influencing technology use.....	88
6.3.1	Environment	88
6.3.2	Usability	89
6.3.3	Accessibility	90
6.3.4	Ownership and personalisation.....	91
6.3.5	Discipline demands	91
6.3.6	Learning strategies	94
6.3.7	Support and community	94
6.3.8	Institutional infrastructure	95
6.4	Changing practice	96
7.	METHODOLOGICAL ISSUES AND RECOMMENDATIONS	97
7.1	Methodology issues.....	97
7.2	Recommendations	98
7.2.1	Content	98
7.2.2	Interactivity	98
7.2.3	Social and community learning.....	98
7.2.4	Assessment.....	99
7.2.5	Personal devices and anytime, anywhere access	99
7.2.6	Usability	99
7.2.7	VLEs	100
7.2.8	Aggregative portals	100
7.2.9	E-Literacy skills	100
7.3	Further research.....	101
8.	CONCLUSIONS	101
9.	REFERENCES	102
	ACKNOWLEDGEMENTS	104

PROJECT TEAM..... 104

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1. Executive summary

The study yielded both expected and unexpected findings in terms of students' use of technologies. The expected findings are useful in terms of providing valuable up-to-date empirical evidence of students' current learning environment. The unexpected findings give a hint of the student learning environment of tomorrow and raise a host of important implications for policy and practice.

Across all subjects the students made extensive use of personally owned technologies including mobile phones, laptop computers, personal digital assistants and USB memory sticks. In terms of expected findings the study revealed that students are using a range of standard packages (Word, PowerPoint, etc) in creating and presenting learning artefacts and assignments, and for manipulation of textual and numerical data (Excel, statistical software).

The Web is unequivocally the first port of call for students – with extensive examples across the study of how students are using search engines, dedicated subject-specific sites and e-journals to find information of relevance to their studies. What is surprising perhaps is the extent of this as a common practice amongst the students and the sophisticated ways in which they are finding and synthesising information and integrating across multiple sources of data. Similarly technologies are used extensively by students to communicate with fellow peers and tutors, with students demonstrating use of a variety of tools (email, MSN chat, skype, mobile phones, etc) to support a range of different communicative acts. Again the level and type of communication is notable – there is strong evidence of peer support and peer community, resonant with the rhetoric inherent in the idea of social networking and the world of Web 2.0. The key picture that emerges is that students are appropriating technologies to meet their own personal, individual needs – mixing use of general ICT tools and resources, with official course or institutional tools and resources.

The above findings point to a profound shift in the way in which students are working and suggest a rich and complex inter-relationship between the individuals and the tools. The following eight factors emerge from the data in terms of the changing nature of the way students are working.

1. *Pervasive and integrated*: Students are using technologies extensively to find, manage and produce content. They use technologies to support all aspects of their study. Students are using tools in a combination of ways to suit individual needs. There is evidence of mixing and matching. They are comfortable with switching between media, sites, tools,

content, etc. They said that technologies provide them with more flexibility in terms of being able to undertake learning anytime, anywhere.

2. *Personalised*: They appropriate the technologies to suit their own needs. They use the computer, the internet and books simultaneously. Their learning is interactive and multifaceted, and they use strategies such as annotation and adaptation of materials to meet their learning needs.
3. *Social*: Students are part of a wider, networked, community of peers. They are members of a range of communities of practice - to share resources, ask for help and peer assess.
4. *Interactive*: Students' perception of the nature and inherent worth of 'content' is changing; they have access to a rich variety of free material that is easily downloaded via the Internet. Students expect high quality, interactive materials with a preference for 'byte' sized and condensed forms of information that can easily reviewed anytime, anywhere and store on handheld devices. Content is no longer 'fixed' and 'valued', it is a starting point, something to interact with, to cut and paste, to adapt and remix.
5. *Changing skills set*: Students are demonstrating new skills in terms of harnessing the potential of technologies for their learning. These include developing new forms of evaluation skills and strategies (searching, restructuring, validating), which enable them to critique and make critical decisions about a variety of sources and content. Students are becoming sophisticated at finding and managing hybrid forms of information drawn from a multitude of traditional (text books), existing (Google search engines) and emerging (blogs, Wikipedia) sources.
6. *Transferability*: They see the PC as their central learning tool. They are used to having easy access to information (for travel, entertainment etc) and therefore have an expectation of the same for their courses. There is evidence of the transfer of practices of their use of technologies in other aspects of their lives to their learning context: for example MSN chat, Amazon, ebay and Skype.
7. *Time*: The concept of 'time' is changing – both in terms of expectation of information and results on demand. There is evidence that despite the fragmentation of the learning timetable, technological tools (email, mobile phone, MSN, Skype, WebCT) are mediating and allowing students to remain connected and synchronised.
8. *Changing working patterns*: New working practices using an integrated range of tools are emerging. The use of these tools is changing the way they gather, use and create knowledge. There is a shift in the nature of the basic skills with a shift from lower to higher levels of Blooms' taxonomy, necessary to make sense of their complex technologically enriched learning environment.

Students are evidently comfortable with using technology and see it as integral to their learning. They are generally sophisticated users, using technologies in a variety of different ways to support different aspects of their learning. They are critically aware of the pros and cons of the use of different technologies and 'vote with their feet' – i.e. they don't use technologies just for the sake of it – there needs to be a purpose and clear personal benefit. They have an expectation of being able to access up to date and relevant information and resources and see this as vital. They don't see the technology as anything special; but see it as just another tool to support their learning.

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2. Background

This paper describes some of the findings which have emerged from an in-depth case study exploring students' experiences of e-learning. The report is divided into the following sections:

1. *Executive summary*
2. *Background* – which gives a contextual overview of the project
3. *Methodology* – outlining the methodological approach adopted and how the research instruments addressed the principle research questions
4. *Case study narratives* – a description and discussion of the findings from the main case studies drawing on the LXP audio log diaries and interviews
5. *Putting the case studies in context* – positioning the case studies within the wider spectrum of learner experiences drawing on the data from the LXP online survey
6. *Discussion* – synthesis of emergent themes and comparison of the findings of the project with key related studies
7. *Recommendations and conclusion*– implications and recommendations of the findings of the LXP study for key stakeholders (students, teachers, developers, policy makers, institutions)
8. *Appendices*
 - Appendix A – the online survey
 - Appendix B - summary of quantitative results from the 427 online surveys
 - Appendix C– summary of the qualitative data from the 427 online surveys (please contact the LXP team for further details)
 - C1: Technologies students most like to use
 - C2: Technologies students least like to use
 - C3: Integration of e-learning with other learning activities
 - C4: Technology use other than for learning
 - Appendix D – summary of the 85 audio log diaries
 - Appendix E – summary of the interview questions
 - Appendix F - summary of the 14 student interviews
 - Appendix G – project outputs

The project was funded by the Joint Information Systems Committee (JISC) in the UK and ran from January – August 2006, as part of the broader JISC e-pedagogy programme. In

particular the project is part of the ‘Understanding my learning strand’.¹ The main research theme of the project was to collect learner stories on their experiences with e-learning. A previous detailed review showed that the learner perspective on e-learning had been largely overlooked (Sharpe *et al.*, 2005) but that knowledge of how learners use and experience e-learning/technology in their learning activities was crucial for the development of tools, pedagogy and teaching practices.

The main research questions addressed were:

- How do learners engage with and experience e-learning?
 - What is their perception of e-learning?
 - What do e-learners do when they are learning with technology?
 - What strategies do e-learners use and what is effective?
- How does e-learning relate to and contribute to the whole learning experience?
 - How do learners manage to fit e-learning around their traditional learning activities?

The project was particularly interested in extrapolating out subject discipline differences in the use of technology and worked in conjunction with four of the UK’s HE Academy subject centres: Medicine, Dentistry and Veterinary Medicine; Economics; Information and Computer Sciences; and Languages and Linguistics. These centres were chosen because they gave a good spread of subject areas and because they were centres who had a track record and interest in research on both the way in which students learn and the use of e-learning.

2.1 Related studies

The strand of work under which this study sits is underpinned by a scoping study undertaken by Sharpe *et al.* (Sharpe, Benfield *et al.* 2005). This provided a comprehensive review of studies (post 2000) which purported to focus on students’ experience of e-learning. They concluded that there was a scarcity of studies focusing on the learner voice (beyond that of simple course evaluations), far more emphasis appears to have been given to the practitioner perspective and to course design. The intention here is not to provide another literature review but to highlight the findings from a number of studies, which align closely to the LXP project. These are summarised here.

The Sharpe *et al.*’s report distilled out a number of overarching themes which emerge from their review of research studies on the students’ experiences of e-learning. In terms of the student voice they highlight three aspects: *Emotionality* (students mixed views on the pros and cons of e-learning), *Time Management* (the contradiction between the tutor-centric view of the flexibility technologies afford and students’ concerned about the additional time requirements), and *e-learning skills* (a wider range of skills than just IT skills are needed for students to make most effective use of technologies to support their learning). In terms of the factors affecting the e-learning experience they highlight literature on: the influence of the *tutor*, the influence of *pedagogy*, *learner differences* – gender, cultural, learner preferences, language, disability, etc, and *effectiveness as an e-learner*.

¹ http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_learneroutcomes.aspx

The 'Learner Experience of e-learning' or LEX project was carried out in parallel to this LXP study and was funded under the same JISC programme. Both LEX and LXP arose from the recommendations of the Sharpe *et al.* scoping study and were intended as initial pilot projects under the 'understanding my learning' strand of work. The focus of LEX was much broader than that of LXP. The aim was to 'investigate learner's current experiences and expectations of e-learning across the broad range of further, higher, adult, community and work-based learning (Creanor, Trinder et al. 2006). The study focused on three main questions: characteristics of effective e-learners, beliefs and intentions, and strategies for effective e-learning. The findings led to the development of a conceptual framework which mapped five high level categories (life, formal learning, technology, people and time) against five influencing dimensions (control, identity, feelings, relationships and abilities).

The SOLE project also represented an important landmark project in terms of being one of the first to evaluate students' experiences of e-learning (Timmis, O'Leary et al. 2004; Timmis, O'Leary et al. 2004). Of particular interest is the discipline differences reported from the project.

In our studies, there was a marked difference between some subject areas in the roles of tutors and students. As might be expected, in the Education case studies, learning models and approaches were more overtly constructivist/social constructivist in design and this was supported by evidence from the students and tutors regarding their roles. Students tended to see their role as active and the tutor as a facilitator... Despite a wide variety of activities and learning models amongst the Economics and Psychology case studies, the evidence of any significant changes in roles and behaviour is slight. In the main the roles appear to be fairly traditional and static and many students wanted more tutor involvement. In these studies, students did not appear to be as comfortable as the Education students with working online and showed resistance to working more without direction from a tutor. (Timmis, O'Leary et al. 2004)

Kirkwood and Price (Kirkwood and Price 2005) report on data spanning five years from evaluation data on students' attitudes to and experiences of technologies. In terms of access to and use of ICT they suggest that there has been a fundamental shift in students' access to ICT – arguing that this reflects not only attitudinal changes but the changing needs of society. Their meta-analysis shows that student access to, experience of and attitude towards technologies varies across subject disciplines and argue that:

Although students' access to computers and to the Internet is no longer considered an obstacle in some subject areas, there are still concerns in others (e.g. health and social welfare).

They also provide valuable insights into how students are using ICT in their studies, which mirror the findings reported here. For example the high use of generic software such as Word for preparing assignments and students' habits in terms of using the internet to search for information and using a range of technology tools to communicate with peers and tutors. Their conclusion echoes the conclusions inherent in many other research studies into the use of technology for learning and is an important factor in terms of reading and interpreting the findings reported here:

The most important point to conclude from the studies presented in this article is that the medium itself is not the most important factor in any educational programme – what really matters is how it is creatively exploited and constructively aligned. The educational benefits

that students perceive as gains from using ICT are more significant than the intrinsic characteristics of any particular medium.

3. Methodology

The project adopted a methodology developed during a scoping study carried out by Sharpe *et al.* (2005), to collect data on learner experiences with e-learning. In general the research procedure was aimed at describing the learner’s personal background and (learning) context in which they integrate technology into their learning. The selection of learners was done in close collaboration with the participating subject centres, via tutors who have taken specific approaches, or were working in specific contexts. Learners who have been effective in their participation with e-learning were approached to capture their experience with e-learning.

The methodological approach consisted of two phases – a wider contextual review of the use of technologies across a broad spectrum of students using an online survey and a more in-depth series of individual case studies of technology use gathered through student audio log diaries and interviews. Data collection consisted of three main sources:

- information derived from the online survey
- data gathered through audio logs and
- transcripts from the interviews.

The online survey was used to gain a wider understanding of learners’ experiences around particular artefacts, whereas the case studies of individual learners (via the audio logs and interviews) included describing the nature of the e-learning activities carried out by the learner and exploring the e-learner context and background.

After the data had been cleaned up a total of 427 valid entries were received from the online survey. The survey was sorted according to subject centre and divided into qualitative and quantitative responses. Quantitative responses were imported into SPSS for analysis. 85 distinct audio recordings were collected. Audio recordings were sorted by subject centre and individually coded indicating the subject centre/institution, individuals and the number of the message dropped (eg U15 = Ulster University, Computer Science, message number 15). Audio logs were ordered and anonymised and a separate look up coding table created. A total of fourteen interviews were collected. The names used in the description of the in-depth interviews are fictitious. Background information and notes were collected during each interview and the sessions were audio recorded. A cross table matching original log and interview details was created. Table one gives the breakdown of the data collected.

Table 1 Breakdown of data collected

Phase one – context	Phase two – case studies	
Survey	Audio logs	Interviews
Economics: 128	Economics: 3	Economics: 2

Languages: 92	Languages: 47	Languages: 3
Medicine: 31	Medicine: 16	Medicine: 5
Computing: 158	Computing: 19	Computing: 4
Other: 18		
Total: 427	Total: 85	Total: 14

The data capture methods targeted the experience of learners across different e-learning modes and settings, ensuring that the data captured allowed for comparison between learners in the same e-learning modes as well as in different modes. The combination of methods allowed for rich empirical data, as well as for the triangulation of interpretations of the data that result from the different methods and different individuals and groups targeted. The sampling strategy was to a degree pragmatic, working specifically with the four subject centres to identify appropriate courses and student cohorts to target.

3.1 Summary overview of each subject centre

Data was collected in conjunction with four of the HE Academy subject centres. See <http://www.heacademy.ac.uk/> for an overview of the HE Academy, its origins and mission. The HE Academy has 24 subject centres which provide discipline-based support. These are located within relevant subject departments around the UK and hosted by higher education institutions. The subject centres have an established and well deserved reputation for working closely and successfully within their subject domains. Each centre engages in a wide variety of activities to support practitioners, subject departments and discipline communities. The disciplines included were:

- Medicine, Dentistry and Veterinary Medicine (MEDEV) - <http://www.medev.ac.uk/>
- Economics - <http://www.economicsnetwork.ac.uk/>
- Information and Computer Sciences - <http://www.ics.heacademy.ac.uk/>
- Languages, Linguistics and Area Studies - <http://www.llas.ac.uk/>

Access to appropriate courses and students was agreed in discussion with the subject centres and the subject centre mailing lists were used as one mechanism of disseminating the online survey. Students for focus on the in-depth case studies were agreed with the subject centre representatives. The participating institutions involved in the in-depth case studies provided a range of contexts across the UK – from old and new institutions, to those located within a metropolitan area or a regional locality. The institutions were: the University of Ulster (Magee Campus), London Metropolitan University, the University of Newcastle and the University of Southampton.

3.2 Phase one – contextual data

The survey was developed as the first instrument to gather background information about the learners and the way they integrate technology into their learning. This was designed to gather general information about the learner background, selection of technologies, level of competence and their experiences of working with different technologies. The survey was

used to collect more generally information on how learners across the different subject areas engaged with e-learning and integrate technology into their learning in general. As learning is situated in a socio-cultural context which contributes to the learners' experience, understanding the learning context and setting is crucial to interpreting learners' experiences.

A version of the questionnaire is available online² and also in Appendix A. The introduction to the survey provides an overview of its purpose:

Research in e-learning is usually focused on technological or pedagogical issues and so far students have been largely overlooked. In this research project we should like to address this and turn our attention to students who are using technologies to support their learning activities. Besides conducting several interviews to gather student stories on how they use and experience technology within their learning tasks, we should like to generate a bigger picture: hence this survey. In it we should mainly like to focus on what kind of technologies you use, how you use them and why. We would be grateful if you could fill out these questions and provide, if you can, a detailed description of your reasons and strategies for using your favoured technological devices or software to allow you to study alone or together with others.

The survey covered a broad spectrum of technologies and contained a series of matrices of technologies against types of learning activities. These matrices drew on the media types table originally developed by Laurillard (2002) and the definition of learning activities developed in the DialogPlus taxonomy (Conole and Fill, 2005, Conole, forthcoming) of learning activities as a basis for categorising types of technology and their use. The survey was initially developed by the project team. It was then improved in light of discussions with the four HE Academy subject centres and finally via exposure to the JISC e-pedagogy group at a meeting on 22nd February 2006.

The survey was sent out by the participating subject centres to reach a maximum number of students within their institutions. The survey was designed to be a mixture of qualitative and quantitative questions. A summary of the quantitative results are provided in Appendix B and the qualitative results in Appendix C.

3.3 Phase two – case studies

The second phase focused on the actual learning experiences. Based on the results of the survey and students availability, a selection of learners from across the subject centres were selected for in-depth case studies on their e-learning activities and experiences. A member of the research team wrote the participation brief, which was delivered either by them in person or by a member of the subject centre liaison team. The brief outlined the purpose of the study and students involvement. Students were then asked to provide regular audio log diaries to demonstrate the different ways in which they were using the technology. Once the audio log data was collected, the same member of the research team met again with the students and carried out a semi-structured interview to help contextualise and extend the

² http://www.geodata.soton.ac.uk/eLRC/learner_survey/

findings emerging from the audio logs. Each student received fifty pounds as a token of gratitude for participating in the study³.

The audio-logs were used to collect diaries on the students' learning activities over a period of time, when the students were engaged in their HE course. A summary of the audio log diaries is given in Appendix D. The use of audio-logs allowed the students to inform us each time they used some kind of technology to support their learning activities by leaving a phone message on our answering machine. It provided a means of gathering 'in-situ' use of technology on a daily basis which could then be interrogated in more depth in the follow up interviews. The students were instructed to leave the following information:

- Name
- University
- Course
- What device/tool were they using e.g. 'I'm now using email and WebCT'
- What they were using it for - e.g. 'I'm using email to contact my friend, to check some details of the course and WebCT to look at course material'
- What they gained from using the tool e.g. 'I got the information I need from my friend, because the course material was not on the web'
- What was their experience of using the device/tool e.g. 'I like to use email, because it is an efficient and fast way to get the information needed from a friend'.

Audio logs were chosen because such diaries can provide rich data about day-to-day events, as they happen, and contain a realistic account of the activities undertaken by the learners. Furthermore the outcomes of these diaries were then used to feed into the subsequent interview with the learner to reflect on the technologies they have used and the learning strategies that they have developed as a result. Previous research suggested that working with written diaries was useful but that these written diaries are often incomplete and participants usually find keeping diaries time consuming (Timmis *et al.*, 2004). To overcome this we set up a server which students were able to ring and leave a message. Participants are asked to make short recordings during their activities about what they are doing. A summary of the audio logs is provided in Appendix D.

At the end of each case study a selection of learners were interviewed across the four subject centres, the focus was on eliciting their experiences of integrating technology into their learning as expressed in the main research questions. Appendix E gives an outline of the interview protocol used. The interviews were held at the universities where the students were studying. A total of fourteen interviews were recorded. A summary of the interviews are given in Appendix F. Interviews lasted between 22-42 minutes with the same member of the research team undertaking them to ensure consistency. Prior to each interview the researcher went through the aims and details of the research. During the interview participants were asked to reiterate what kinds of technology they used during the audio log period. From this a series of semi-structured questions guided the conversations.

³ University of Ulster, Magee Campus gave students a mini iPod for participating in the study, the cost of which was covered internally by Magee.

3.4 Data analysis

SPSS was used to analyse the quantitative data; qualitative analysis was divided up into appropriate sections and manipulated in Excel. First a broad descriptive analysis was carried out across all the available data to see if some general patterns emerge. These patterns were then further analysed to see if there are differences between the participating subject centres. The qualitative data was then organized and coded according to emerging patterns and the results ranked, proportioned or directly quoted to support the quantitative findings.

After gathering data at the level of individual students, the research team used several analytical methods to analyse each case study individually followed by an overarching study across the cases (study of cases). The central purpose of analysing the qualitative data was to extract, generalise and abstract from the complexity of the data, evidence concerning e-learning activities and experiences in order to answer the main research questions.

Relevant extracts from the interviews were transcribed and used to complement and extend the survey and audio logs findings. Importantly these extracts were used to provide more in-depth information about the strategies that the students used and how the technologies influenced their approach to learning and the impact this had on their daily lives.

3.5 Theoretical framework

The broad interpretive framework for the study combined phenomenographic and ethnographic approaches, which are geared towards the description of particular cases and individual approaches in the way they use technology to support their learning. The kinds of technologies and strategies used at various stages of their (collaborative or individual) assignment were identified together with the students' experiences and desires for future e-learning activities.

4. Case study narratives

This section attempts to capture the heart of the learner voices illustrated through the in-depth case studies. The case studies draw on the data from the 85 audio log diaries left by the students and the 14 semi-structured interviews. In this section eight of the case studies are discussed in detail to illustrate the variety of learner perspectives, to draw out the 'learner voices' and to try and get a clearer understanding of their use of technologies holistically, over time and to support all aspects of their lives and learning. Additional data on all fourteen of the case studies is provided in Appendices D (summary of the audio logs) and F (summary of the 14 interviews). The section concludes by drawing out and summarising key commonalities and differences that emerged from across the case studies.

4.1 Learner voices

Each of the eight learner voices described here draws on the data from the interviews and the relevant audio logs. Each voice is presented as a summary which attempts to capture that student's story and in particular their own unique perceptions of and experiences with technologies. The eight examples are drawn from across the four subject centres and help to

draw out the use of these technologies within these subject disciplines. The eight learner voices chosen are listed below; along with their subject discipline.

- Learner one – Fabio (Economics)
- Learner two – Samir (Economics)
- Learner three - Annmarie (Medicine)
- Learner four – Gary (Medicine)
- Learner five - Jack (Computer Science)
- Learner six – Finbar (Computer Science)
- Learner seven - Dzel (Languages)
- Learner eight – Peizhi (Languages)

4.1.1 Learner one – Fabio (Economics)

Interviewee	Fabio
Date of interview	10 th May 2006
Subject, year	Economics, 1 st Year
Age	Not available
Interview length	22.17 minutes
Technologies used	Computers (home, university), internet, web CT, Excel (data manipulation), Word (processing), PowerPoint (presentations), Google and Wikipedia (research)
Context	Fabio is a Portuguese student. He has lives in London and has been in the UK for five years. Did his A-levels in Portugal. Works during the day for Apple doing the inventory and audits online for the different stores. Had not carried out the LXP questionnaire, when interviewed and did not drop audio messages. Described himself as an individual learner and that he doesn't have much time to socialise as he works. Finds technologies efficient in allowing him to work and study. Discusses the strategies he uses to critique information he finds on the net and how he validates information from different sources.

Fabio

Fabio is in his first year of university, studying economics. In discussing his approach to using e-learning tools, he specifically noted his use of the internet as a research tool and web CT as a means of accessing lecture notes, mock tests and related reference material. He also discussed how he uses the university's online web pages to access information about himself,

such as his grades.

Fabio mainly attends afternoon lectures, working in the morning or at other times during the day. In terms of using tools such as email, MSN or the discussion forum available in web CT to communicate with other students, he said that his job limits the time he has to communicate with other course members. Consequently due to his personal circumstances Fabio is best considered as an independent learner. This is not to say that he ruled out the need to discuss work with others but that he currently does not have the time to do so. Fabio felt that he had all the e-learning resources necessary to carry out his work but recognised that his needs might change as he continues into his second and third year. But for the moment he finds that having a home computer (with functions such as the dictionary), access to the internet and a set of basic data manipulation (Excel) and presentation tools (Word, PowerPoint) was all he needed for his current studies.

Fabio mainly used the internet for research, using Google to search for information and publications to support assignments. He was currently using it to gather data for an essay he was writing on gross domestic product (GDP) for his macroeconomics module. For his module in finance, he also used Google to search for the definitions of specific words. He specifically mentioned Wikipedia as one of the sites that regularly came up in his searches. Although he considered Wikipedia as a useful starting point, he did not consider the information within it to be the most appropriate or useful to use in essays. He also referred to the website of another economics school, which had useful information about finance and an American economics journal site, for academic publications. He did not remember the names of either site, noting that once the course work was finished he often forgot such details.

He appears to access sites using a mixed strategy – combining sites recommended by his tutor (although he couldn't always remember specifically which had been recommended by the tutor) with those found as a result of his own searches.

...mmm, those sites, I find the internet, to find, mmm, a place, where you can get aware, to get a variety of opinions and compare, I compare those opinions with the ones that are on the recommended books by our teachers....

He combined the outcomes of internet searches with information from recommended text books, suggesting that he uses the latter as an authoritative benchmark

...I use the publications of the sites and compare them with the recommended books, if they are the same, I'm definitely going to use the material

He didn't feel however that the course provided explicit support for developing internet searching and evaluation techniques, suggesting also that there was a mismatch between student and tutor skills, with the latter being unaware of the extent to which students were using the internet to support their studies.

... I think, I, I use, I don't get a lot of support to use that, like I don't think most teachers would appreciate that we get everything from the internet coz there is a lot that is not correct and they maybe afraid that some, who are maybe using not good materials

He appeared to be aware of the importance of evaluation skills and careful choice of resources

so you have to know what to exactly select from the internet but, like in a way I said there is a variety of opinions and I just go to pick what's necessary

From the above we can see that Fabio has developed critical searching skills, which show that he does not take information directly from the web without cross referencing it to other validated material. It is interesting to note how he specifically cross references online material, with traditional text books recommended on this course. This indicates that, for Fabio, textbooks are still the most reliable form of information. Additionally he also notes how the university does not provide specific training on using the internet as a research tool and that some tutors may not realise how widespread it is used for learning. He even suggests that some tutors may be 'afraid' of recommending the internet because they know that not all the material available is correct. Interestingly it seems that the macroeconomics tutor was the only one to specifically recommend websites, indicating that this tutor was more open to such research practices and aware that the students use the internet for their work.

Again referring to macroeconomics, Fabio discussed how the lecturer used WebCT to support his teaching and learning. Most of the lecture notes and seminar notes were made available in WebCT, along with questionnaires and subject tests. Fabio considered WebCT to be a really useful tool as it allowed 'everyone access' to the course material, even if someone had missed a lecture. In the current semester, the macroeconomics teacher was the only lecturer out of the four modules Fabio was studying to use WebCT. Discussing the reasons for this, Fabio noted that it might be because the other modules were Maths based and therefore not so easily disseminated via WebCT. Fabio considered that more predominantly text- and research-based work, such as macroeconomics, might be more suited to WebCT than those such as Maths and Science, which required specialised annotation, although he does think that it should have been possible to put Math examples and tests on the server.

Overall Fabio, considered WebCT to be a very useful and practical tool that was easy to use. He has only started to use it since coming to university and finds it an interesting tool, which he will continue to use throughout his studies. The only negative side, he felt was that sometimes the tutors took a bit too long to put the lecture notes up. He also noted that even though there was a discussion forum on the WebCT, it was not used by the students.

When asked to summarise his experiences of using e-learning tools, Fabio felt that technologies were changing the relationship between students and their university. He suggested that the relationship was now 'technologically driven', i.e. that modern students now have no excuse not to know what is happening on their course, as, in most cases, all the information needed for the course will be available online. In this respect technology has shifted the responsibility away from the institution and placed it in the hands of the learner.

... I think the relationship between students and the university itself, is becoming very ...technological ... most services are provided online, and that saves a lot of time, meaning you don't need to come to university, which is travelling time and you don't need to queue. You can, there is a lot of information about yourself, you can find out, because even your

grades, you can just go online and they'll be posted there for you and ...in fact in saving time and because, the saving time ... its been much easier to interact with the university, you don't have any excuse, like no time too, maybe you have an excuse not having the internet available but ...I think in the future it will be even more...ahhmmm... that way and I'm finding it to be quite useful

This demonstrates how online university services, such as student profiling ensures that students have immediate access to their personal information. While facilities such as WebCT mean that students do not necessarily have to attend lectures in order to receive information. The effect this has is that students who are not living near the university or who have jobs or other commitments (as many of them do) can access learning material without having to travel to the university. For some students this is an invaluable resource. However such technologically mediated learning relationship may not suit everyone. We also have to question whether such relationships are always the most conducive and supportive and what kinds of learning experience they end up delivering.

4.1.2 Learner two – Samir (Economics)

Interviewee	Samir
Date of Interview	10 th May 2006
Subject, year	Economics, 1 st year
Interview length	Interview not properly recorded
Technologies used	Has his own computer and lap top, internet (for research), WebCT (lecture notes but not all are online), Mobile phone and text (with family and friends), MSN (with friends and to talk with other classmates when working on assessments).
Context	Samir considered himself as a bit of a computer 'buff'. He fixes PC computers in his spare time and for work, consequently he is technically competent and not afraid to use new technologies. Also considers himself as a bit of a knowledge source on how to access information for his course, noting that other students come to him to ask for references etc. So he is in active communication with other students on the course, or within his group. It was clear from how he talked about himself that he is a social guy and likes to learn along with others.

Samir

Samir was really late for the interview, which nearly got cancelled. Unfortunately although he gave a good interview the recording did not come out on the minidisk. The following summary is taken from the researcher notes.

Samir used the internet extensively to help him understand economic terms and concepts. He found that terms in the textbooks were not always clear and that the internet provided

clearer examples, which he could compare with other sites so as to get a better understanding of the key concepts.

Specific site he mentioned searching through for defining terms and concepts were Investopedia (<http://www.investopedia.com/>) and Wikipedia (http://en.wikipedia.org/wiki/Main_Page). He also referred to specific economic sites such as globalinvestor.com (<http://www.globeinvestor.com/static/hubs/quotes.html>) for general updates in the field and sites such as Moss Bros PLC company site that he used as a case business example.

Examples of software Samir mentioned using for his course work include the statistical package SPSS and the Wincon software for economics, business and maths (<http://www.winecon.com/>).

Samir was also an avid user of MSN and email, which he used to share course material and essay plans. Swapping exercises with other students helped him to learn how to better structure his work and in reading other peoples' assignments he could see where he was going right and wrong. He had a close group of friends on his course that kept in touch via MSN, email and text messaging when they were working on assignments. He also used email and his mobile phone to generally keep in touch with friends and arrange his social life.

Samir used WebCT to get the basic course work (lecture notes, seminar notes, learning aids, module booklet etc) information but didn't find it so useful, particularly because not many other people seemed to be using it. Also the discussion forum was hardly ever used and even when the teachers were supposed to be there at certain times to discuss work, they were not. Consequently he did not find this aspect of WebCT very useful or inspiring.

When asked how he would like to see e-learning tools improved, he mentioned that he would like to have more e-text books or a service where students could download bits of information or lectures onto their iPods.

Samir was a very confident and social learner. He considered himself quite techno literate and builds PC as a hobby for extra money. Given his technological confidence he finds that other students ask for his advice when using computers or different pieces of software. He is happy to share his knowledge and also considers himself 'brainy' because other students ask his advice on various course matters.

4.1.3 Learner three– Annmarie (Medicine)

Interviewee	Annmarie
Date of Interview	7 th June 2006
Subject, year	Medicine, 4 th year

Age	23 years
Interview length	45.45
Technologies used	Computer , laptop (own); PC (at boyfriends); PC (at hospitals, and university); email; Open Office on her laptop; Microsoft Office elsewhere; Excel; PowerPoint; ePortfolio; Whiteboards; Mobile phone (friends and family only)
Context	Annmaire had a home computer for A-level and learnt to use PowerPoint at University in third year, while making online teaching materials for a Professor. She did not consider herself a confident computer user before university. However as you have to use computers at university, she has over the last few years has become more self-assured. Reflecting on her years at university, she discussed how before university she would not have been able to do an online search in the same way as she knows currently knows how. At A-level, for example she wouldn't have known where to look, what to access. She feels that each year at university she builds her technology skills, many of which she'll use in professional life.

Annmarie

Annmarie is her university's representative for one of the key professional organisations in her field. This requires her to email her peers and colleagues on a daily basis and she notes that she couldn't do this role without email access. In particular she makes extensive use of email and list servers within the XXX⁴ [Student's university] Veterinary and Medical Department. In all of her audio log diaries she mentions the use of email – showing how she uses it both for work purposes (setting up meetings, details about her electives, feedback and comments and keeping in touch with a friend in New Zealand) as well as contact with friends and family.

The department has set up the option for students to email different groups collectively: for example at student group, whole class, or departmental level. Annmarie discussed the advantages of this both in terms of communicating with others about work-related matters as well as the social advantages, such as using the list servers to update people about rooms available for rent, charity events and requests for donations, social nights etc. She noted that the service is predominately used by the university to send bulk communications to student cohorts and for students to inform each other about social events.

I access my email pretty much everyday... the main reason for using it everyday is because I am part of the XXX Medical students committee, which communicates mostly via email and

⁴ Note here and throughout the report XXX is used in place of real names or institutions

there is usually quite a bit on that everyday

Discussing the disadvantages of email, Annmarie said how because of the prevalent use of email, people nowadays increasingly expect immediate responses – dealing with emails a week later is considered too late and generally not acceptable. In discussing her technological ‘wish list’ she noted that when she has the money she’d like to buy a Blackberry or some other kind of software, which has a phone, word processor and internet access built into one device.

almost all our communications with the university are through email...which is almost invaluable because we’re all, well, yeah, we’re all off site so much, from 3rd year onwards, that posting, just posting things on the notice board wouldn’t work... We also have something quite useful, as a medical student, I can email any other medical student in my ... medical school, using, like a list server, kinda of and you can break it down to your year, or your group, or the whole medical school, which has been really useful this year, for my work as a rep and for advertising spare rooms in my house which a lot of people use it for.

She did not use her mobile to contact other students; instead she used her mobile mostly to communicate with friends and family, commenting that mobile phone calls and texting were too costly. Email was her main form of communication with other students; she also commented on the benefits of email for organising practical periods abroad.

It’s unlike phoning someone, if they are not in and you send the message. They can pick it up any time in the next couple of days; it’s not like missing someone... You can use it, I’ve been using it to contact friends in New Zealand, where I’ll be going for my elective on Friday, so I’ve been arranging stuff from my elective I could not have done by phone because of the time difference.

In her audio logs she refers several times to the fact that she uses technology to prepare for a presentation – using Google to find specific pieces of information, Google Image for pictures and the Open Office PowerPoint software to create presentations. She discussed in detail the relevance of PowerPoint for her studies and how useful she felt it would be in her professional practice. For example, she specifically mentioned how in her second year, during the summer months she worked with one of the university Professors using PowerPoint to create online teaching materials for biomedicine. Before coming to university she had never used PowerPoint and found this summer work to be really useful in learning the more advanced details of the software (such as adding hyperlinks; formatting text *etc*). She used this to reflect on the fact that although the university did provide some computer training for students in their first year, this training only provides students with the basics. Furthermore, she stated that there was no specific training given on PowerPoint, despite the fact that the students use it extensively (and pretty much as a requirement) in their third and fourth years.

...we didn’t get any official teaching in how to use PowerPoint it’s just assumed that because at a basic level it is quite easy to use that you can do what you need to do on it without any training

Annmarie also discussed how she helped some colleagues to make their PowerPoint presentations more advanced, by showing them the aforementioned features. She considered the university training to be sufficient but commented that it would be useful to be able to

find out about more detailed features as you started to develop and hone your skills.

In the third, and particularly the fourth year, of medical training the students use PowerPoint extensively. The LXP study coincided with when the Medicinal students carrying out their SSC (Student Selection Component). These are specialist modules, which the students elect to do. The students have to do three SSC's, which involved carrying out an excel audit on a particular hospital procedure over a period of time, an online self-assessment ePortfolio and a PowerPoint presentation on a particular medical topic (which they had to present on acetate overheads). The high percentage of PowerPoint used by the medical students recorded in the online survey (see section five) is more than likely related to the fact they were required as part of their coursework to use PowerPoint during this time.

...well its from the third year onwards we use a lot of PowerPoint, ...during third year you do case presentation quite a bit and you do that using PowerPoint and you only really need it on a basic level of slide A, B, C, D through to whatever but it's nice to know some little tricks so it's, it's useful then....

Anmarie commented that the Learning Support Environment (LSE) (i.e. the university's VLE) for the course was central to student-departmental communication. She used the LSE as an online diary, which she found really useful as it visually represented her timetable. She thought the LSE was a great resource but underused. In one of her audio logs however she did point out that it contained a lot of information and could be quite difficult to navigate. She felt that the LSE was especially useful given the nature of medical training in the third, fourth and fifth years of the course, where students are off site, (completing practical periods of work in local hospitals) or on electives (often abroad). Consequently the LSE was a central, virtual base through which students and the department kept in contact. She considered it an invaluable resource but felt that the online timetable could be used more efficiently. For example, she discussed how over the course of the semester her class (of approximately 300 students) met face to face only three times. The only detail for these meetings, which was posted over the LSE, was the time of the meeting; nothing was posted about the nature of the meeting. Additionally the information about the time and place was buried deep in the LSE, which was only accessible by clicking on several hyperlinks. She recommended that such use of the LSE could be improved by simply putting all the information on the front-page timetable.

The LSE is really, really useful, we've got an online timetable which is not used as much as it could be. They used it quite a lot for us at the beginning of fourth year but they've not used it again and we've had a couple of days when we've all been together where the information, the timetable has been posted in some back of beyond place in the LSE and you've got to go to here, and then click on here and then it's under there, whereas when you've got this online timetable on the front page of the LSE that would be brilliant if that could be used more often because it means if a lecturer phones up the day before to say I'm sorry I cannot do my lecture at one, can I fit it in at two. You check your timetable at night and 8 o'clock or 9 in the morning, when you get to Uni and it will tell you things have changed ... you click on the online timetable on the LSE....And it tells you on there ... it's just common sense that you check it at the start of each day if something did change they used to tend to email you.

Anmarie also discussed how the current technologies she is using would be relevant in her

professional life; audits and PowerPoint in particular are part and parcel of medical practice. ePortfolios, although not common yet in professional practice, she felt would become an important part of future developments in the field. In terms of other specific software that hospitals use for patient records, she noted how currently they use different patient filing systems and that it would be impossible for the university to provide coherent training on this as they are all so different. However all hospitals now produce their X-rays and images online, they are no longer available as hard copies. So all doctors have to be able to call up online records and use computers as part of their daily practice.

Although not every hospital does it, normally on the first day of their practical period, students get an introduction to the hospital computing systems. Hospital practices have changed so much in recent years that some have more advanced IT. Annmarie commented that given this pace of change, it is inevitable that students will just need to learn to cope with this and pick up the changes as they go along. She did note that in her opinion universities should put more pressure on hospitals to ensure that student doctors get internet access from their first day. She discussed how she spent the first day at a recent hospital just trying to find the IT department and arranging this basic requirement. She clearly felt strongly that internet access was essential for medical students throughout their study and that connectivity to the university whilst they were out on their practical periods was a basic requirement.

Annmarie specifically discussed how she used the web for research; searching it to find general and specific medical information.

..well I use Google almost everyday. And it actually turns up quite a bit of scientific data and if you go to limit, or do a special search or detailed search you can limit things down too, well you can take off .dot or .co.uk sites and then it tends to give you back scientific sites and I turn up quite a bit of information through that. I use that more than I've use specific paper sites, like em, journals searches, em because sometimes it even turns up those and as well as turning up journals it turns up a lecturer, the lecturer at the University of Birmingham has done a lecture on genetics and they've posted it their web for their students...Which means if I type in genetics, and I've got stuck on something you can turn up other people's lectures and that is quite common, that you can find teaching resources from all over, from America, from all over the UK universities, that are quite specific to the topic I'm looking at ...it's too much to ask one university to provide all those teaching resources. So it's a bit of an online pool...

Specific sites she used included 'GP notebooks', which she said was invaluable during the third-year practical period, she pointing out that this was a popular resource amongst her peers - nearly all the students used this resource. Other sites include 'pub.med', 'eMedicine' and 'doc.net'. She also noted that later in their careers, when people specialise it's quite common that they sign up to specific journals. She also referred to the online NICE (National Institute for Clinical Excellence) site, an independent organisation responsible for establishing guidelines for clinical practice.

and I go to what specific information there is but I normally go to Google first as I'll find background information and very often it will reference articles too and then you can find the article using pub.med or medline ... but I think pub.med comes up on Google anyway...I use Wikipedia when it comes up on a Google search and eMedicine as well, is a

useful site...it consists of, it's usually kind of text book chapters, that are online and free access and I usually get reminded about it when it crops up on a Google search I'll go oh yes, eMedicine...that's a good site and I'll go search that specifically...

Other software she uses includes Excel, which she used during her SSC. She used this to create histograms, which she then transferred to Word to create an A1 science poster. She found Excel really useful for this and although she knew you could do the poster in PowerPoint, she didn't know how to and hence decided to stick to producing the artefact in a way that she was familiar and comfortable with. She thought that having somewhere you could learn more advanced skills on how to use different technologies for learning and research on a 'just in time' basis, would be useful. She also mentioned using CD ROMs in previous years and simulations as part of her anatomy course in the second year. However she noted that as you developed your skills in your clinical years you move from simulations to real people so students tended to need these technological resources less over time.

Summarising her use of technology and its influence on learning, She noted that technology is not just a peripheral part of her learning, it is central to it. Over the last four years her skills in using different software and hardware has improved considerably, most notably she has learnt how to use PowerPoint and use the web more effectively as a research tool.

Other technologies she referred too were whiteboards, which had been used as part of the course in the previous semester (before Christmas, 2005). Annmarie stated that Whiteboard's were used for collaborative group tasks; each week study groups received a different patient case. All the material related to this case (pictures, images, test results, patient information) were made available online and accessible using a group password. Each study group worked on the cases, collaboratively diagnosing the patient using the whiteboard. This was done in one of the medical school buildings, where there was a whiteboard in every room.

.....we'd have a case each week, a certain, a patient's case, with a certain illness or disease, em, and then generally on a Tuesday, the case would be released online, which we could access using our groups password and it had kind of pictures on it, images, test results, so we'd have all the information about the patient, and we'd use the XXX [names a building] and the electronic interactive whiteboards in there, to kind of go through the case, and use all the information that was available, because, you could click on this-that-and-the other to get test results and images.

This highlights the benefits of the whiteboard for Annmarie, such as saving information, and updating records, plus the ability to collaboratively and visually share and discuss data around a large board. Although she did note some initial problems with the interface.

it tended to work, em, it was reasonably instinctive but it took 12 of us about 5 or 10 minutes to work out how to use new things.

She also mentions some advantages of the tool for collaborative work in comparison with the traditional whiteboard:

but they [whiteboards] were really, really useful for working in a group, em, they made a lot more sense than having a normal white board, where you have to scrub stuff off or flip charts...and that you could write stuff, save it and come back to it because it linked to the

computer as well and you could pull up, information that was online, say images, x-rays and rather than, 12 of you having to cluster around one computer screen, you could have a 4-foot x 4-foot X-ray on the wall... and we'd say so-and-so is going to do that question or this learning point, or ... two days later, we'd have our next session and all feedback and there were questions we'd have to answer, em, the way to monitor whether the group were working or not was to answer the questions and you'd at least attempt to answer them right and tick the boxes.

Later in the interview she also discussed how the outcomes of their diagnosis were completed online, along with questions about how they had as a group, worked together etc. The answers to which they received immediately. However this immediacy, lead to copying, so the department decided not to give the answer until about three days later. Annmaire discusses how although this might have curbed cheating it was not very useful, as you could not monitor your own progress or know if you were on the right track with the diagnosis

Annmaire also described her use of the e-portfolio for her study of acute paediatrics (also a SSC). She outlined how the portfolio was built over time and how it related to her learning objectives:

...you start off with setting your learning objectives, you just have an online table and you'd fill in each of the boxes, with what you wanted to achieve and how you were going to achieve it and your achievement would be monitored and you could edit it and update it, during the first three weeks of the course, you could go in and change anything you wanted or add anything, it was quite flexible...at least that was on the LSE that had to be submitted three weeks in and it was finalised then, em and in the final three weeks, you had to then record whether you felt you'd achieved your learning outcomes in a very similar manner kinda just in a table that you could edit and add too, take away from, right up until you submitted it. You submitted it electronically but you also need to hand in a paper copy at the office...

Interesting Annmarie used an open source suite of office tools, although she did use standard commercial packages (such as Excel and PowerPoint) for other purposes. She was one of two medical students who used open source software. Although this is a small number it is was interesting and hints had a potential future trend in the use of open source software. She used 'Open Office', a free software developed by Sun Systems. Her reasons for using were primarily that it was free and therefore cost effective.

4.1.4 Learner four – Gary (Medicine)

Interviewee 5n	Gary
Date of interview	7 th June 2006
Subject, year	Medicine, 4 th year

Age	21 years
Interview length	35.56
Technologies used	Word (essay and presentation notes); internet (research); PowerPoint (presentations, posters); Email (communication); HISS data base (hospital database)
Context	Gary studied Maths and 3 Sciences at A-level. He never used any technology for learning during his A-levels, and although he did have a home computer he did not use it for learning and used to hand write everything. It was not till University that he started to use technology everyday and in particular for learning, as a result he has had to teach himself quite a few things. He spoke about how there is a lack of software training at university and that with very basic training you are expected to do quite sophisticated tasks. This means that some students' work can look better than others because they know how to use the software better. Despite this Gary considered himself to be quite techno literate and discussed the pros and cons of different software.

Gary

During the interview Gary discussed how he used Word and PowerPoint to create posters and supplements. He also discussed how he used the internet for research, using specific sites such as mBase and medline, as well as relevant e-journal databases to search for articles. He used search engines like Google to find general patient information and policy documents. Gary also discussed the issues of validating web-based information and how he prefers to use sources, which are peer reviewed by professionals in the field. In previous years he had also used CD Roms, which he found really good for understanding antimony and psychiatry. He spoke of the transformational aspects of how technologies have changed his approach to learning and how he will continue to use certain tools within his professional career.

Gary systematically discussed the different components of his SSC (Student Selection Component). The following summary discusses each of the three SSCs he chose to study, plus the details of how he went about this and the technologies he used.

The reason he chose to elect SSCs in multiple sclerosis, radiology and rheumatology was because they were areas of medicine he liked and would like to go into, so the choices were directly related to how he envisaged his career developing. He also wanted to explore these areas before he made any final choices about the direction he wanted to go in.

He described in detail the way in which he used PowerPoint and Word to create a presentation of multiple sclerosis.

The first thing I used was the internet, where to find information. So I'd look things up on the internet and then used Word to make notes on it, coz I find that a lot easier than writing it down, if I can just write it down coz then you can just edit and chop it and change it without having to redo it all again. And then from there, it was a case of put, turning that into a presentation. I design my presentations in PowerPoint as it's pretty easy to use. So I put it on PowerPoint, design the presentation, and then, and then used word to make handouts for it as well and then emailed these to em, thee, to someone in the office who printed out the handouts for me so I could hand them around at the group session, while I presented to the group off the PowerPoint.

For his PBL (Problem Based Learning) SSC component, he focused on researching and creating a presentation on multiple sclerosis. Gary discussed how he used the internet to search for the relevant literature on multiple sclerosis, used Word to write notes and chop and change text and then designed the presentation and handouts using PowerPoint and Word.

For the radiology elective he had to do an audit. A typical medical audit is a set of protocols or standards, which should be followed by the hospital when caring for the patients. Gary's task was to examine the care given to lumbar spine patients. Checking their radiograph requests he was focused on whether they were requested for the right reasons or not. This information was retrieved via the HISS (Hospital Information System for Students) system, at XXX hospital where he was based for his practical. Through HISS he could access the patient's history. The outcome of the audit was turned into a scientific poster, designed in Word, and presented to his peers. Carrying out audits will be part of his ongoing professional medical career as part of his own self-assessment and that of other doctors.

That is the reason why we are doing one now (ie the audit), because we will have to perform audits in the future to audit our own work and also the work of whether, what specialism he ends up in. So that will be an ongoing thing

For his rheumatology SSC Gary had to give a presentation on an interesting topic. Again, his involved researching papers, from which he created a supplement using Word, on in-patient notes, which summarised patient care. This was then printed out and submitted as part of his course material. The following extract shows how this student project got picked up by professional doctors and may be subsequently used within their practice.

Yes, well, em, this form (ie the rheumatology supplement), I gave to my supervisor and now she's informed me that, the paediatricians in XXX were having a little look at it, to see whether they could take it on and use it in their practice or not. it is a job that has needed doing for a long, long time and nobody has done it. So I came in, wanting specifically to look at transitional care and adult health care in rheumatology and had the time and

enthusiasm to go ahead and make something like this as it hasn't really been done before.

Discussing the benefits of using technology, Gary noted that they were efficient and time saving tools, which allowed him to integrate different types of media easily. The following quotes demonstrate his perspective on this.

I found that the technology, which I choose to use, I use them because I find them easy to use and they also, they save me a lot of time rather than doing everything in paper. And because they save me time, I can spend more time doing the research and getting everything ready because I know when I put the whole thing together it will come together quite smoothly -It's good I can pull together different things from different sources...I can write notes and when I want to make a presentation I can modify the notes a little bit and take them straight a cross so there are kind of xxx (missing word) with it each other really.

In terms of using technology for research purposes and in particular use of databases, Gary specifically noted using medline and mBase, which he used to look up journals. Once he found what he was looking for he would go to eJournals (the library electronic journals), which he could access via the library and print out the relevant article. The following extract also shows how he uses search engines to seek out general patient information and support groups and how he uses online e-text book for references. Gary also searched the NICE website for policy documents via Google. He is a bit 'wary' of Wikipedia but does use it. However he prefers to use source material that has been peer reviewed and validated by professionals in the field. The following quote describes how he uses search engines for general and specific information.

...it's just the usual search engines such as Google and things like that for, I tend to use them for more kinda patient based information really. Like when I am looking for a patient information leaflet so I can see what is given out to them and things like that Or specific patients support groups I'm looking for then I'll go through that. Also there are a few like trusty sites I know of like GP notebooks, Prodigy guidance and things like that, which are very good, are em Kumar and Clarke the big medical text book they have got an online version of that as well

Gary also discussed the authorship and accreditation of web based information, he privileges certain information sources over others, discussing how peer reviewed journal offer security that the knowledge contained in them has been credited by others.

Like if I was to go to a journal article I know that what I am reading has been looked over by a lot of other medical professionals and ok-ed that is all been fact and that they have not omitted any fact or tried to put certain slants of it or anything like that, well they all do to a certain degree but not as much as some information which you find on the internet which can be mostly opinion based so it is nice to have that security, that someone high up in the profession has looked at it and read it so its proper information I am learning

Despite receiving little training for the university in how to critically review online material, Gary discusses how you can 'pick' this skill up. Cross referencing online material is obviously an important part of this process and one that all students, across all the subject centres practiced.

Well, we got a little bit of teaching on how to critically phrase things but you kind of pick it up as you go along like, you're looking through Google and you got two sites that contradict each other, you're like hang on, I've got to check this through and also if you go to a journal

article and if they say one thing. And if a site supports what it says then you can probably take that more like it would be true, but if it disagrees with what it says. You've got to look at why it disagrees and whether it says reasons or change of view. So it is just kind of looking at everything and trying to find the evidence base for it.

Gary also discussed the advantages and disadvantages of technology. In discussing the downsides he noted they could make things too easy. For example, he can easily browse for very specific bits of information, without knowing anything about how it relates to other concepts, which he believed can narrow your viewpoint. He discussed how when reading a book, you have to read the whole thing and therefore this makes you understanding the concepts better. Technologies can sometimes in Gary's opinion reduce your 'total learning experience'.

Discussing other disadvantages of technology, Gary also noted how it can lead to cheating. For example, he discussed how some students were involved in the practice of forging confirmation letters for their electives. This arose from the situation where some students were applying to study in developing countries, which had little administration and back up support. Consequently the students were unable to obtain a letter of support from the hospital to say that the students come and work for them. As a result students forged confirmation letters and emailed them to the department.

The problem with email is you cannot really certify, in a way, like I don't, I don't (stumbling) I don't know whether I should really say this. I know, I know that some people, when arranging their electives they em, instead of getting an elective confirmation letter they emailed themselves with an electric confirmation letter and handed that into the medical school.

He was also critical of PowerPoint, feeling that the course did not really provide adequate support for the students on how to fully utilise it.

The problem with PowerPoint is that we don't really get enough training on it, really I think, the medical school, we're told to make PowerPoint slides but you're not really given much, much training about what you can do with it so then you get a situation, with two students, both giving both the same sort of presentation, one of them knows a lot about PowerPoint and how to really manipulate it and how to really get their messages across using it and other people who don't really know much about it and it kind of really puts a good light on one student and not the other because we've different levels of training in it, coz it is what you pick up when you go along so its got the potential to kind of make yourself, your presentation look better or worse although it has not much to do with the content.

Gary also discussed the concept of the 'Google School of Medicine', where students just come together and google the necessary content and search words to complete their assignments. This was how he completed one of his modules on group work, where the students were meant to collectively diagnose a case patient. What actually happened was that students came together on the day and would specifically use Google to find the answers. The assistement was completed this way because meeting face-to-face and searching the net was easier than pinging emails back and forth to each other.

Discussing the advantages of technology, Gary noted that he will continue to use all the technologies he currently uses in his professional context. He has had a laptop since A-level

and has always seen it as a 'necessity'. He also has broadband at home, which means he can easily work on evaluations and assignments without having to come into the university. He doesn't use MSN or blogs as he doesn't have the time. However he will start to use MSN to keep in touch with family and friends when he goes on his elective to New Zealand, as it'll be cheaper than making phone calls.

Gary would consider himself as quite techno literate however he also notes that medical students tend to be a 'bit old school' and because of that are not the most technological savvy students, providing the example that some students don't even know how to take an USB memory sticks out properly.

Medical students as a group generally are not the greatest user of technology, we're still, we can be quite old school in that sense

He also thought that the university should provide better and more specific training on different software. For example, students were meant to use PowerPoint in quite a detailed way but only basic training was given on some software and at the wrong times (e.g., too early in the year etc). For example, he received no training in Excel and learnt how to use it for his audits from his friend, which he found really useful as it allowed him to manage the data in quite a sophisticated way.

.....there is a definite gap between what we need and what we are given, where we have to find out how to use the technology for ourselves, which is for most of us a case of trial and error

I'd like to have had more specific sessions, like this is how you do these things, for the future'(referring to the need for more specific software training)

Gary also thought that the university should continue providing practice exams and questions in the 3rd and 4th year. This practice was dropped after 2nd year, which Gary did not think was a good idea.

Reflecting on how technology has changed his approach to learning, Gary made the following insightful comments.

Well I think, as I have started to use technology more I've come to rely on it more, like now that I have got more easy access to information and much more efficient ways of manipulating it, and I don't think I could really go back to doing it all by hand again. And you just come to rely on it a lot more, like for my next year or my fifth year, I am planning to write all of them on the computer. And just saving them, instead of just having files and files of work.. So I think it is just so much easier to reference where everything is and just click on it as opposed to look through pages and pages And also during A-level you are learning quite a broad base, on the surface, so it is very easy to go looking through quite a thin text book for what you need. In medicine where you are looking for a very specific point in amongst many and to go and find the information in a big old three volume text book. Is really quite hard work and it is, is a lot more efficient if you can just go on to the internet, go on to your database find 5-6 references come straight up with useful information and you can just go through them and find exactly what you need, so it's far better for just finding the specific points.

He also demonstrated how he planned to incorporate technologies into his work pattern and learning in the near future.

... when I qualify after my fifth year I'm planning on getting a Palmtop, coz I know one of my friends has got one and he's got all his medical text books loaded on to the Palmtop, while you're on the ward and you need some information you just pop it up and read it. And I think that is going to be one of the single most useful things for me when I get into medical practice just to have all that information there ready for me to access'

4.1.5 Learner five – Jack (Computer Science)

Interviewee	Jack
Date of Interview	24 th May 2006
Subjects taken, year	Computing Science , Electronics, Computing Systems and Data Network Communications, 3 rd year
Age	20 years
Interview length	43.27
Technologies used	Mobile phone, laptop and home computer, projector, internet, specific sites mentioned included Google, Wikipedia, ZD.net and howstuffworks.com, WebCT, email, MSN, blogs, WebCT and lectures personal home pages
Context	Had a home desktop computer, projector and laptop, which he bought in his second year. Reckoned that half of the class (15 in total) had laptops. Discussed the social aspects of learning and how face-to-face interaction is still important for learning, even in the digital age.

Jack

One prevalent feature from Jack's interview was the way in which he highlighted how computers were useful in supporting his particular learning style. This was evident both through the examples he gave in his interview and throughout his numerous audio log diaries – he is very much a social and interactive learner who feels strongly that he has benefited from the communicative and interactive affordances new technologies offer him.

One of the main advantages that Jack found with using technology was that it enabled him to interact material in a mode that was suitable towards his style of learning. For example in one audio log he describes how he uses a projector to revise – annotating lecturer's notes and materials with additional information from the internet, preferring being able to look up at the projector screen and be able to interact with the material rather than down at a static book pages. He also notes how he finds it difficult to read text from books finding it easier to engage with material online, via interactive, colourful websites. The following extracts illustrate these points.

Well, I think, for me personally, I've never really been a good reader, You know, I couldn't sit down with a text book, you know and just go through it, it would, I couldn't, I really couldn't. I couldn't do it. I cannot just read blank, black text, it like really gets to me but I find, if it's on the computer I can do it. It's just always been one of those things for me, I reckon. If I have a computer in front of me, I always can look at it more interestingly than when reading stuff. If a, if your one, a website and it's interactive like you know, you see colours and all that, it stimulates you a bit more to actually read it. And it's I think, when you read something like a text book, you have to read a whole bunch of it, a whole ton of stuff, before you get the point. Ah, while a lot of the information I find on the computer, will be summarised a lot more. And, when people are writing books, they try to fill them up a bit but on the internet it is summarised, people try to keep it short, especially on the likes of Wikipedia or whatever. And other sites which I'd use a lot is, 'how it works'.com, I think or 'how it is made', I cannot remember which one it is.

Jack is a good example of a student who very much adopted a social approach to learning – he uses technologies frequently to communicate with fellow students – to check details and deadlines, to get information or missed materials. He uses a variety of media to do this – text messages, MSN chat and email and is aware of the different characteristics of each – for example he feels that sending a text message is less intrusive than ringing someone – particularly if you don't know them very well. He provides a wonderful example of 'just-in-time access' through peer communication when he describes in one audio log how he uses his mobile phone to get a cover sheet for an assignment which was due in as he had been unable to get the information from the web site.

However, Jack also emphasised the importance of having face-to-face contact with his classmates and how this instils a sense of community and belonging. He discussed how this was reinforced through MSN and mobile phone contact, particularly during projects as it enabled students to keep in touch, allowing them to check and update each others progress. At the time of the data collection, one of the main projects that the computer science students at Magee had to carry out was an essay. Essays were submit electronically and on paper. Jack discussed how the electronic copy was partially required because his lecturer used software to detect for plagiarism, which to his mind was necessary as it ensured equity and fairness.

Jack's experience of writing the essay is also a particularly good example of how students support each others' skill development by, for example, reading each others' essays to get a better understanding of essay writing skills and how to structure an argument. For example, for Jack, essay writing was not his strong point. He pointed out that he had chosen science and math-based subjects, which required less essay writing skills than Arts or Humanities subjects. In preparation for the essay writing, the tutors provided a list of topics to choose from, along with hyperlinks summarising the essay requirements and literature, and some tips on how to write an essay. Students also read each other's essays, which provided those without essay writing skills with an important starting point. Jack also spoke of the comradeship and support while jointly writing essays with classmates in the university's computer suite. Although he had a home desktop computer and projector and a laptop, he found it easier to focus 'his mind' on essay writing, in collaborative spaces, such as the computer suite with other classmates.

.....when you're doing projects in school (referring to university), you always kinda like to

know what other people are doing, uh, it gives ya like a kinda, I suppose it gives ya a, a hand like you know. Ah how other people are approaching things what kinda things they're covering, so although we haven't done that many projects, I suppose the essay would be the main thing we done this year ... I've haven't really written many essays, in the past, never done English, or any kind of writing subjects, it was all Sciency subjects and Maths and all for me. So I was really poor at writing essays. And XXX, one of my friends, he was a, like he done A-level English and that, so he's pretty good at writing essays. So I took, I had a read over what he had written, and like, and kinda gave me an idea of what to do, you know. Although we weren't doing the same topic or like, but just the way he was writing it and the way he was structuring it, coz when you're doing an essay there is obviously a certain structure you follow, and I didn't really know about that. So that gave me a kinda insight to all that and helped me writing the essay, I guess which helped me get a decent kinda mark on it, anyway.

In relation using the internet, Jack felt that one of the main disadvantages of the web was that it contains too much information. He regularly searches the web for material and uses the Google search engine for researching material and finding out about new developments in computing, as well as the tutors links and Wikipedia. He refines his searches by making sure he has as much detail as possible in the search string and also takes steps to ensure that the information he finds is reliable. For him reliable sources are considered as those that have the ac.uk domain name.

..... I try to type in a string of words that probably covers it more you know instead of trying to type in a, 'computer', you know, I type in a detail thing, you know, like 'computer network, type robot network', you know you type in a really detailed string, you might get a more relevant result but still there is a lot of information you filter through and that's probably the only bad thing about it at the moment, because you might not know if it's a reliable source you're looking at or if it's a proper one you could be reading something someone typed out themselves, like out of their own head without having, you know, any experience in it, or you can look at where it comes from, if it's in an encyclopaedia, or something, it should be ok. Where if it's on a, you know, on a university, if it's got the .ac button in its name, it's ok you're probably on the right track. Eh but if it's just on Geocities, you know or something it might not be the right kind of thing you're lookin' for.

He discusses the merits of Wikipedia (which he only discovered earlier this year), which he considers as a good reference for general descriptions and definitions because it is peer written, although he is unclear of the mechanism used to enter and edit entries.

and I find it very good, it's a, if your looking for a kinda definition or a really strong kind of summary of what something is, I would go on to that so, 'eye, so I would use Google definitions and all that I do, I would trust it

For Computer Science students at Magee it was common practice for all lectures to put their notes online This appeared be delivered via either a WebCT environment or the lecturers own personal university pages. Jack describes in some detail in one audio log how one lecturer provided extensive support for the course via his own website which he used extensively. This includes course materials as well as small interactive HTML-based tests. Jack discussed how one course module (Entrepreneurship) was completely delivered through WebCT, in his first year (lecture notes, slides, final tests, results). The WebCT

also included practice tests, where students could click on the link and answer questions, which provided immediate feedback on whether they were right or wrong. Jack discussed using the practice tests as part of his revision process, going over the tests, redoing them etc. He also discussed how all his Maths exam's were done via the web, which for that particular module made up 25% of the mark.

It is clear from this interview that XXX have a comprehensive online structure, which was actively used by lecturers, university administration and students. However the following sequence demonstrates Jack critique of the online learning experience and how as a student he finds it important to have a mixed, blended approach with both online and offline components.

If you start, I think to do everything online, I think it will start creating problems. ... There was classes we had that were completely online module but I never went to them, I don't think anyone went to them ... basically because you had everything online there was no real need to go into the class at all... ..but I think there should be, you know, lectures so you do come into university, since you're paying to come to university, to be taught by a you know a doctor or whatever, there, if you start to do everything online, it, it wouldn't just be worth it... you start to lose your contact with people and you don't know what your doin, kinda with a module that has a bit of online exams, or course material or whatever it is, and along with the physical lectures I think that's a good idea, it uses computers for you know how handy there and it's good way of, ah well them weekly tests, it's a good way of building your confidence so that you could, do this, do the stuff ...and you got do it, and you knew you were doin' well. It kept you, you know, in sync with, with what you were doing like. But where it's totally online you haven't really got a final goal at the end of it, it's just the online test and then it doesn't seem, you know, kinda real or that

He also relates this to value for money; you pay to go to university to be taught by doctors, to have direct contact with them. He also discusses how such contact with tutors and peers, helps to keep you on track, otherwise 'you don't know what your doing'. For example, at a later point in the interview he discussed how last year, they had an Electronics module, which was practical and you had to come in and write the notes down. Everyone was at the class and he discussed how this face-to-face meeting, created a sense of community of what he called 'belonging to the class'. They even began to play football together and had the 'craic' (Irish for fun). For Jack this sense of community and teambuilding was necessary and obviously very important to him. He reiterated this many times during the interview (in relation to online learning, using mobile phone etc), noting how you are more comfortable in your place (ie in our environment), when you knew everyone and that this is not always possible if everything was delivered online.

Jack also found that in online contexts it can be easier to get distracted and that he personally found that he still had to come into the university to concentrate on doing the work, even when it was online. This is not to say that he didn't appreciate the online benefits of distance learning and how they best utilised the networking and processing power of computers.

It basically opens up a whole world of learning for everybody, you know. You can find up, read up, on anything you like. In a university context, you can have all your notes and everything all on one machine. So anytime you have to look for something, you don't have to flick through a big file, or you can type, search your computer for what you're

looking for. Look through a PowerPoint presentation like, it's pretty easy. I used, I'd to sit, you know, if, if I had spare time, I'd put one of the lectures presentations on, just flick through it and make some quick notes, especially when you're revising, that's that way I'd have done it. Make notes on, on what was done, he had a lot of slides on his page, 46, but a lot of them would have been overlapping so it would kinda really reinforce the points he was tryin' to make so by the time you'd have read them, like you know, you'd have covered pretty much everything you'd need to know for the exam and, so you don't need them, they still do you know give you recommended books, for you to take out and all. But for the minute, maybe in final year but not this year, or this first year you would not have to read up anything, everything you need is usually online.

He also discussed how the weekly online test gave him confidence and reassured him that he was doing well. Yet at the same time, he discussed how traditional paper and pen tests, were more 'real' and that there was a greater sense of closure, of reaching your 'goal', when you completed them, in comparison to online tests.

Jack noted that in one semester last year they used simulations to test circuits before they built them. He found this lesson reinforced how different the simulation can be from the physical components, even when you build it exactly as the simulation dictates. Last year they also learnt how to write in Java and C and again used these programmes to test circuit boards etc. During this year, the students also used blogs. Writing the blog was the end goal of one of their modules, where they had to review a particular technology and their understanding of it. Despite not liking to write, Jack found the blog much easier to do and got joint highest mark for his entry. He found the blog a really interesting way to communicate ideas and was easy to use in that you did not have to write html. However he also found that some people 'rambled' on in their blogs. He preferred blogs that were about something rather than the personal details of someone's life.

In sum Jack was very much a social and interactive learner, keeping in touch with other students, friends, networks and course tutors via MSN, email and blogs. Although citing many of the advantages of technology he also stressed the importance of variety and mixed learning environments, which maximised the power of technological infrastructures without replacing the need for face-to-face communication.

4.1.6 Learner six - Finbar (Computer Science)

Interviewee 2	Finbar
Subject, year	Computing Science, Electronics, Computing Systems and Data Network Communications, 2 nd year
Age	20 years
Interview length	43.01 minutes

<p>Technologies used</p>	<p>Internet, specific sites mentioned included Google; Wikipedia; cooperate sites e.g., CISCO, Intel. eBlogger used to create the blog he wrote for his course. Has also used Microsoft Blog tools to leave comments on other people's blogs. Programming languages, Java, which he learnt as part of the course. Also used networking tools (e.g., ping) to build networks. Email - used predominantly to communicate with other students and lectures. Mobile phone and text used to communicate with other students, spoke at length about using webtext (specific to the o2 network), which is free to send text messages through the web. Home computer and laptop, recently (ie, day before the interview) installed Broadband. Doesn't use MSN messenger but does use Lotus notes at work to communicate with US colleagues and has used (minimal) other chat based software such as version in Google, gmail. However would not consider himself as a 'chat' software user.</p>
<p>Context</p>	<p>Finbar is a part-time mature student, who works at a major telephone systems company in Northern Ireland. The company is very supportive of continued professional development (CPD) and many of his colleagues had previously taken the course at Magee.</p> <p>In many ways the work that Finbar was doing informed the choices he made and modules he studied, all which were related to his working context (e.g., he choose to focus on VOIP, wireless communication etc). This meant that his study practically informed his working practice. He discussed how industry was continually changing and to progress at work required a degree and possibly masters.</p> <p>To 'stay ahead' in the area he also takes regular courses, which are more specific to his profession – eg., courses with companies such as CISCO. Finbar has a computer and laptop at home, which he finds invaluable, especially when doing computer programming courses; the blog and writing essays. He also just had Broadband installed in his home the day before the interview. He also works after hours on his study at work or in the library at the university, as he has four children, he doesn't like to take over the time he spends with them on work.</p>

Finbar

As part of his course he completed the data network communications module, which was a specific module he studied during the audio log data collection period. This module involved doing various assessments one of which involved a blog. Finbar had to keep a personal blog and update it weekly for the period of the modules (12 weeks; he did the blog for most of that time, namely about 9-10 weeks). The blog was to include personal information but also the students' opinions about new technologies. Finbar focused on network technologies, which related to his actual job (eg. vLands, VOIP) and kept a blog on developments within this area.

Finbar used eBlogger to create his blog, which he found was good. Other people he noted

also used the Microsoft blog tools, however he had found with the Microsoft blog tool that if you wanted to provide comments on someone else's blog, you had to be a member and sign in. eBlogger did not require this and was more user friendly. However as he lost his work once after carrying out a spell check using eBlogger, he decided to write his blog in Word and then transfer it eBlog.

...there is a Microsoft one (referring to Microsoft blog tool) some of the boys used that one, and I just went to the eBlog one and I preferred that one. I even noticed with the Microsoft one, if you wanted to pass a comment on anyone else's blog ya needed to be a member and ya needed to sign in

Although he didn't find that writing a blog changed his view, per se, he did find it useful to see what other people were writing about and he commented that it did make him think about how to present what he was doing.

For another part of the assignment Finbar had to create a website, and write an essay on new technologies. For the latter he focused on mobile Wi-Max technologies, using the internet, he drew on information from company sites (CISCO and Intel), the Wi-Max federation website and cd.net. These sites he either already knew about or was recommended by friend. Links were also provided by the tutor depending on what essay subjects students chose. The following extract demonstrates how Finbar searched for information 'on-the-fly' while at work or studying, storing information for later so that he could compile it into a form for his essays and future study.

Ah the handy thing about the internet, is that if you're in the, if I was in work and say I was workin' them three days, them three days if I had a spare half hour, I can go into the internet and go lookin' for stuff and browsin; and I could either print it off or just grab a link and put it in an email and just save it. I would do a lot of that kinda stuff, just grab, or even even if I just grab one page and just screen grab it and put it in an email and save it, I'm just goin' ta hold that, keep that for handiness then the internet for that kind of thing is just handy, where you can sort a go on it when you have two minutes. And with my work I'd have ready access to the internet so that would be handy. And I suppose you could do just the same with the internet if you came across a blog or two that has information that you need.

Furthermore Finbar also discussed how he used webtext as a means of communicating with others via the net, while away from the university.

.....what I use the more now is the mobile for the webtext thing. I find that thing quite handy now, you're on the internet and you just to send ah text, it's a handy way of emailing people to say that you've just got stuff and I'd use it that kinda a way as well...

He noted specifically how had a 'fair bit of communication' with one other 'boy', who was also a mature student on the course, via email and mobile phone (text, webtext and calling). They worked together and helped each other with their assignments. He also got support from the other people at his work, who had studied his course before (e.g., out of the 14 in his department, 4-5 people had completed the course before). Work colleagues Finbar noted were always 'happy to help'. In generally there was a strong ethos of learning in his work place, which involved various forms of continued professional development courses provided internally and externally by specific industry (eg. Microsoft, Cisco). In many ways

his learning goals and agenda were driven by his desire to progress at work.

With a lot of the companies now, if you want to go into anything over technical level, technical level, to an engineering level, you wouldn't, they are asking for a degree nowadays. I'm at a technical level at the minute just if I want to go any higher I need the degree just with them, with them, with the opportunity to eh do it while I am working, it seemed like a good idea at the time(ie to go back into further education)

Discussing some of the implications of living in more digital world contexts, Finbar spoke about how he feels that we now live in a climate where people expect speed and immediate responses. Consequently when we go to universities we expect the same level of service as is provided in commercial contexts even if the infrastructure is not there to support it. On another level Finbar also discussed how this notion of 'speed' and byte size levels of communication may mean that students are not learning the material as 'deeply' as they could. They just read information, cut and paste it and distribute it round without thinking a great deal about it.

Reflecting on the changes he has noticed in returning to education, he noted how 15 years ago everything was done by hand. Now it is all-online and students don't need to take notes anymore. This has lead to the process being a lot more automatic and has made it easier to search, retrieve and store information in one central place. Also it has made it easier to return to education as digital technologies have provided more flexibility, allowing people to work and care for their families, while studying.

Speaking about how he would improve the support they got, Finabar described the need for a central repository of resources credited by the university, which would allow students to preview course material. He specifically noted how difficult he found it to get information about his 4th year study options, which (at the time of the interview) were not yet available on the site. He wanted to know the module specifications so that he could choose the best options for him. However this information was not available. In addition he felt that the central repository could also hold content about other universities or educators, which were university approved and which students could access. He cited Wikipedia as a good example of a central repository model, which the university could use.

4.1.7 Learner seven – Dzel (Languages)

Interviewee	Dzel
Date Interview	30 th June 2006
Subjects, year	Applied linguistics for language teaching (masters, full time), 3rd year
Age	24 years
Interview length	23.45 minutes

Technologies used	WebCT for library searches; Microsoft word; internet, specifically mentioned Google; memory stick, telephone to speak with friends; PowerPoint for presentations. She had her own laptop which she bought towards the end of her first degree.
Context	Completed survey and voice messages. Overview of the project provided, plus recordings. A friend of one of the other students interviewed for this study they lived in the same halls of residence, were friends and studied together. She found living in the halls of residence really helpful to studying and socialising. When asked if she engaged in group work she noted that the course that she was studying was very individual, not collaborative or group work carried out.

Dzel

Dzel, specifically moved to the UK to study linguistics, from Turkey, and at the time of the interview was in her final year. She had previously studied English language and literature at university in Turkey. Her reason for studying the MA was so she could become a teacher. It was her first time studying in England and she was close friends with one of the other students on a related course (who was also involved in this study).

Dzel was studying the MA in Applied Linguistics for Language. There were about 20 other students on this course. This was similar to the Master Degree in English Language Teaching that her close friend was studying. The only difference between the two courses was one course per semester and the elective modules the student chose to take.

Dzel was in her final year at the time of the interview and focused on completing her final year thesis and assessments, which included essays on language teaching and curriculum; language teaching and education; sociolinguistics and a presentation for autonomy. The goal of the autonomy assessment was to learn about independent language learning, students could decide what they wanted to learn and so it included a bit of ‘everything’. Dzel chose to focus on the role of technology , teachers and learning objects for language learning.

She owned and used a laptop and had done since towards the end of her first degree. In comparison to some of the other students she uses technologies to a more limited degree. There appears to be a pattern of technology use emerging from her audio logs: she uses Word and PowerPoint to prepare for her assignments and presentations and the internet, specifically Google and the library web catalogue to find information and resources. The entries suggest that she is an example of a student who is still in more of a traditional mindset in terms of the use of technologies – text books feature as her primary resources and she comments that she sometimes finds it difficult to obtain relevant articles and information from the web suggesting that she may lack the necessary information searching and evaluation skills. In terms of subject specific uses of technologies however she

comments that she finds online dictionaries useful as a means of checking words and finding new vocabulary. However she does not appear to use discussion forums or MSN chat extensively preferring to phone friends directly to talk about assignments and work activities.

Her responses to interview questions were often short and general so it was difficult to ascertain how exactly she was using the technologies and how they were influencing her learning. She discussed technologies as 'supporters' or 'facilitators' for learning and as a 'rich' resource, which allowed her to easily access content. She thought it would be 'impossible' to 'access' knowledge and to study without them as they offered the opportunity to write, search the web, browse library files and prepare and present work.

Dzel noted that she will continue to use the aforementioned technologies in her professional teaching practice. However from her practical teaching experiences in a UK prep school (teaching pupils 22-27 years) she found that it's difficult when using online technologies to know if the pupils have actually done the work (ie if they are the original authors). Despite this she also thought that as teaching tools, online technologies motivated pupils.

Specifically she discussed the use of Blackboard and how she found it assisted in getting more in-depth knowledge about specific questions. She discussed how she actively browsed the Blackboard discussion forum, but did not consider herself as an 'active participant' as she did not engage in writing questions or comments on the discussion board. She also discussed the fact that one of the main disadvantages of the VLE was that the same people seemed to always engage in the discussions.

Dzel also discussed the differences between technologies she used in the UK, to those available to her in Turkey. The main differences were that they were not the same level of VLE facilitates in Turkey. For example it was more common in the UK to communicate via email with your tutors, whereas in Turkey it was more common to speak face-to-face with the tutor.

When asked how she would improve technology services for foreign students coming to study in the UK, she noted that more support with online learning would be useful. For example, although they were introduced in the first week to web technologies and the VLE, they did not use it until later, so it would seem that the timing of when support is given as well as the need for continued support is important. Dzel also speculated that as many of the students on her course were not native to the UK or native English speakers, that their experiences with technology, before they came to the UK, could have been very different to what they were expected to do when they arrived. She noted that they needed support to 'orientate' themselves to working with technologies that are new to them.

I think if the people would have more support, then, I mean they orientate themselves more easily towards those technologies

Despite the need for orientation, Dzel did comment that the resources (digital and non-digital) available were suitable and relevant to her studies.

Yes, definitely, they were very suitable and I think they were very, that the resources were very rich. And I really benefited a lot from them the whole time during my studies, especially during this first year... For example, for the xxx improving my English, there were some

language resources. For the university, we could access and I mean I studied all kinds of which they are like writing about, reading about, listening and specifically about our courses we also had some online material and yeah. And that was great.

Dzel also commented that the Virtual Learning Environment (VLE) also supported their studies and she described how the students in her group used the discussion forum as a space to collectively decide what they were going to focus on, however not everyone contributed to the discussions.

...we used Blackboard for all the courses actually this discussion board was specifically used for the autonomy unit but we didn't use it for the other units. I found it very interesting; we could access it in our free time and just write a comment whenever we wanted too and it was a nice discussion coz everyone just wrote a question, when you wanted and then, ahh. and then the others could join. So I found it very interesting, but I think always the same people just contributed to the discussions, so I don't think there was a, I mean that not everyone contributed so not everyone joined the discussion

Reflecting on her own contributions to the discussion she notes:

Actually to be honest I read it everyday but I am not, I mean, I didn't actively participate in it. Just some maybe topics I really very interested in, yeah then I participated. But to be honest, no I was not a keen participant as well.

The above extract highlights how Dzel not surprising focused on conversations she found interesting and that she preferred to read the discussions threads rather than actively engage in the discussion.

She also sees the technologies as important in relation to her own practice and is clearly internalising her experience as a learner and what this might mean in terms of the ways she might use technologies to support her own teaching.

I think they (technologies) are quite important and em they are really I mean a great advantage coz, I am a teacher myself. And I think they are very important like for language learning as well as for teaching for everything, they are very important.

As an international student she was also able to provide some useful comparison on the use of technologies to support learning in the UK compared with her home country, Turkey.

Actually I found some differences in the materials for courses. For example back in Turkey we don't have any Blackboard site. And we didn't have any webmails specific for our school. So I mean, for example here communication was really just done by, by email, whereas in Turkey during your studies it's not that widespread communicating through email... em, for example in my own study you would just go directly to the teacher to have to ask something.

In sum, Dzel's experiences highlight how overseas students require support in orientating to modes of communication that may not be so widespread or everyday in their own cultures. This requires supporting such students to become enculturated not practices that although maybe familiar to them, facilitate different forms of interaction, which for some students may not be suitable to their preferred mode of communication and/or require time to

become accustomed too.

4.1.8 Learner eight – Peizhi (Languages)

Interviewee	Peizhi
Date Interview	30 th June 2006
Subjects taken, year	Applied linguistics for language teaching (masters, full time), 3rd year
Age	22 years
Interview length	39.42 minutes
Technologies used	MSN, ICQ, QQ (chat software); Skype, SPSS (analysing data for her dissertation). Word, PowerPoint, Blackboard
Context	<p>The interview recording originally was not very high quality. Also the interviewee spoke in broken English, so the transcripts from the interview reflect her style of speech.</p> <p>Originally from China, Peizhi came to the UK to study linguistics for language teaching. Previously she had completed her undergraduate degree in English and her plan once her master studies were completed was to apply for another scholarship to continue studying linguistics in the UK. If this were not possible she would return to China and teach. She currently lives in the student halls of residence where she finds the technological access (landline, broadband) very 'satisfactory'.</p> <p>MSN and Skype are central technologies, which she uses not only to keep in touch with family and friends but also to collect data from Chinese students for her dissertation. She considered MSN as very important enabling her to carry out her work and studies. This was of interest as was her daily blog, which she wrote about the experiences of the course and life in the UK. She spoke in detail of the differences between studying in China and the UK, and the difficulties she experienced as well as the benefits of studying in a foreign country.</p>

Pelzhi

Pelzhi specifically mentioned using MSN, ICQ, QQ and other chat software such as Skype for not only keeping in touch with family and friends but also for data collection. She used MSN, to collect data from Chinese students for her dissertation, which examined students writing styles. MSN was always 'on' she said and was 'very important' for her. Other technologies she noted included using SPSS for analysis of data she was collecting for her dissertation and the basic suite of tools available from Microsoft Office.

Discussing the differences between technology in the UK and China, she noted that in China, although the technologies are the same they are used a lot less. For her first English degree she used radio, television and basic lecture notes. It was not until she came to the UK that she started to use Skype to keep in touch with people and SPSS for her dissertation.

I think it [referring to the technology] is very important, coz in China, em, when we need teachers, we just need them, and the teachers I don't think in such a rush and you can ask them questions and even follow them to their office after class. But here everything you have to make, make an appointment, you have to send email and not all things sent by email are not things like the programme Blackboard [sentence spoken in broken English, interviewee referring Blackboard as a system they do not have in China]. Although in China, we do use these kind of systems although I don't use them quite often but here if you don't look into it, you are not using these things, ah. I think that is more important, that everything in your year arranged in order before so you can know what you are going to do but in China I don't think it is like that and here the students might report that way.....

In China most of the time we don't use computers that often, when you have to do an assessment you don't have to have it typed. So although, in China we have email and QQ (chat system) we don't check that this often

The following quote shows that in China Pelzhi was used to sharing a laptop with others whom she lived with. Since coming to the UK she has bought her own computer, as this was easier. She also discussed how in China if you own a laptop others will want to use it and this can cause some conflicts and that is why she previously decided not to have one.

I think, in China, a, in China, although, its not with many things, it's just, when we live together, if you have a laptop and other people want to share it, then it cause not a problem, so I would rather prefer don't have one

From the above extract it is clear that the distribution of technical resources in China was more collective, people shared their computer. For Pelzhi having a computer in China was hassle become of this, it caused arguments between people because they had to share it, which is why she states that she would rather not have one. Although since moving to the UK she has bought a computer but if not expected to share it.

The following quote demonstrates how she also finds that the laptop can distract her from studying because when she has it on, she also has MSN and other programmes open, which can take away form her study time.

Sometimes you cannot concentrate on doing one thing, if I am at home, I mean in China, if you don't have a laptop, you write everything out by your hand. It is easier for you to concentrate, but here when you type often xxx and that you cannot help to listen to this and

that

She also discussed her views on the VLE for the course, Blackboard, highlighting in particular the benefits of Blackboard because it meant that the materials for the course were all co-located and always available, so you could also refer back to them.

the good thing, is that, what you want is always there, so you can, I mean, that if at the beginning, I think the teacher give out, ah, some pamphlets, that I think lost them but most of them you can always download them, from the internet. It is a pity that when you take them to the Blackboard, you can just the little things, you can, you courses, you have, you know, some other courses you might have interests in you can not get access to the data

However she also said that there were draw backs to Blackboard, because sometimes students 'forget to look at it'. She felt that with respect to the discussion forum you cannot always discuss ideas with the people you want to as they may not be logged on at the same time as you.

...eh, you don't know who is on the Blackboard, sometime you want someone to discuss but they are not there, they just leave a message there, and you put your opinion there several days ago, you see someone say 'not it's not that case'...but you have, you can, you might forget what you have said and what others have said and you have to look at it again. I think this is quite, disappointed. So I just go there not quite often, I see, I just want to see what other people talk

She also discussed how when using Blackboard, she 'looked' more than she talked. This did not mean that she never contributed to the discussions, which she considered was important to do, but that sometimes because of the format she felt compelled to talk, even if she didn't have anything to actually say.

I think I look more often than I talk, although I talk, I just think, it is not too good if you just look and not talk, so I just talk not because I want to

Discussing the uses of the web as a tool of researching and searching for information. Peizhi, reflected on what were the pros and cons of the web for her and how knowing the right key words was essential.

I think use search quite often, however you must be very good at using, choosing key words, or else you'll find a pack of rubbish

She also notes that in some Chinese websites you might find an article that you are interested in but the details of the articles such as the authors, institution, source and so forth are not given. For Peizhi this is frustrating as you don't know how to 'code' or reference such articles.

Sometimes, the things on the internet you are not sure whether they are right or wrong and I think the English it is alright but for the Chinese most of the time, they wouldn't give you the name of the people and they the b.bibliography or the time or date of the data or something like that. It just, its just there so when you write dissertation or something like that you cannot really use it, or it will cause a big problem, how is it, who write it each one, is that reliable or something like that

Pelzhi valued the opportunity to experience different cultures and said that her reasons for coming to study in the UK were not just to 'learn original English style' of communicating but also to learn 'what others were doing'. This was reflected in her comments about how she liked to discuss work with other international and British students, particularly those who had different opinions to her.

mostly when I need help I turn to the British students and other International students, rather than Chinese more, I think. Coz when Chinese look at a sentence they, think, they might have the same opinion but one thing, people from different culture, they have different things. So I think you learn more.

I would rather to discuss with other international students, as long as they have different opinions

She also discussed how her experience in the UK had changed her perspectives on things.

...I think the things I learnt here is very useful for me.....

...coming to England is not just coz the teaching here is good, because I can get access to other cultures, other ways of thinking, so in this way, if you know more about others, you know more about yourself

...you realise why I am different from others...

Referring again to cultural communication differences, Pelzhi, also mentioned how it is sometimes difficult for her to ask a question in class as she has not yet learnt how to properly interpret the teachers. Another social convention, which she is still learning, is how to debate with others. She discussed how argumentation and debate are not forms of thinking normally engaged in China and she found that this is something she had to learn. In particular she discussed how her first week in the UK was very hard as the teacher expected the students not only to find the answers in the book but also to present their opinions and argue their points. This approach was not familiar to her and she discussed how in China writing assignments was easier than in the UK because they were not expected to discuss ideas in the same way.

...I mean sometimes the Chinese wouldn't have conflict with each other, they wouldn't agree, here teacher, would like the students to argue

To record her experiences, Pelzhi kept a blog, a daily online diary (written partly in English and Chinese) of her experience in the UK. The following extracts illustrate the different uses of her blog – to record her private thoughts and perspectives; as a notebook or reference for content that she found appropriate to her studies; a record of her life in the UK.

Yeah, I write blog nearly everyday, that is when I look into these things, and I think something is important, I write it in my blog, as a notebook

...but my blog, I mean the blog, is not too others, I mean in my course can not see it in fact, coz some of the things is important for me, I think it is new to me and sometimes you don't

want to share everything with others

....some them, some of them is just to say what I learnt from the teacher today, yeah and, just the progress, what is the progress of the day, and some is like I think ah this is new ideas and ah I write it down and sometimes I say well I like this paragraph and I copy it down, and sometimes it just I don't like this class and give a comment on xxx students or something like that, mmm.....sometimes you just write some nonsense on it

In sum Pelzhi experiences highlight the complexity and overlaying cultural norms and modes of communication and interaction that overseas students simultaneously engage in when studying in the UK. For Pelzhi technology plays a vital, mediating role, a bridge between worlds, which allows her to keep in touch with friends and family, collect data for her thesis and reflect on her experiences of studying in a foreign country.

4.2 Commonalities and differences across the subject disciplines

This section summarises and discusses some of the overarching themes which emerge from the interviews and the audio logs, concentrating where appropriate on how the technology use evident in these in-depth case studies highlights commonalities and differences in subject domains. The next section broadens the discussion by drawing on the wider data gathered from the online survey. Whilst reading this section it might be helpful to refer to Appendix D which provides a summary of the key points which arose from the audio logs and Appendix F which provides a summary of the key points from across the twelve interviews.

Across all the subjects represented in the case studies the students made extensive use of personally owned technologies including mobile phones, laptop computers, personal digital assistants and USB memory sticks. PC use was divided between student-owned computers used in the students' own room and university-provided workstations. Most of the students did not have personal printers and brought files on USB sticks into the university to print.

The findings indicate that although there was a degree of commonality in terms of the general hardware (desktop computers, mobile phones, laptops) and software (Word, PowerPoint, Excel) used across all subject centres, how they were used and the frequency of use, differed. Students reported using technology primarily for:

- researching and retrieving information
- communicating with fellow students, friends and academic staff
- processing and manipulating data
- saving, storing and sorting information and data
- preparing assignments and presentations.

4.2.1 Researching and retrieving information

All students extensively used the web for research purposes and for extending their understanding of concepts by complementing core course material. General information sites such as Wikipedia (the online peer written encyclopaedia) were commonly mentioned, as were search engines such as Google. The students all used Google and other global search

engines extensively, although Google was particularly prevalent. Several reported that searching with Google was always their first action when trying to get information for an assignment. Only one student mentioned Google Scholar specifically. All found Google easy to use and most considered it 'very useful'.

There were examples evident in both the interviews and the audio logs where the search engine failed to provide useful information. Nonetheless this did not appear to have dented the students' overall enthusiasm for it. All students reported using specific websites, and in particular subject specific sites (See Appendix D and F). Google was the most commonly visited search engine and Wikipedia was the most commonly visited generic site – mentioned by a significant number of the students both in their interviews and audio logs. For example, one student specifically reported always going to Wikipedia first to get information on any topic. However for the majority of participants Wikipedia functioned as a site to through which to get a snap shot or conceptual overview of a topic or term but that it failed to provide in-depth information, which they usually retrieved through specialists sites, online text books and/or academic articles.

Nonetheless the rapid positioning of Wikipedia as an important authoritative text, despite its relative newness (one student admits that he had only discovered it this year) as a resource is an important indicator of the nature of the way in which students are now using technologies with peer review and sharing of 'what counts as good' being an important scaffold in helping students to make meaning of a complex and constantly changing information landscape.

Despite this openness to exploring new sources of information, participants also discussed how difficult it could be to assert the creditability of sources found on the web. Students have learnt to double check source material or hone their searches into reliable sites that they learnt to trust. For example students discussed how they cross-referenced and validated material found on the web with other sources (e.g., text books and lecture notes). Such methods of accreditation and cross-referencing indicate that students mix and match information sources, combining old and new methods. Given how rapidly information and understanding changes in the areas the students were studying, particularly in relation to medicine, economics and computer science for many the internet provided the latest and most to date information. Printed textbooks for example were considered by some to be out dated and difficult to digest but still tended to be used as a baseline measure. On the other hand online textbooks and sources were preferred particularly in medicine and computing science because they were easy to search, tended to provide byte sized, digestible chunks of information and were more interactive.

Other websites visited often related specifically to the subjects being studied – for example investopedia.com (business studies), zdnet.com (computer science) and gpnotebook.co.uk (medicine). Therefore not surprisingly subject differences were evident between the different subject disciplines, with medical, language, economics and computer science students all referring to particular discipline-specific sites depending on their area of study and course requirements. Many students during the interviews discussed how during their university career they have learnt to refine their web searching skills. This was something that was not necessarily taught by the university but something they learnt informally through trial and error. The level at which different subject disciplines and their tutors recommended using

the web for research varied greatly. Whether the web was recommended or not appeared to depend on individual departments and tutors: some would provide hyperlinks to sites they approved; others would not. Links to particular sites were also passed between students or picked up from other professionals working in the field, particularly when they were on placement.

What was very clear from both the interviews and the audio logs was that the web is one of the most important e-learning tools used by the students, usually it is their first port of call when researching a particular topic and more often than not the students' use of traditional text book material was also supplemented by web searches.

Those students that did mention blogs used them to keep updated on new developments in their related fields; only the computer science students were actually required to write a blog (online diary) as part of their semester outcomes. The focus on the blog was to research a particular new technology and discuss its merits, strengths and weaknesses via the blog. In this respect the student blogs functioned in a variety of ways as a research tool, course assignment, a method of disseminating information on a particular subject, reflection tool and personal viewpoint. The students were also taught to consider how the blog could be used as a CV and method of advertising your domain knowledge to prospective companies. For example there are many bloggers within the IT industry (e.g., refer to the O'Reilly Network blogs) who demonstrate their potential and market knowledge through blogging. The tools used for creating the blogs were commonly found, popular open packages such as eBlogger, WordPress and Windows Live Writer from Microsoft.

During the audiolog period online library services were mentioned by medical and modern languages students but not by computer science or business students. One language student in particular appeared to use the library catalogue extensively and for her, in contrast to many of the other students, this was still a fundamental and core initial source of information. Students did recognise the value of library catalogues in terms of being able to see which books were available in the library and being able to reserve them before visiting the library. Some difficulties were reported in using library catalogues and students were frustrated when they found that a paper they wished to refer to came from a journal that their university did not subscribe to and therefore if they wanted the paper they would need to pay for it.

Information retrieval from the web was primarily for text-based materials but students also reported searching for images (to include in presentations), as well as downloading relevant podcasts. One medicinal student reported studying e-modules on health topics from the British Medical Association (BMA), while another referred to using online course materials and lecture notes from another university. This latter point indicates how students now draw on an international pool of materials to support their learning. Gleaning the best of material from around the world, they mix commercial, academic and popular information sources together so as to gain a better understanding of their area.

4.2.2 Communication

Use of communication technologies to support their studies was extensive. Students in all subjects used mobile phones, and are phoning and texting each other frequently to discuss

issues related to their learning, most commonly in connection with assignments. They also used MSN Messenger and other instant messaging software (e.g., ICQ, QQ), particularly when communicating internationally. All students expressed positive feelings about the communication technologies they used, though some found the frequent interruptions which arose as a consequence of this constant communication disruptive to study.

Email was used by all students and was the main technology used for communicating with university staff. Students expected and generally received quick responses to their emails from their tutors or lecturers and appreciated the channel of communication email provided. Students discussed how peers and tutors accept immediate responses to email and that because of email, mail servers and mobile telephony there is now no excuses for not receiving information or getting in touch with people. Interestingly the overseas students from China and Turkey who were studying languages also noted how in the UK it was much more common practice to email your tutor to discuss issues or arrange meetings. Although they used email in China and Turkey, it was more common to speak with your tutor face-to-face rather than email them.

For courses that had discussion forums their use was limited and in some case frustrating. For example the language students appeared to use discussion forums the most but of the students interviewed found that they preferred to read the forum rather than post messages and contribute to the debates. Although they considered the forum a potentially useful means through which to engage with others views, they also found that one or two person's opinions could dominate discussions. Additionally there was issues around time delay for example there could a delay between when a message was posted and when it was viewed, by the time it was viewed the debate could have dwindled and died and so it was not always possible to engage with the issues at a deep level. Other courses that provided discussion forums showed that students did not find them particular useful or inspiring. This is an interesting finding, particularly when a number of the students noted how they used other technologies (instant messaging, mobile phones, email etc) to discuss their work with other students. What appears to be happening is that students are creating their own social network to support their learning, tailored to their particularly needs and using the technologies which suit them rather than being constrained in topic and technology via discussion forums.

Low cost communication technologies such as Skype, Microsoft's Instant Messenger (MSN) and email were considered invaluable forms of communication and there was evidence of these being used in a variety of ways (student-student, student-friends/family, student-department/university or tutor). Skype, software which allows students to call people for free or at a low cost via the internet, was specifically mentioned by foreign students and students who lived in halls of residences as a cheap and easy way to keep in touch with friends, colleagues and family. For many students text messaging and the mobile phone, although popular, were regarded as expensive alternatives and therefore cheaper alternatives such as Skype and MSN chat were favoured, even if in some cases these were either less convenient or less sophisticated in terms of functionality.

As noted the computer science students were required to write a blog as part of their course. Interestingly one of the overseas students on the foreign language course also kept a blog as a record of her experiences studying and living in the UK. As highlighted in section 4.1.8,

the blog played quite an important role in providing the space to reflect on her personal life and circumstances, while simultaneously being record of her impressions of living in another country and a collection of inspiring material. Some other students (economics and languages) also reported reading blogs but did not discuss writing them. None of the blogging software used was provided or hosted by the universities.

4.2.3 Assignments and presentations

A high proportion of the time students spent working at computers was in connection with assessed work. Students used Word (and Open Office in two cases) to write assignments as well as take notes. In three of the subjects students also reported using PowerPoint to prepare and give presentations to their class. All were positive about the benefits of PowerPoint and Word and some wondered how they had ever managed during A-levels without word-processing.

All students used Microsoft Word for essay and report writing, while PowerPoint was used across all subject centres for either oral presentation, distributing online course material and/or revision. Other aspects of Microsoft Office, such as Excel, were used for carrying out audits and drawing graphs. Students cited few disadvantages to using word processing packages such as Word or Open Office. All students found them invaluable for presenting work, with foreign students specifically mentioning the grammar, spell checking and dictionary functionality of the packages.

Despite the commonality of such tools, the level of training provided by the subject disciplines varied with some providing little or no training on the use of tools such as PowerPoint which were nonetheless essentially a requirement in terms of students completing assignments. Some students mentioned that it would have been useful to learn about the more advanced features of such packages. As noted by some foreign students it is also possible that students, who did not carry out their A-levels in the UK, may not have had much experience on computers prior to coming to the university in the UK and some form of continual computer support for such students may well be needed. Other students also discussed how packages such as PowerPoint helped in terms of presentation, helping to improve the look of work produced. This in itself of course does not mean that the quality is any good and neither does it demonstrate that the student has gained an appropriate level of understanding of the concepts being taught.

The medical students interviewed tended to use PowerPoint extensively for oral presentations. This is not surprising given that at the time this study was conducted the students were in the fourth year during which they were required to make oral clinical presentations. All the medical students interviewed used PowerPoint to complete this task. In comparison the economic students involved in this study were in their first year and were not required to make class or group presentations as extensively as the fourth year medical students. Computer science students predominantly used PowerPoint as a means of revision, by for example flicking through their tutors' online slide presentations. In contrast the language students involved in the study were in their final year, writing their thesis and term essays so PowerPoint did not feature as much in their conversations. In this respect the use of technology captured in this study gives only a partial view on subject centre similarities and differences. More specifically the study reflects individual universities' technological

resources and particular students uses of technology depending on the level they were at and the semester requirements as dictated during the time this study took place.

The medical students all made extensive use of the e-portfolio integrated into their VLE since this was an assessed part of their study. Most found using an e-portfolio useful, particularly as they considered that self-assessment would become an important part of their future careers. Other forms of computer-aided assessment noted by the students – included the use of multiple-choice questions used for self-testing which students had found helpful as it kept them focused and refreshed. Mock online tests were described as useful and immediate means for revision and were frequently used by economics, medical and computer science students. One medicine student described how online self-assessment was only provided the first, second and third years and that it should continue into their fourth and final year.

There was surprisingly little mention of subject-specific software. Traditional CAL-type software (such as e-tutorials and simulations) was noticeable by its absence. The medical students interviewed did specifically mention that CD ROM simulations had been used earlier on in their course. They found these simulations useful as they provided insight into the internal and complex workings of the body (e.g., heart, autonomy). However as the medical students pointed out nothing replaces the ‘real thing’ and given that the students interviewed were coming towards their final year, they were already working with patients on the ward, so the simulations had only been used as study aids in earlier years. One language student encountered difficulty with some subject-specific software (Endnote, concordancing and textual analysis packages) that she needed to use. Although she could see the value in their use, she found them time consuming and difficult to use. Despite training been given in such packages, it was scheduled too early in the course when students did not require to use the packages. As before the timing of training as well as continued support were an issue.

Two of the fourteen students interviewed specifically mentioned open source software, such as Sun Systems, Open Office. Again the reason cited for using such software was because it was free to download and therefore cost effective.

4.2.4 Integrated learning

Students in all subjects reported using their institution’s Virtual Learning Environment (VLE). Computer science students also mentioned that many of the computer science tutors has their own home pages on the university site through which they posted all relevant links, assessments and lectures notes. Medicine students made most use of their VLE, which included support for e-portfolios, which was a mandatory requirement of their course. Mostly students used their VLE to check information about their courses. The computer science students also specifically mentioned using alternative sources of information such as course websites set up and run by students. - .

Out of the four subject centres, computing science had the most advanced and active VLE environment, with both students and tutors regularly using it to update course material, carry out practice or final tests and run online modules. For some subject centres the VLE was essentially used as an online diary or as a means for the department and students to communicate course administration and timetable changes. While for other subject centres

the practice of using the VLE was still under developed with mixed usage - some tutors use it, others don't. Across all subject centres students mentioned that the discussion forums on the VLEs were rarely used. These findings indicated that the way in which VLEs were used varies greatly not only between subject centres but also between universities and in some cases departments. More importantly use of the VLEs is dependent on the culture of usage – in terms of who is using and why. Successful usage is dependent on clearly shared understanding of which functions are being used and why, clarity of purpose/relevance of use and a critical mass of users. It is clear from these primary findings that more detailed research is necessary in this area.

The interviews and audio logs revealed a more detailed understanding of how particular technologies served the individual's learning style and needs. For example students who worked part-time, had children, lived some distance from the university campus or had heavy clinical or practical work placements, tended to highly value online learning facilities such as Virtual Learning Environments (VLE's) or online communication tools and learning support facilities. For such students the possibility of being able to download lecture notes or view course timetables was a real asset as it meant they did not have to travel everyday to the campus. This saved both time and money and gave students more flexibility and freedom to arrange their learning around their individual lifestyle and working situation.

However despite the general consensus amongst the students that online course materials and modules 'are a good thing', the importance of face-to-face contact with tutors was still considered necessary and important and was cited by a number of students in both the interviews and audio logs. The students interviewed discussed the need to personally meet with classmates and tutors to discuss work issues. Face-to-face contact was considered vital in building a sense of community or 'belongingness' to the class or study group. For many this could not be replaced by online environments. Also the issue about value for money and quality of experience was discussed. As one computer science student noted you pay a lot of money to come to university to interact with and be taught by academics and knowledge experts you do not want all this interaction to happen via the web or online as it does not provide the same quality, value for money or level of communication.

Overall students had no difficulties with any of the technologies and applications that they had selected for themselves. The computer science students were, perhaps unsurprisingly, the most adventurous in their use of technologies and acted largely independently of university-provided facilities. University provided facilities: VLEs, library services and subject-specific applications were all seen as having some problems, either with usability or, in the case of VLEs, incomplete implementation, especially in relation to discussion forums. The audio logs provided a picture of students relying heavily on a wide range of technologies and managing to integrate them quite effectively without any specific help from their institutions.

In summary students found that technology opened up a variety of possibilities in terms of enabling them to engage in a range of different learning processes suited to their individual needs and preferences. Various digital technologies emerged as central to the students' everyday practices allowing them to communicate, keep updated with administration, manage learning materials, process, and create and revise work. Discussing some of these issues one computer science student during the interview noted:

....it (ie technology) basically opens up a whole world of learning for everybody, you know. You can find, up, read up, on anything you want, like in a university context, you can have all your notes and everything all on one machine.....

In this respect technology is not simply an ‘add on’, it is central to how the students organise and orientated their learning lives by providing alternative routes to engagement, responsive and immediate modes of interaction and communication and flexibility, which allows home, work and university life to become manageable.

5. Putting the case studies in context⁵

In this section we contextualise the findings from the in-depth case studies discussed in section four, by triangulating them with the findings from the broader online survey, which contained both quantitative and qualitative questions. Quotes from the qualitative data are given as originally provided – no attempt as been made to clean the data or correct the English. The quantitative data is summarised in Appendix B, the qualitative data is summarised in Appendix C. The data from the survey questions, focused on the following:

- Context of use - background information on the student (Appendix B).
- Use of technologies to support different types of learning activities (Appendix B), including:
 - The technologies that the students used most; how these technologies were used, why students preferred and used these, and suggestions for how they could be used more effectively (Appendix C1).
 - The technologies that students least used and their reasons for not using them (Appendix C2).
 - How they are using technology to support other aspects of their life other than study (Appendix C3).
 - The strategies that they use for integrating e-learning with their other learning activities (Appendix C4).
- Perceptions of technologies and their use (Appendix B).

Evidence from the survey mirrors that described in section four, for the in-depth case studies, namely that there are some fundamental changes in the nature of practice for modern students - not only in terms of how the students are studying and learning, but also in terms of how courses are being set up and delivered. This section reports on the ways in which technologies are being used to support their learning and their overall perceptions of technologies and the importance of e-learning for their studies. Some of the findings are unsurprisingly (use of Word, the internet and email is pretty much ubiquitous) but provide valuable empirical evidence of what most practitioners in tertiary education perceive about students’ use of technology. Some of the findings, however, are more surprisingly and point to fundamental changes in practice which have significant implications for institutions and

⁵ Note that all quotes from the survey are included as typed by the students – spelling mistakes and grammar errors have not been corrected

other stakeholders involved in developing and delivering learning (See section seven for a discussion of policy implications).

One of the key overarching findings is that students' use of technologies is multi-faceted, complex and tailored to individual needs. Students are accessing information from different sources to gain multiple interpretations. Wikipedia was cited frequently as a source used by students to add meaning or explanation; students were turning to it as a means of helping them understand course materials or perhaps lecturers' notes. Communication is also multi-faceted and there is evidence that there appears to be an increase in the amount of oral and visual presentations that students are now required to do; many students referred to the fact for example that they were required to do PowerPoint presentations as part of their courses. Thus both the ways in which students use information and communicate appear to be changing.

5.1 Context of use: places of study and technology use

The aim of the survey was to gather some general information about technologies used by students during their studies. To get a first impression of their background we started by asking where the students are studying, multiple responses were possible (Table 2).

Table 2 Places of study

Location	Economics (N=128)	Languages (N=92)	Medicine (N=31)	Computer science (N=158)	Other (N=18)
At home	30%	23%	7%	35%	4%
At home & using a computer connected to the Internet	30%	20%	7%	38%	4%
At my place of work	22%	24%	22%	24%	9%
On campus	30%	21%	9%	36%	4%
At a hall of residence	34%	28%	32%	6%	0%
Elsewhere: (library, computer rooms, internet cafés, friends, etc.)	27%	31%	10%	27%	6%

There was some indication of different tools being used at different times, depending on where the students were, what they had access to and what they were doing.

Msn is quick and simple to use, and I can ask for help from my classmates at any time. Google is also easy to use and now has the added feature to look in academic essays on my chosen subject. Podcasts are my favourite method of revision as I can use them when I am doing other things, such as cooking or walking. [X147]

For example clearly students without access to the internet at home needed to organise their study patterns such that when they needed to go online they were near an internet connection, either at the university or in an internet café.

I use the memory stick to carry digital material around with me allowing me to access it at any time in any other computer [W37]

I plan times and days of the week dedicated to certain aspects of learning and material [AR97]

A significant number of the students work from their home base or halls of residence and there is evidence from the survey that this is becoming if not the preferred location, certainly one that the students want to be able to do at least some of the time.

In the case of statistical software requires travelling to campus to use when I prefer working from halls.[AC95]

Therefore the use of tools and location of use varied depending on personal preferences.

5.2 Use of technologies to support different types of learning activities

When asked about which tools they used most frequently (see figure 1) the students indicated the top five as: email, the internet (including search engines), computer⁶, word and instant messaging. As is evident throughout the discussion of the findings in this section and the last, although perhaps not surprising it is interesting to see that these are the tools students are using to support the three fundamental types of learning activities that they are engaged with – communication (email, the internet, instant messaging), gathering information (the internet and to an extent email and instant messaging), and working on assignments (using all five of these primarily integrated on their computer often in word).

⁶ Its worth noting that the use of ‘computer’ as a term is not mutually exclusive with the other terms.

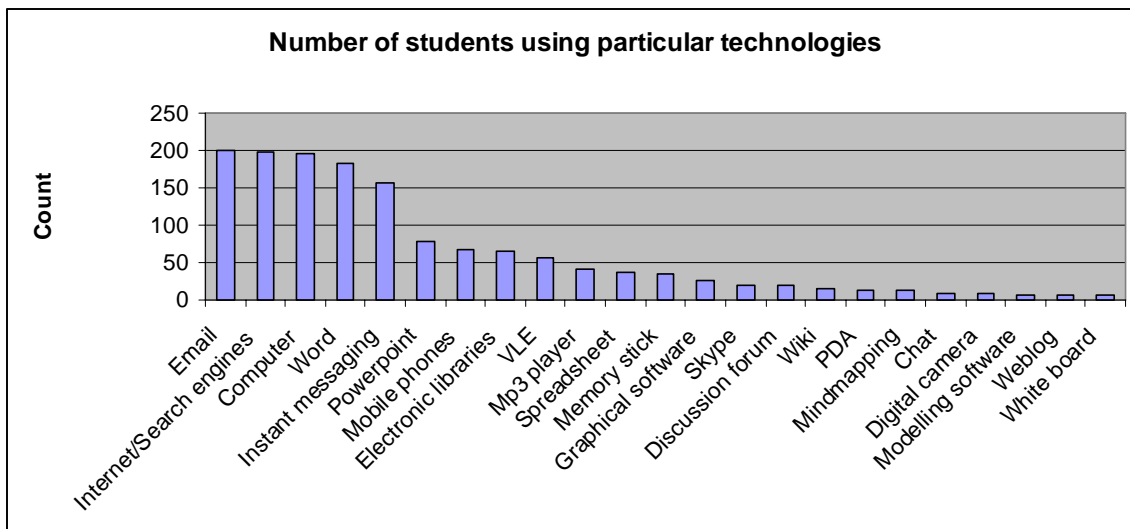


Figure 1 Number of students across the subject centres that listed particular technologies as one of their ‘top four used tools’. N= 427

This figure also shows that in addition to these top five - students are using a wide range of other generic technologies, as well as subject specialized technologies. Next in terms of most used are PowerPoint, mobile phones, electronic libraries, and VLEs. MP3 players, spreadsheets and memory sticks also feature significantly. The ‘top technologies’ indicated in the survey correlate well with the technologies most mentioned and discussed in the in-depth study interviews and audio logs.

5.2.1 Tools for communication

Students are using tools in a variety of different ways to communicate with friends, family, peers and tutors. Email and Instant messaging appear to be the main communication tools (see appendix B figure 1 - 3).

I use email to communicate with everyone, especially lecturers; arranging meetings, asking questions about work and queries over assignments etc I write all my assignments using Word and to sort through the information I find, make notes of what I still need to do and spell check my emails that I'm sending to lecturers. [W46]

Not surprisingly email was mentioned extensively, but Instant Messenger was clearly also of significance.

Msn and email help me keep in touch with people on my course and lecturers. [W362]

Instant messaging - this is very helpful when contacting group members away from university to discuss group coursework, especially when group members are not able to meet in uni.\\\email - once again very helpful for contacting group members away from uni, as well as sending one another work. Also used a lot to contact modules leaders/course tutors\\\graphical packages [W377]

Email - To contact others, predominantly lecturers and coursemates around assignment deadlines. I also use Gmail to back up work. [X402]

Email is my main from of communication with other students, supervisor and friends. [X402]

Instant messenger, used for almost everything apart from talking to university tutors (they should get it [W53]

Figure 2 shows the extent to which they use email and Instant messaging as tools to communicate with their fellow students, family/friends and teachers.

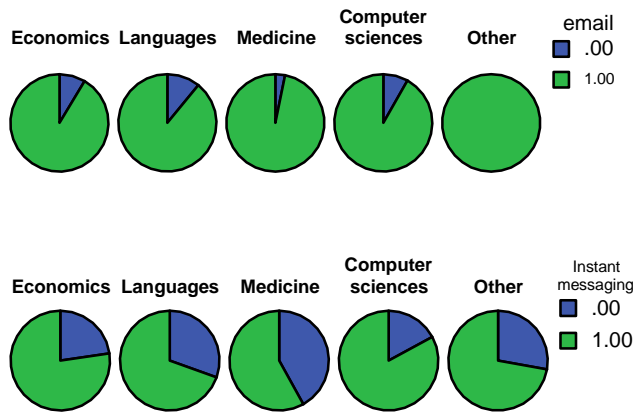


Figure 2. Students using Email and Instant messaging, differentiated by subject centre

It is interesting that email is popular across all the subject disciplines, especially with the high ranking of value 3 ('I use it a lot') across the subjects (see appendix B, figure 4 to see how the students ranked the use of email).

In addition to the obvious use of email as a means of communicating with fellow students and tutors it was also used as a means of setting up meetings and submitting assignments (see also appendix B, figure 5)

I send emails to colleagues to exchange information and as a form of communication. i use my laptop to perform all the tasks described [W33]

I use email to communicate with everyone, especailly lecturers; arranging meetings, asking questions about work and queries over assignments etc. [W46]

To some extent instant messaging is also used amongst the students to do and plan a group learning tasks collaboratively.

Instant messenger, free to use, easy of use to speak to people with fast response, ability to share files across it, ability to work on group projects with it, and ability to video conference. It could be used more effectily if a tutor had it signed in throughout the day and answered questions at the end of the day, far less hassel than E-mail. [X53]

Instant chat-will compare ideas and talk about assignments over msn.[w54]

Instant messaging is used to discuss issues with friends if a topic is not understood.[W108]

Instant messenger I have used to contact classmates in order to discuss ideas and send drafts of essays for proofreading. [W180]

Email and Instant messenger are seen as less time consuming and more efficient than traditional forms of communication.

Instant messenger and software such as skype makes it simple and cost effective to talk.[AO209]

E-mail is simple and good for more official communications. Instant Messaging and Mobile Phone are "on demand" so a reply is instant, unlike e-mail which can take some time before a reply is sent.\\Instant Messaging is great for group projects as the group don't need to be physically together, just online.[X317]

I use these means as they're very handy - they're there for use instantly without me having to physically go somewhere such as a library or public telephone to gather the same information. It means I can get the answers I need much faster and in my own time. I think that I use these means often enough and I don't really know how any of them could be improved.[X318]

Instant messengers have become THE primary form of communication for many students, so why not encourage lecturers to communicate to students in a distributed fashion? [X347]

Instant messaging, e-mail and VoIP allow for instantaneous contact with group members/tutors without having to interrupt other tasks which I may be doing at the time. [X355]

Learner voice three (as described in section four) amply demonstrates this, showing how vital email was for this particular medical student. The student discusses the use of list servers within her university. For this particular student email was the essential means through which she communicated to other students and to her tutors and department. She found email cost effective in comparison to text and mobile phoning, which she considered to be expensive, hence only using them to communicate with family and friends.

Mobile phones are used a lot as well for communication between students, family/friends and to some extent with teachers, where an immediate response is required (see appendix B, figure 6 – 8 and figure 9 for a break down per subject centre).

I use my mobile phone to communicate with class mates. [W56]

Laptop and Word helps me to write things and manage stuff, while mobile phone and MSN helps me to communicate with others. [W68]

Mobile phone messages are generally picked up quicker than emails, so better for urgent messages.[X74]

Students also indicated that they use mobile phones during the planning of and working on collaborative learning tasks (see also appendix B, figure 10).

Arrange meetings by text message on mobile phones. [W74]

Share projects and information through email and mobile phone. [W172]

Mobile phone and e-mail to contact friends to discuss work.[X198]

This is illustrated by learner five (section four) who describes how computer scientists at his university support each other when carrying out course work via their mobile phone. He notes that by talking to others about his course work, he gains a much better insight into how his peers are approaching things. He also discusses how when working on course material, peers share expertise but also confide in each other, check in on each other's progress and update each other with course information (deadlines, hand in dates etc).

However there were a number of criticisms of mobile phones – particular in terms of costs and many students were using email, msn chat and skype in preference.

The use of mobile phone is expensive, and as computers are becoming able to do more, I am using mobile less and less.[AO23]

Other communication tools also mentioned include discussion tools within institutional VLEs and free (evidently an important factor) popular, software such as Skype, with many using a mixture of communication tools to meet different needs, which are often complex and multifaceted and therefore difficult to untangle.

Instant messenger and skype for communicating with students.[W70]

Instant messenger and software such as skype makes it simple and cost effective to talk. [AO209]

Skype is good for international conference calls and is very low cost.[W406]

I use discussion forums to arrange meetings when working in groups.[W36]

The VLE is basically used to download course materials but contains the discussion board to interact with other students.[W82]

The views on the value of discussion boards are mixed, with a significant number of students listing 'discussion boards' as one of their least used technologies. The reasons include feeling that the discussion boards were 'a waste of time', with students preferring to email others directly and/or saying that alternative communication methods were preferable, suggestions that the forums are underutilised by fellow students or the tutors and hence of little benefit, a feeling that the content is not as valuable/authentic as face to face discussions or that certain individuals dominate and distort the sessions.

Discussion board is a good idea but it is not used to its potential, it could be better than email if it were used properly.[AC257]

They are too boring and some messages on the virtual learning board take too long to be replied to, or they can sometimes be taken out of context..[AC108]

It's not a real discussion if you can't really respond to a statement/argument as you would in real life.[AC151]

Discussion boards for each subject are never used much, they are hard to access and moreover the replies from lecturers can take too long.[AC167]

Although search engines feature significantly in the next section (tools for researching and retrieving information) they are also used by the students as a way of receiving communication in the form of up to date discussion, news articles, blogs etc. Students also use the internet to access expert knowledge (which is an indirect form of communication) and have an expectation of being able to communicate with anyone, about anything, when they want to.

...msn is good to talk through different topics when revising or planning assignments. google is great for researching different peoples views on different subjects and e-mail is very useful for communication between staff and student of the university. [X188]

A broad review of the findings from the survey and in particular the comments in the qualitative sections suggest that new forms of collaboration are emerging both with peers and via new 'smart' and adaptive technologies, suggesting a shift towards Salomon's (1992) notion of 'distributed cognition' and shared enterprise with tools.

They [technologies] help to display ideas and are a quick way to gather and collaborate info, improvements would be a conference setting on a mobile[X247]

I use these because its easy [to] organise my life, thoughts and work. The biggest thing that would allow me to use them more effectively is if more students were aware of what the possibilities of using group collaboration tools such as citeulike and del.icio.us. X252]

According to the survey VLE's are used mostly by the students to gain access to and manage course material (see appendix B, figure 11 – 14), It also appears that the use of VLEs is mostly mentioned by the Medical students and further reasonably evenly spread across the other subject disciplines. See for example figure 3 indicating the use of a VLE to view course materials.

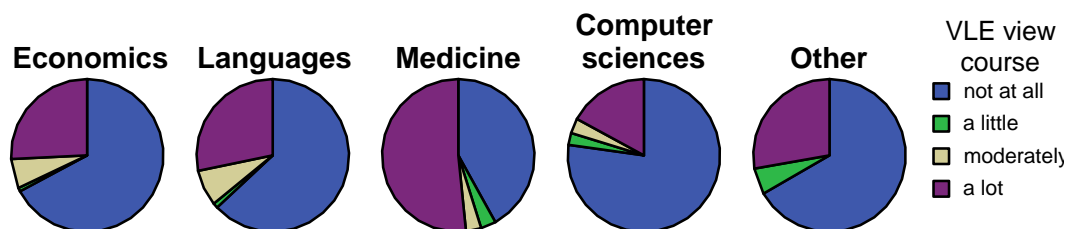


Figure 3. Using a VLE to view course material, differentiated per subject centre.

The VLE is basically used to download course materials but contains the discussion board to interact with other students.[W82]

And then blackboard for coursework and communicating with professors and other students and revising for exams.[W426]

I get relevant information from lectures and tutorials from blackboard vle where available. [W40]

Most of our teaching materials are provided over blackboard.[W408]

For example, as learner voice three (section four) demonstrates for medical students working at that university, the Learning Support Environment (LSE) (which is the University's VLE) is central for student-departmental communications. From the third year on medical students are working off campus, in hospitals. The LSE allows them to virtually connect with the university, check their timetables and allows them on a day-to-day basis to keep on top of their studies. Medical students see the LSE as a visual online resource, which is an essential tool through which they could access their timetables no matter which hospital they were in. Additionally in the fifth year of medical school, many of the students chose to do an elective in a hospital abroad again, in such distance learning scenarios the LSE allowed them to keep in touch with departmental news, relevant deadlines and course materials.

Discussion forums did not feature significantly for the students involved in the in-depth case studies – being rarely mentioned in either the audio logs or the interviews. In the survey the students indicate they use discussion forums to communicate with students and friends but to a lesser extent as a tool to communicate with the teacher (see appendix B, figure 15 – 17).

I use discussion forums to arrange meetings when working in groups.[W36]

Discussion forum - useful for obtaining quick, informed opinion [W242]

A few students make interesting observations about the use of discussion boards for obtaining information and a comparison with search engines and related internet tools.

Search engines are the only to find information without typing in endless guesses at URLs. Discussion boards and forums often yield better internal search results than a broader web search, and have the added appeal that you can ask questions and get a human reply. Unlike when you Ask Jeeves a question and get a list of irrelevant adverts.[X143]

I use Forums for asking questions off knowledgeable people. I prefer forums as you leave a post and come back later, its less time consuming and doesn't suck you in to time.[W364]

In general students do not seem to use discussion forums a lot across the subject centres. Figure 4 illustrates the use of a discussion forum when working collaboratively. Only a few students say they use it a lot (as indicated by the colour purple), but in most cases discussion forums are not used at all, or just a little.

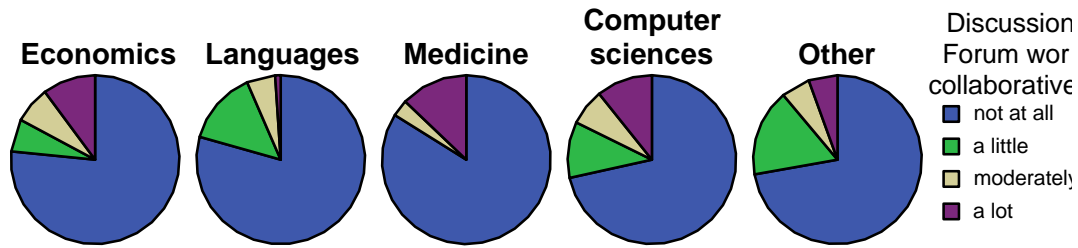


Figure 4. Using Discussion forums to work collaboratively.

Skype seemed to be popular and was mentioned by 19 students on the survey as one of their four key technologies (see also appendix B, figure 1 - 3). Skype is mainly used for communicating with fellow students and family/friends across the disciplines (see Appendix B, figure 18).

Skype is used mainly to communicate with my friends on the course about certain work and tutorial questions.[W98]

It's interesting to see that a few students from computer science also use Skype (8 of 158) to communicate with their teachers (see figure 4).

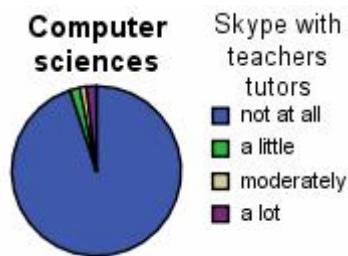


Figure 5. Using Skype to communicate with teachers/tutors by computer science students.

Although it was less frequently cited than the tools discussed above, weblogging also appears to be a popular activity amongst the students (especially with computer sciences, economics and languages), and is used for communicating (see appendix B, figures 1 – 3).

I use a lot more technology in other aspects of my life. I listen to podcasts, watch digital video, take and edit photographs and regular contribute to more than one blog. [AO180]

I use blogging as a personal means to reflect on work and what is seen in practice. Some of this is private some of it is open for viewing and commenting on others.[W252]]

Weblogs - informal 'forum' area for discussion of ideas and a chronological record of project progress. [W379]

I enjoy and find blogging effective as it is often able to reach a wider audience than an email - which will generally be specific to the person reading it.[X412]

Blogs are used as a means of findings specific types of information – particular for those studying computer science.

Blogs to increase my knowledge on what is happening within the computing industry. [X333]

Although some students found it difficult to find information from discussion forums and blogs.

Blogs and forums are annoying o sift through to find relevant data. [AC254]

5.2.2 Tools for researching and retrieving information

The first thing i do when given any piece of word is type it into a search engine! this gives me the opportunity to see how different people interpret the title. from there i can focus on one main idea and use the electronic resources to support my initial findings or indeed rule them out. e-mail is always vital with communicating with different mediums. teachers for support.[W29]

The first issue in relation to the use of information is that it is evident that students' perception of the nature of content is changing. This is a consequence of the fact that information is available readily and usually free; it is perceived as therefore having lower intrinsic value. Students are also used to high presentation standards and increasingly expect a high degree of interactivity of materials. This raises fundamental questions about the value of content in institutions and the appropriateness and nature of assessment processes. The second issue relates to the cost and value of content. The data consistently showed that students were accessing a rich variety of free material, and that the internet was their first port of call for information. Their perception of the value of materials therefore is different – if information on anything is available freely and easily what is its value? The third issue relates to presentation of content. Students expect good quality material, which is interactive and engaging; however there is a mismatch between this expectation and what the majority of students are being given in their institutions. The final issue relates to the new literacy skills that the students need and are demonstrating: skills of evaluation and an ability to critique and make critical decisions about a variety of sources and content.

As with the interviews and audio diaries, the internet generally was mentioned extensively across the survey, as was Google and other search engines and electronic libraries. The internet was felt to offer more up to date information than paper-based books and search engines were evidently the primary tool for students to find information to support their studies. Indeed some students stated that they only use the physical library if they can't find the information they need off the internet.

Search engines are used extensively to support learning, mostly to work on assignments. Figure 6 for example shows the extent to which students across the subject centres use search engines to gather information. Search engines are also used to support both

collaborative and individual learning tasks (see appendix B, figure 19) and to revise for an exam.

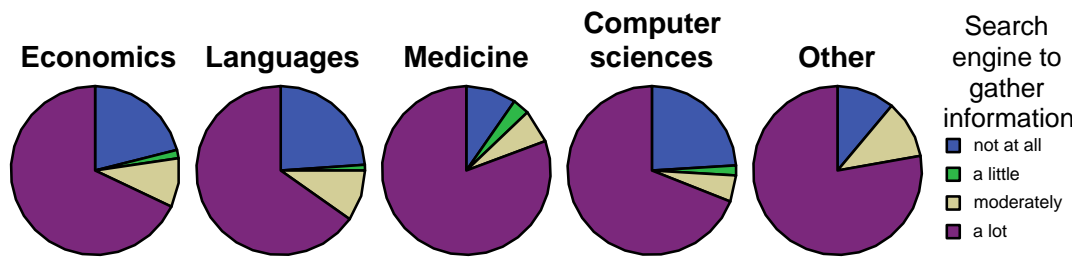


Figure 6. Using search engines to gather information.

Use libraries and search engines for research [W15]

Use search engine for information gathering [W26]

Information searches regarding assignments [W35]

I use the internet for research since I find that often, the Internet offers more up to date information than books.[X43]

Google, for research on all levels, trying to find information, will use the library only after I have failed to find the information required on the internet.[W53]

Electronic library is better, than trying to find specific information in the real library. Can search and access info from home.[X74]

Students demonstrated a variety of strategies for using search engines, often in combination with other sources of information.

If im stuck on a problem, i will use google for similar examples and work out where i went wrong, then i will revert back to traditional learning activities.[AR114]

I use it as my first task in gathering information (google etc) and I use podcasts whenever I can. I will often be reading parts of a course book whilst finding similar information on the internet.[AR147]

Students are using search engines to find both generic and course specific information and some are aware of specialised search engines such as Google Scholar.

Google is also easy to use and now has the added feature to look in academic essays on my chosen subject.[X147]

Google (in form of google scholar normally) to find papers relavant to an assignment. May then use the electronic library to locate the papers. [W233]

Search engines always use for revision, research[W275]

And as the following quote demonstrates – search engines are a core, fundamental tool for the students.

For research stuff, it is hard to imagine life without the services of Google and all its offshoots.[X406]

Learner voice one shows how one economics student has developed critical searching skills, which show that he does not take information directly from the web without cross referencing it to other validated material. It is interesting to note how he specifically cross references online material, with traditional text books recommended by his course tutors. This indicates how textbooks are still considered the most reliable form of information. Additionally he also notes how his university does not provide specific training on using the internet as a research tool and that some tutors may not realise how widespread its use is for learning. He even suggests that some tutors may be ‘afraid’ of recommending it because they know that all the material available is not correct.

Similarly learner voice five shows how computer science students have developed similar critical web search techniques. For example, they refine the search terms by inputting specific details. One of the main disadvantages noted by students with the web is the sheer amount of information available and how they decide which is the most appropriate and relevant. It is interesting to note how this student vets material, considering information with the domain name ac.uk to a valid indication that you’re ‘on the right track’

Electronic libraries were reported to be used mostly during collaborative and individual learning tasks, and to gather information (see figure 7), as well as process course materials.

Use library data base to scour for things; use Google to check for specific facts and other needs, spelling, and a variety of other things.[W67]

Electronic Library is primary research tool.[W74]

Electronic library is better, than trying to find specific information in the real library. Can search and access info from home.[X74]

Why, because Google and electronic librarys are quickest or odfen the only way to get papers. Universities should have licences to hold local electronic copies for journals they subscribe to or at least cache some selected papers locally to save a whole class individually downloading the same paper.[X93]

The electronic library gives me access to books, journals and articles all of which are important for my study.[W102]

The electronic library facilities to read online journals, reserve books and search for relevant texts and the word processing package to present my information.[W109]

However there were a number of criticisms of electronic libraries.

Do not like electronic library as i end up trawling around links which lead nowhere and it would be quicker to go and physically pick up the journal from the real library.[AC71]

I missed a lecture on using electronic libraries and on "athens" and afterwards found it really difficult to pick up - maybe there could be more guidance for students about this.[AC145]

Electronic library - sometimes hard to find what you are looking for, sometimes easier to just look through books in person in the library.[AC158]

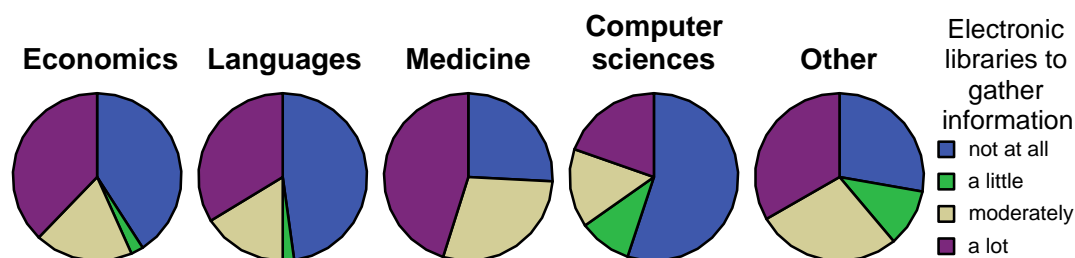


Figure 7. Using electronic libraries to gather information

Learner voice three shows how one medical student used Google search engine ‘almost everyday’. Again this extract from the interviews highlights the prevalence of the internet as a tool through which to supplement course material, refine understandings and definitions of terms and search for research material on specific topics. The medical student specifically discusses electronic libraries such as ‘pubmed⁷’, ‘eMedicine⁸’, and ‘GPnotes⁹’, which are libraries dedicated to her study and professional practice. The student discusses in detail the relationship between carrying out more general searches via Google and these key libraries. Interestingly this information was also sometimes cross-referenced with free online textbooks, such as Kumer and Clark¹⁰, which are specifically related to medicine or online course material from other universities. The student in partiuacalr notes how it would be too much to ask one university to produce all the necessary materials and therefore considers the material that is available online as one ‘pool’ - a common, open resource that can be used by all. Again such student practice indicates how central the web is to their learning processes and the sophisticated vetting and validation processes they engage in tocritique online material.

Wiki’s were frequently mentioned in the survey but deeper analysis showed that they are mainly used by computer science students as a tool for learning collaboratively and gathering information (see appendix B figure 21)

Wikis (most specifically Wikipedia) used to explain something in notes which have not been explained well.[W49]

Individual Wikis for specific purposes[AO154]

I used Wiki's due to their good mathematical definitions.[X206]

⁷ <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?DB=pubmed>

⁸ <http://www.emedicine.com/>

⁹ <http://www.gpnotebook.co.uk/homepage.cfm>

¹⁰ <http://www.kumarandclark.com/>

Wikis are good sources of information and I can transfer information onto my PDA to review at a later date [W342]

The following quote gives a good illustration of how a student uses wikis in combination with a range of other information sources, validated through peer review.

I search for what I need using Search Engines and Wikipedia, and build up a list of things that I need. I reference those through to Word, and send the file to my peers through IM, where I get feedback and additional info. on what's going on and how the things I'm researching relate to the current area of study.[W337]

Learner voice five shows how a student from the computer science subject centre recently discovered Wikipedia and demonstrates the degree to which students do or do not trust sources such as this in terms of whether they represent authoritative sources. In this particular case the student did feel that this was a trustworthy source, reasoning that because it was peer reviewed if information was incorrect it would have been changed so therefore the information it provides is appropriate to his studies.

5.2.3 Tools for assignments and presentations

Word was cited extensively by students when asked which tool they liked most and it was evident that students were using it as an essential tool to support their studies. Word is used by the students not only for writing assignments, but also more widely - for example when planning and working on group and individual tasks, revising for an exam and viewing course material (see appendix B, figures 22 – 25).

I find Word the best and most useful tool for putting together my research and assignments.[W6]

I use word to write course works and organize course material.[W37]

Word processing - For course reading and lecture notes, writing notes and assignments, planning and organising group assignments.[W47]

Word processing to manage information, write drafts. review and format work.[W72]

Word Processing - is the ultimate. you just need it for every thing you're doing, essays, presentations, letters, etc.[W107]

Word is used in writing notes, drafting emails, writing essays, presentations, in fact any type of written communication uses Word.[W167]

Since word processing is used so extensively to write an assignment we wanted to see whether or not there are differences here between the subject centres.

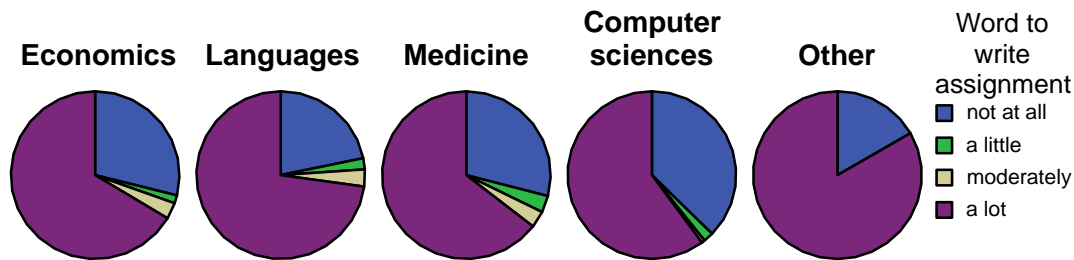


Figure 8. Using word processing software to write an assignment

Word is listed as the fourth most popular technology used by students (see figure 1) and based on figure 8 we can see that word processing is used extensively by students across all the disciplines; most students give ‘using word processing’ the highest value of use (‘a lot’ = 3). Usage and importance is roughly the same across the subject centres. However we can see also from figure 8 that across the subject centres there are still a lot of students who do not use word processing at all when writing an assignment.

The extensive use of Word is not surprising and echoes the findings of a related parallel study which evaluated the JISC-funded eBank project (Conole, 2006) which showed that final-year Chemistry undergraduates also emphasized the importance of Word and their preference for word processing material rather than writing by hand.

Word just makes everything look so much tidier than handwritten (especially since I've done most my work on computer since GCSE's 4/5years ago and my handwriting isn't the neatest now through lack of practice)... [X46]

Furthermore the findings demonstrated that Word is being used in a variety of sophisticated ways. Word was quoted by many as being used extensively to prepare for assignments. It was quoted as been useful for organizing materials and the students’ thoughts. Students mentioned that because of the cut and paste facility it was easy to change and adapt the structure of an essay. It was cited as being useful because it was possible to write down ideas and then subsequently move and manipulate them, to ‘gather thoughts’ or ‘put ideas together’.

I usually word process my work since it is easy to change the structure of an essay (without copying it all out again).[X43]

Use word processing to put together ideas and to write up work.[W11]

Spelling checking and the thesaurus functions were also mentioned as valuable, the latter in terms of being able to generate different words. Interestingly a number of students referred to the importance of being able to spell check their work – particularly before sending material to their tutor, which echoes the findings of the eBank study (Conole, 2006), suggesting that they have a degree of insecurity about their spelling ability.

Write all my assignments using Word and to sort through the information I find, make notes of what I still need to do and spell check my emails that I'm sending to lecturers.[W46]

I use word processors as it is easy to use and has many formatting features and also a spell checker.[X381]

Word processing is very important because it generates different wordings using thesaurus and it is helpful when I need to do my assignments.[X305]

As discussed later these patterns suggest that there is evidence here of a fundamental change in practice and the way in which students undertake their study, evidence of actual cognitive change and the co-construction of knowledge by the student and tool, ie Salomon's notion of distributed cognition.

The presentational aspects of Word were also cited as important to the students. The fact that Word enabled them to produce a well structured and presented document was important to them.

They are effectively a requirement and help produce professional-looking work.[X427]

Easier to look professional when use computer to design presentations and assignments.[X71]

The Word count function was also noted probably as a consequence of students' awareness of the need to stick within word limits for assignments.

Have to provide types assignments rather than handwritten and the tools it provides such as spell check and word count.[X47]

Word was also used as a vehicle for reading course materials, lecture notes, as well as general annotation and note taking.

Virtually, all my work is done using a computer and the Internet. However, I will still get books out of libraries but will make notes on a word processor. [AR43]

The facility to read from the screen using Word's improved 'read' function has probably shifted the proportion of students who are now willing to read from the screen rather than print material out, although students in this survey did also stress that for many of them the ability to print out and read electronic material was still important. Acrobat was also mentioned as a means of viewing pdf files electronically by a number of students.

Most of the journal articles that I have found online I have kept as electronic files and have read them using a reader such as adobe acrobat. [W180]

PowerPoint was also mentioned extensively. It was being used by students to both design and present 'professional presentations' but also as a mechanism for viewing lectures (see figure 9).

To write up notes or assignments (Word), to keep track of my work-load (Excel), to give presentations and view lecture notes (PowerPoint)[W27]

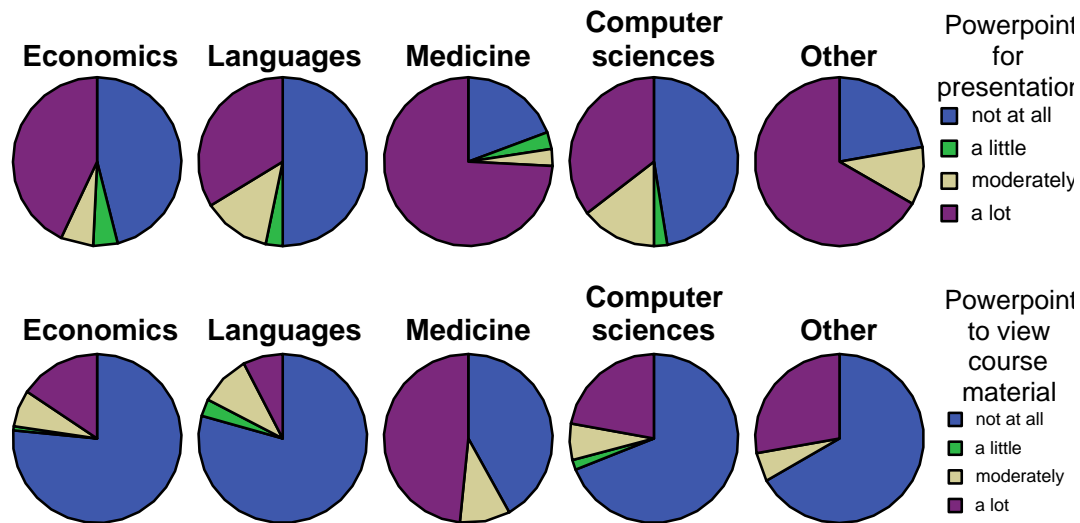


Figure 9. Using power point software to present and view course material, differentiated by subject centre

Figure 9 suggests that the Medical students are using PowerPoint more extensively than students in the other disciplines. However, the high percentage of Medical students using PowerPoint may be misleading (due to sampling and the sample size of each subject centre, see note 4 and table 1), as it is in part due to the fact that the medical students targeted for the in-depth studies (and also many of those who responded to the survey) were in their fourth year. This is a practical clinical year during which students have to do their Student Selection Component (SSC). As part of this they were required to make an oral presentation using overhead projectors. Students recognised the usefulness of PowerPoint for oral presentations but also noted that despite its widespread use, there was usually little or no specific training provided by institutions on how to use it.

It was also evident from the online survey that many of the tutors now supply PowerPoint presentations as a standard part of the course resources. From the student responses it seems that PowerPoint is also used to facilitate communication with students and teachers, to work on learning tasks collaboratively or individually, as well as to view, read and revise course material. The following sequence taken from the interviews, aptly demonstrates this point, specifically in relation to students' revision processes.

Learner voice five shows how one computer science student uses the PowerPoint lecture notes that his tutor put up on his university home page. It appears to be common practice in his department for tutors to put lecture notes, slide presentation, mock, and in some cases final, tests online. In this specific extract, the student discusses how he can 'flick' through the tutors' PowerPoint slides, when he has free time, making notes on them. This he discusses as an immediate, on-the-fly, central strategy for his revision processes. It is interesting that the student actually notes the number of slides (46) that the tutor has put online, discussing how many slides 'overlap', therefore reinforcing the main points he needs to know. Additionally he also discusses how at this point in his study (he is in his second year), he doesn't need to refer to the recommended textbooks that the tutor put on his website. Given how comprehensive the tutors' PowerPoint slides seem to be he notes that for now he has been

successful in revising in this way and that he may not have to refer to the recommended text books till his final year.

Basic software for manipulating data were also cited as being used for doing coursework and assignments; in particular Excel. Spreadsheets were cited as an important mechanism for generating or manipulating figures, graphs, but also occasionally to manipulate text – ie for example in tabling notes.

Some of the uses of tools for assignments and presentations were more imaginative and personalised, for example one student said that they used Excel to keep track of their workload, ie they were using it as a means of managing their learning, which can be taken as an example of an effective e-learning strategy. However the use of spreadsheets does not 'jump' out as a frequently used and popular tool. The use of statistical software on the other hand seems to be used more widely, especially within economics and computer sciences, according to the survey responses (see appendix B, figure 26).

More specialised tools were also cited as being used by students. For example mindmapping software was mentioned as a means of organising thoughts and information. It would be interesting to explore this aspect further, both in terms of how the use of such software might be changing the way in which students create and manipulate information, create new understanding and learn and also in terms of the use of this kind of software to help with specific learning difficulties. Mindmapping software for example is recognised as a valuable tool for supporting dyslexic students (Price, 2006).

Whiteboards appear to be used in the classrooms to some extent by students for communication and working collaboratively (see appendix B, figure 27 & 28).

Learner voice three illustrates how whiteboards were a commonly used resource in her course and in particular how they were used for collaborative patient diagnosis and study. The student also discussed more specifically the advantages and disadvantages of whiteboards. Comparing them to more traditional tools like flip charts or non-digital whiteboards, she notes how they allowed all students to easily view, store and retrieve material. One of the main disadvantages was that certain functions were 'a bit fiddly' and as with all technology required some time to learn.

MP3 players were mentioned by a lot of students. Some students use ipods or mp3 players for learning, whereas other students reserved the use of ipods or mp3 players purely for leisure and hence might not use these during their time on campus. Therefore some used them simply for leisure purposes but others did use them to support their studies, as a means of storing information or listening to podcasts or watch lectures.

Use internet on a daily basis, subscribe to podcasts and listen to my iPod. [AO157]

ipod - relaxation\google - research\msn/chatrooms - talking to friends [W230]

Others also downloaded or recorded music or other materials onto their mp3 players. The value of mp3 players in terms of helping students to relax was evident. For some background music on their mp3 is an important part of their learning strategy, they stated that 'it helped them to relax whilst working'. This clearly indicates a shift from old notions of

the importance of students working in a quiet uncluttered environment where they can concentrate on single sources of information. The survey suggests for many modern students their learning environment is the reverse – multifaceted, noisy, with conflicting information and material from different sources. It would be interesting to explore in more detail just how this is changing the nature of the way students are learning and what they are learning. DVD players were also used by some students as a means of viewing lectures or other video material. For some the boundaries of these different tools for learning or for leisure are blurred

The ipod allows me to listen to my favourite music as i work and also it allows me to save my work and is better than a memroy stcik due it being able to handle very large file sizes. [W361]

Clearly there are other social and cultural factors which impact on this, such as the fact that mobile phones are generally disapproved of, if not actively banned, in lectures and hence students either turn them off or don't take phone to lectures. As stated earlier many students referred to the fact that they had their own computers and many are also connected to the internet. As a consequence, for many their preferred study location was at home – where they could control their own environment.

However it is also evident that students do not use individual tools in isolation, use is integrated and multifaceted. They use a combination of tools for example to store and organise information. A lot of the students referred to the fact that they had their own desktop or laptop and see this as an integral tool in their learning. Technology for many was an essential tool for managing their information, workload and activities.

5.2.4 Integration learning

VLEs were cited as a general resource and for many were part of the 'background' of course provision. VLEs were cited as being used to access course information, lecture notes, to find out assignment details and also for revision purposes. There was some evidence that VLEs were also being used for online assessment purposes. Some stated that they also used the VLE to view specific course materials and to communicate with other students and staff – the latter depending on how individual tutors were actually getting students to use the VLE. Some did state that they saw the VLE as a fundamental resource for their course, whereas others see the VLE as either restrictive or unhelpful.

In relation to VLEs and online learning in general, it was interesting to hear from a computing science student, who found that a mixed, blended learning approach was their preferred method. Learner voice five (section four) demonstrates both the merits and disadvantages of online learning. For example, the student discusses the advantages of having online course materials as they allow students who live in rural areas or some distance from the university the option of not having to travel to the campus to attend physical lectures. He also commented that it means that if students miss a lecture they can easily access the notes. The student also talks about the benefits of having weekly practice tests online, which built confidence that you're in 'synch' with your course and understand the material. These summative forms of assessment, allowed the student to incrementally build their knowledge base.

However the disadvantage of having all course material online is that it could lead to a situation where students do not think it necessary to attend physical lectures and so begin to lose contact with peers and tutors. Learner voice five discusses this in relation to a particular module from the previous year, which was delivered entirely online. Although the student personally thought this module ‘dragged’ a bit and therefore was not the best example to discuss online material, the experiences was discussed in relation to community building. The sense of community that face-to-face contact does not appear to happen or be supported for some students in VLE environments. Online learning experiences and tests are discussed as not feeling as ‘real’ as paper and pen tests, which once completed you feel you achieved your goal. At a later point in this interview the same student also discussed the importance of belonging and community that comes with face-to-face contact.

5.3 Students perceptions of technologies

Students are evidently comfortable with using technology and see it as integral to their learning. They are generally sophisticated users, using technologies in a variety of different ways to support different aspects of their learning.

I use them to find out information for assignments, and also to help me clarify my notes on each subject area that I study. Instant messaging is used to discuss issues with friends if a topic is not understood.[W108]

I use the mobile phone and email to communicate with tutors and members of groups which i am in. The electronic library facilities to read online journals, reserve books and search for relevant texts and the word processing package to present my information.[W109]

I use these technologies to present information in a format that is accessible and pleasing to students. \\I also use them to help me assemble information in a format that I understand it and can revise from it. [W263]

They are critically aware of the pros and cons of the use of different technologies and ‘vote with their feet’ – i.e. they don’t use technologies just for the sake of it – there needs to be a purpose and clear personal benefit.

I dont think i 'fit it around' other learning activities, i find to learn effectively i use them to complement each other i.e. searching elec library to find a paper and then printing it off to read.[W289]

They don’t see the technology as anything special - it’s just another tool to support their learning. And finally they have an expectation of being able to access up to date and relevant information and resources and see this as vital.

Use it alongside traditional learning, sometimes do activities completely based on technology, but often use them together, ie research using books then write essay on laptop, or find an activity online, eg. grammar exercise and print it off and do it as a hard copy. [W212]

Indeed a number of students found the whole idea of differentiating between ‘learning’ and ‘e-learning’ inappropriate.

This is a silly question, We've been brought up using new technologies, and introducing new ones to our way of working as new technologies appear, it's not a case of "fitting around" it's just the way I work, using multiple methods, some "traditional" some e-learning.[AR387]

But throughout the findings the views on e-learning and its importance in comparison with other forms of learning is mixed, depending on a complex range of factors such as personal preferences, experiences of technologies, relevance and peer/tutor pressure.

One half of my course has really embraced e-learning and the other has not done so to the same extent; the side that has embraced it to a greater extent is a more organised school than the other.[AR329]

5.3.1 Reasons cited for using technologies

There were a range of reasons given by the students as to why they particularly liked using technologies. The main reasons cited were that they were:

- easy to use
- fast
- effective (in terms of doing what the students wanted)
- efficient (in terms of saving time)
- multi-functional (offering a variety of functions in one tool, enabling them to undertake a range of activities at once)
- accessible.

In addition they outlined some specific advantages of particular tools and functionality that were possible. Two overarching uses emerged – using tools to communicate and using tools to find information.

In terms of communication, email was cited by many as the easiest means of contacting tutors. Instant Messenger is also clearly important and for some a primary communication tool between students. They stated that the different communication tools they used (email, MSN chat, discussion forums, mobiles, etc) were an invaluable means of accessing people (other students and tutors) who could help them with their studies, suggesting that if these communication tools weren't available to them they would not be able to contact them or at least would find them more difficult to contact. Email and MSN messenger was cited as cheaper and less time consuming than other means of communicating and email in particular was clearly a major communication tools for most of the students. Ease, speed and convenience were clearly important and recognised benefits of these technologies for the students.

...they [sic] are easy to access and actually they are the most common technologies for a student.[X68]

Messenger-to keep in contact with classmates if I have any queries\\Email-to keep in contact with tutors/lecturer should I have any queries\\Word Processor-to do any assignments/essays\\Blackboard-to access course material.[W73]

Messaging is an easy and convenient way to keep in touch with friends and to discuss problems. [W92]

...instant messengers allow communication with a great number of students simultaneously whilst still allowing one to continue with ones work. [W95]

MSN Messenger for talking to other students to plan group meetings - very effective already\\Email to talk to tutors and students to plan meetings and be sent important information (e.g. exam dates)- very effective already. [W158]

Search engines were mentioned extensively as a means of finding out information and they demonstrated that they had a good understanding on the whole of how to search for and retrieve relevant information. Search engines and subject portals were recognised by the students as helping to make the gathering and finding of information relevant to their courses easier, suggesting that they were aware of the complexity of the internet in terms of the sheer magnitude of information available. Search engines were also seen as a convenient and easy ways of accessing information and as a 'first port of call'.

I also love to use search engines for researching oth in side and out side of my studies. [W387]

Search Engines have enormous knowledge available.[W392]

Search engines - i use to research any information that i need.[W2]

Read notes on the internet, extra information related to topics on search engines and spreadsheets like excel.[W8]

I use search engines to find information.[W33]

I use search engines to search for information to use on assignments.[W80]

Students also mentioned that they used e-learning as a means of catching up on material if they had missed part of the course for some reason. Having lecture notes and other material easily accessible via a course website or VLE is clearly important in this respect.

As a mature student and mother I find e-learning helps me manage my time more effectively. I am free to work from home if necessary and can catch up on any lectures missed or discuss any problems without using the phone or going in to college.[AR384]

Students also mentioned that they find it useful to be able to use the technologies to share files with other students and with their tutors, hinting at a move towards more of a collaborative approach in their strategies for learning. They also state that current tools enabled them to work more easily and efficiently on group projects.

A number of subject specific tools were mentioned. These varied depending on the nature of the discipline; for example in some cases the specialised tools were for manipulating data, whereas in other cases they were discipline-specific resources or portals. The BBC was mentioned by a number of students as an important source of information and resources.

BBC for information on current affairs and interests, tv for news and other interests, electronic journals to read up on economics papers.[W4]

I use the internet to keep up with current events via the bbc news website.[W381]

Many of the economics students for example cited the BBC website as an important resource for gaining up to date news information or useful podcast interviews with experts. It was interesting to note that quite old resources, such as the TLTP-funded Winecon software were still in use and integrated into course curricula.

Use the win-econ system and test myself and the material learnt in class.[W2]

Generally e-journals were recognised as important for gaining access to authoritative research text.

Electronic journals to read up on economics papers.[W4]

Use electronic libraries for journals\research essays google.[W87]

The electronic library gives me access to books, journals and articles all of which are important for my study.[W102]

Electronic Library: especially for online journals and other chapters that have been uploaded as PDF files.[W208]

Not surprisingly, those undertaking numerate subjects used a wider range of advanced data manipulation software:

I use Maple to solve simple models analytically and quickly determine their behaviour. Matlab is for bigger models that need to be solved numerically. I use both of these to produce figures for presentations and articles (set in LaTeX). I use Stata for statistical analysis.[W58]

The scientific packages (Maple, Matlab, Stata) help me to get the results I need very quickly. I can see how my ideas work or what the data looks like without having to write loads of code. They're pretty effective already, though I have a few complaints about the Stata and Maple interfaces.[X58]

5.3.2 Student opinions of e-learning

Finally the survey was used to find out more about student opinions on e-learning. We asked the students to respond to eleven statements about e-learning (see appendix B under question 18 for general descriptive statistics).

E-learning was cited as an important part of their course across all four subject domains but was particularly high for medicine. (Table 3).

Table 3 Percentage values by subject discipline (Q18a)

e-Learning is an important element of my course					
Ec	Lang	Med	Comp	Other	

10%	11%	3%	14%	0%	Not applicable
5%	10%	0%	2%	6%	Strongly disagree
7%	9%	7%	1%	12%	Disagree
9%	8%	0%	14%	0%	-
39%	37%	32%	25%	29%	Agree
30%	25%	58%	44%	53%	Strongly agree

The response to the question ‘With e-learning I interact more with other students’ was fairly similar with slightly higher percentages for computing and medicine (Table 4).

Table 4 Percentage values by subject discipline (Q18 b)

Without e-learning I would be unable to study					
Ec	Lang	Med	Comp	Other	
11%	12%	3%	15%	5%	Not applicable
9%	12%	7%	10%	24%	Strongly disagree
26%	29%	16%	16%	18%	Disagree
16%	13%	32%	14%	12%	-
25%	20%	29%	23%	24%	Agree
13%	13%	13%	22%	18%	Strongly agree

E-learning was seen as an important tool for learning and was perceived as helping to make learning easier (Table 5), again with slightly higher figures for computing and medicine.

Table 5 Percentage values by subject discipline (Q18c)

e-Learning is one of a number of important components of my course					
Ec	Lang	Med	Comp	Other	
13%	11%	7%	14%	0%	Not applicable
5%	11%	3%	1%	0%	Strongly disagree
9%	11%	13%	4%	12%	Disagree
16%	16%	7%	18%	12%	-
42%	37%	42%	39%	47%	Agree
16%	14%	29%	25%	29%	Strongly agree

Table 6 Percentage values by subject discipline on (Q18 d)

e-Learning makes my course more enjoyable					
Ec	Lang	Med	Comp	Other	
13%	13%	3%	15%	6%	Not applicable
2%	7%	3%	2%	6%	Strongly disagree
13%	4%	3%	6%	6%	Disagree
23%	26%	32%	27%	35%	-
31%	29%	36%	32%	29%	Agree
17%	21%	23%	18%	18%	Strongly agree

In general most of the students across the disciplines are responding rather positively towards e-learning in their courses and are quite neutral about how e-learning is being used within the institutions.

Table 7 Percentage values by subject discipline (Q18 e)

My college/university is not very smart in the way it uses e-learning					
Ec	Lang	Med	Comp	Other	
12%	16%	3%	15%	6%	Not applicable
6%	15%	13%	8%	18%	Strongly disagree
29%	20%	32%	27%	29%	Disagree
22%	19%	39%	27%	29%	-
20%	21%	10%	17%	6%	Agree
12%	9%	3%	7%	12%	Strongly agree

Table 8 interestingly shows that the students do not really think that e-learning leads to more student interaction.

Table 8 Percentage values by subject discipline (Q18 f)

With e-learning I interact more with other students					
Ec	Lang	Med	Comp	Other	
14%	13%	3%	14%	0%	Not applicable
9%	8%	20%	8%	24%	Strongly disagree
29%	24%	36%	20%	24%	Disagree
21%	20%	23%	23%	41%	-
20%	26%	23%	23%	6%	Agree
8%	10%	13%	13%	6%	Strongly agree

Table 9 and 10 indicate that students nowadays are very computer literate and confident in using various kinds of technologies. Also the students don't seem to have problems in 'getting online'.

Table 9 Percentage values by subject discipline (Q18 g)

I find using computers difficult					
Ec	Lang	Med	Comp	Other	
10%	11%	3%	13%	0%	Not applicable
51%	50%	39%	72%	64%	Strongly disagree
25%	29%	48%	8%	12%	Disagree
9%	2%	7%	3%	6%	-
4%	4%	0%	3%	12%	Agree
1%	3%	3%	0%	6%	Strongly agree

Table 10 Percentage values by subject discipline (Q18 h)

I find using technological devices difficult (eg. pda/mobile phone/mp3 player)					
Ec	Lang	Med	Comp	Other	
11%	14%	3%	13%	0%	Not applicable
52%	37%	45%	71%	47%	Strongly disagree
25%	32%	39%	11%	29%	Disagree
9%	11%	10%	3%	12%	-
2%	7%	3%	1%	12%	Agree
1%	0%	0%	1%	0%	Strongly agree

Table 11 Percentage values by subject discipline (Q18 i)

Getting access to an Internet-connected computer is a problem for me					
Ec	Lang	Med	Comp	Other	
10%	11%	3%	15%	0%	Not applicable
59%	59%	26%	65%	47%	Strongly disagree
21%	26%	53%	15%	53%	Disagree
7%	2%	7%	3%	0%	-
3%	0%	3%	1%	0%	Agree
0%	2%	7%	2%	0%	Strongly agree

Table 12 Percentage values by subject discipline (Q18 j)

e-Learning makes studying easier for me					
Ec	Lang	Med	Comp	Other	
15%	12%	3%	14%	12%	Not applicable
3%	2%	13%	5%	0%	Strongly disagree
6%	10%	3%	2%	6%	Disagree
7%	15%	13%	18%	18%	-
40%	27%	36%	30%	24%	Agree
30%	34%	32%	30%	41%	Strongly agree

In the table above the students across the subject centres make a clear statement that e-learning makes studying easier for them and indicate that there is a future for e-learning in their courses (see table 13)

Table 13 Percentage values by subject discipline (Q18 k)

It would be good if there was much more e-learning in my courses					
Ec	Lang	Med	Comp	Other	
14%	14%	3%	17%	6%	Not applicable

2%	8%	3%	6%	24%	Strongly disagree
12%	21%	23%	7%	6%	Disagree
32%	29%	45%	27%	35%	-
20%	16%	13%	25%	6%	Agree
20%	12%	13%	19%	24%	Strongly agree

6. Appropriation of technologies, factors influencing use and changing practice

Analysis of the data across the three sources reveals a number of interesting results which give us a valuable insight into students' current practice in using technologies and their experiences. These are discussed here under the following main headings which emerged from the data:

- Appropriation of technologies by learners
- Factors determining or influencing use
- Changing practice and learner competences

6.1 Appropriation of technologies and types of activities

The findings from this study showed that students were using technologies to support all aspects of learning; directed study, resource discovery, preparation and completion of assignments, communication and collaboration, presentation and reflection. In addition the study revealed that their use of technologies for learning is intermingled with use of these tools for social and leisure activities. The data shows that students are using a range of different types of e-learning strategies, appropriating the tools to meet their own needs.

In this section we draw on the findings discussed in sections four and five to highlight illustrative examples of how the students are using technologies across these different components. The examples are intended to demonstrate how students are appropriating technologies for particular uses.

The DialogPlus project has developed a learning activities taxonomy (Conole and Fill, 2005, Conole, forthcoming) which describes the key components of a learning activity. This includes the context within which the activity occurs (level, subject, learning outcomes, etc), the pedagogical approaches adopted (associative, cognitive, situative) and the tasks undertaken by the students. An adapted summary of the components related to the tasks undertaken by the student is given in table 14.

Type (What)	Technique (How)	Interaction (Who)	Roles (Which)	Tools & resources	Assessment
Assimilative	Annotated reading	Individual	Individual	Word processor	Not assessed
Information	Collate resources	One-to-one	Participant	Spreadsheet	Diagnostic
Handling	Modelling	One-to-many	Facilitator	Search engines	Formative
Adaptive	Online Debate	Group based	Pair person	Virtual worlds	Summative
Communicative	Essay	Class-based	Presenter	Forums	Self-reflection
Productive	Virtual field trip	<i>Etc...</i>	Peer assessor	Wiki	Metacognition
Experiential	<i>Etc...</i>		<i>Etc...</i>	<i>Etc.</i>	

6.1.1 Assimilative tasks

Assimilative tasks are traditionally considered as predominately passive in nature (reading from a text book, viewing television, listening to a piece of music). The data reveals that the students were using a variety of tools to do assimilation tasks; scanning through web sites and resources, reading pdf files, listening to podcasts or viewing streaming video clips. However what was striking is that these assimilative tasks are far from 'passive' in nature. Students were cutting and pasting relevant material whilst scanning a range of resources (course materials, relevant web sites, blogs, wikis). They were listening to podcasts whilst on the move, or listening and making notes. Therefore these technologies enable the learners to 'assimilate' information in a variety of different ways, depending on what they choose or want to learn, influenced by the time and the location in which they are learning. The sheer variety of technologies and possible ways in which they can be used allowed students to take control of their learning and to be creative in terms of how the tools were used. The following quotes give a flavour of the variety and ingenuity of ways in which students 'assimilate' information. The first four demonstrate how students use a variety of different media formats to assimilate information – reading, viewing or listening, in situ or on the move, independently or in combination with other methods.

My PDA is useful for reading things when I'm on the move.[AR82]

Use the net/Wikipedia to find out background information, and find out further reading from that. Listen to RFI French radio programmes on my MP3 player when out and about. [W154]

DVD player for viewing course material.[W215]

Using slideshows of lectures and tutorials for learning and reviewing.[W400]

Many of the quotes showed how students were complementing 'core' material with supplementary material from the web, demonstrating the ability to synthesise and integrate information from a variety of sources. The quotes also demonstrate the way in which students are actively engaging with the text.

I will often be reading parts of a course book whilst finding similar information on the internet.[AR147]

They work together, reading through notes and googling unknown terms, or searching wikipedia for an alternative explanation. [AR89]

As discussed in more detail in the next section, personalisation of technologies is evident with students having developed learning strategies which utilise the technologies to play to their strengths, as with the following example of auditory learning using mini-disks

Also, I record reading my revision notes aloud on a digital mini-disk player and then listen to them to revise.[AR208]

The students appear comfortable with using and integrating multiple sources. In the following example the student shows how they store information electronically for future reference, building up their own electronic repository of information. The student is comfortable with translating information into different formats. It is possible in this instance that they have developed these skills through manipulating audio files for leisure purposes, transferring the skills gained for learning purposes as described here.

Most of the journal articles that I have found online I have kept as electronic files and have read them using a reader such as adobe acrobat. Audio data I have collected and had to transcribe I have put into mp3 files that I have played on my mp3 player.[W180]

Having learning materials available electronically also means that students now have access to a greater range of materials than before; paper-based materials which were previously in short supply when made available electronically can be accessed by a limitless number of students.

6.1.2 Information handling tasks

Information handling is an essential skill which students need to develop, whether they are studying Arts and Humanities or the Sciences. Students need to be able to manipulate and adapt information – to collate and summarise text, to create or annotate images, to manipulate numerical data, or to interrogate a large corpus of data. The in-depth studies and the survey data reveal that students are using both standard tools such as Word and Excel, as well as more specialised or subject-specific software, to find, manipulate and make sense of different types of data/information available through a range of different types of media and formats. Particularly for students studying numerical subjects, use of technology for data manipulation is important and this was evident from the data, with both Excel and more specialised statistical software cited by the students. Part of the skill is about students being able to critically select appropriate information (from a vast variety of sources), to manipulate and use this information and to manage and archive it for future use. The students demonstrate a variety of uses, again showing how they adapt the tools to their own needs.

Use it to manage my data and thoughts... \\endnote for referencing \\spss - stats software - easier dataentry, producing stats..[W105]

Easier to move things around documents\\endnote easier to manage references than typing in yourself - getting formatting correct\\generate anaylsis/graphs in spss - quicker and easier to manipulate\\online datebases - eg. abi inform used to find publications etc - good search terms \\.[X105]

To find information and especially to manage it. When writing up my thesis I use Endnote to search for and insert references. Atlas-ti and SPSS are used for data analysis, with graphs etc. copied to the thesis.[W179]

Microsoft word I have used to write essays to submit to lecturers with use of excel for diagramatical and statistical effect and I used a statistical package called e-views to learn aspects of econometrics.[W96]

TWINSpan and DECORANA were statistical computer programmes that helped me analyse the results obtained for my independent study. Microsoft Excel was used to make business decisions as part of a module at university. [W298]

To write up notes or assignments (Word), to keep track of my work-load (Excel), to give presentations and view lecture notes (PowerPoint), usually my IT assignments include creating a database for which I use Access. [W27]

Interestingly, mindmapping software also emerged as an important tool for some students in terms of both creating ideas and managing information.

Mind mapping to manage the information and to prompt writing and presenting it with word processor and PowerPoint and graphical packages to add graphics. [W234]

Mind mapping so that I can have all the information to hand in a short concise way. [X234]

6.1.3 Adaptive tasks

There were few explicit examples of students undertaking adaptive tasks using modelling or simulation software. This is to be expected given the nature of the subject disciplines considered, although modelling is a common and important aspect of economics. Those examples, which were present, demonstrate the evident value students place on the use of adaptive tools, for manipulating data, testing out ideas and presenting information in different ways to highlight specific issues or emergent themes. A number of the replies hint at the value of specialised software for manipulating large amounts of data and it is interesting to speculate how in the future students might harness the potential of grid-technologies for enabling large-scale, distributed data manipulation and research which is currently being explored in the research communities, particularly through initiatives such as e-Science and e-Social Science.

I use Maple to solve simple models analytically and quickly determine their behaviour. Matlab is for bigger models that need to be solved numerically. I use both of these to produce figures for presentations and articles (set in LaTeX). I use Stata for statistical analysis. [W58]

The scientific packages (Maple, Matlab, Stata) help me to get the results I need very quickly. I can see how my ideas work or what the data looks like without having to write loads of code. They're pretty effective already, though I have a few complaints about the Stata and Maple interfaces. [X58]

6.1.4 Communicative tasks

Examples of the social dimensions of the use of tools are prevalent throughout the data. As outlined in sections four and five students use a range of tools to communicate with fellow students, tutors and friends. Although, as is evident in sections four and five, search engines were used extensively to find information and the internet was clearly used by the majority as their first port of call for information, what was not expected but what did come across clearly from the data was the fact that students were using technologies in a variety of often very sophisticated ways to communicate with their peers and communication tools emerged as an important element in their strategies for learning – examples cited included using

mobile phones, Instant messaging and discussion forums, as well as the expected use of email. The quotes drawn out here demonstrate a variety of uses of tools, used to support a range of communicative activities and also give an indication of what the students see as the benefits of each of these different tools – speed, convenience and fitness for purpose emerge as important success factors.

I would use a search engine to help gather on line information and research and use email and messenger to stay in contact with my group and to forward work to each other.[W6]

I dislike using discussion boards as often they are not used properly and I find that groups tend to prefer to use email or msn anyway[AC06]

Word processing - For course reading and lecture notes, writing notes and assignments, planning and organising group assignments. PowerPoint - When designing presentations with individually or as a group.[W47]

Instant messenger, free to use, easy of use to speak to people with fast resposne, ability to share files across it, ability to work on group projects with it, and ability to video conference. [X53]

Email word processed documents during group projects. Arrange meetings by text message on mobile phones.[W74]

Discussion board- communicating with students and lecturers\\web messenger-communicating with other students to discuss modules, assignments and working in groups[W213]

MSN messenger - discussing problems or ideas with coursemates, sending files for group projects or links for useful resources\\Email - Sending group work to group for editing; sending resources to coursemates or queries to tutors[W221]

I use email daily to keep up with information from my uni, and communicate with friends and relatives. I use a variety of computers in lots of different locations in doing this. \\During the section of my course requiring group study I used an electronic whiteboard a lot but have never used one before or since.[W225]

The biggest thing that would allow me to use them more effectivley is if more students were aware of what the possibilities of using group collaboration tools such as citeulike and del.icio.us.[X252]

Finally Mindmapping is more for group projects and assignments.[X205]

Instant messaging was mainly used to communicate with fellow students to keep track of events and discuss group work. Electronic whiteboard was ocasionally used to give presentations.

I use instant messaging for group interaction when we have group projects. (usually involving software development), E-mail is a necessity for communication within our department and internationally, it is my lifeline.[W329]

6.1.5 Productive

Word and PowerPoint emerged as key tools for producing learning artefacts, whether they were essays, presentations, reports, or portfolios. As discussed in section five students use these tools creatively - mixing and matching their functionality to suit their own individual needs and despite the fact that the use of these two particular tools was almost ubiquitous, the ways in which individual students used the tools varied significantly. They recognised the benefits of using these tools to produce more professional looking and engaging materials and indeed for many producing computerised assignments appears to be a requirement. The students integrate the use of the tools to produce particular artefacts – mixing the use of Office word tools, with information gathered from the internet and where appropriate more specialised or subject specific software. Many are aware of and use information management tools such as bibliographic software.

Use word processing to put together ideas and to write up work. PowerPoint I only [use] during final stages of work by creating summary slides. I use email to communicate with students. Use laptop computer at home. [E9]

They also make the finished piece of work look more professional. [X246]

Have to provide types assignments rather than handwritten and the tools it provides such as spell check and word count. PowerPoint is an effective and easy way to design professional presentations.[X47}

Easier to move things around documents\\endnote easier to manage references than typing in yourself - getting formatting correct\\generate analysis/graphs in spss - quicker and easier to manipulate\\online databases - eg. abi inform used to find publications etc - good search terms.X105]

To find information and especially to manage it. When writing up my thesis I use Endnote to search for and insert references. Atlas-ti and SPSS are used for data analysis, with graphs etc. copied to the thesis.[W179]

6.1.6 Experiential

Experiential type activities are those which enable students to explore and apply concepts – they include activities such as practicing techniques, applying understanding, mimicking others (such as adopting an apprenticeship model of work practice), exploring and investigating. These types of task become increasingly important as students progress throughout their period of study and are some of the key skills required in the work place. In particular experiential type tasks are particularly evident with the medical students included in the study, because work-based practice is an integral part of their course.

An important aspect of learning is providing students with a variety of engaging ways in which to practice what they have learnt. The following quotes provide some examples of how the students are using the technologies to carry out a variety of experiential tasks. In the first example the student is actively using a range of technologies to record information, to produce materials, and to manipulate data. In the second example the student highlights the importance of practicing concepts as part of his learning process and of applying the concepts learnt in structured sessions.

Digital Camera - Used for recording experiments and details of machines, and for taking pictures to illustrate reports. Modelling software - Used for producing working drawings for the construction of prototypes and for producing illustrations to insert into reports. Spreadsheet - Used for a range of tasks including mathematical modelling of machines and creating text tables.[W419]

As I am doing a computer course it is a lot easier as many ways of revising for an exampl is simple by practicing what we have done in practical lessons.[AR292]

6.2 Types of learning

Dyke et al (2007) provide a review and critique of modern learning theories and argue that

What is missing is a metaview of the key themes which emerge across these different positions with specific reference to e-learning.

They argue that e-learning developments could be improved if they were orientated around three core elements of learning:

- through thinking and reflection;
- from experience and activity; and
- through conversation and interaction.

With respect to these, what is evident from the data is that students are demonstrating all of these core elements of learning in the way in which they are using technologies. They are combining the technologies, synthesising and re-appropriating materials, checking meaning and understanding with others, self-reflecting and evaluating.

6.2.1 Thinking and reflection

Reflecting on learning has long been recognised as a core ingredient of success for learning. The data reveals that technologies offer students a range of opportunities for reflection – tools to annotate and combine information in different ways, the ability to compare different definitions and explanations from a range of sources, and tools to manage their learning. In terms of learning management students are using a range of tools – some use the task facility available in Outlook Express whilst others use dedicated project management software. Mindmapping also features as a useful way for some students to learn, as a way of representing and reinforcing concepts. Formative self-assessment is also used as a learning strategy either by using existing tests created by their tutors or available from subject specific websites or in some cases by creating their own personalised tests. Blogging not surprisingly also appears to be valuable in terms of enabling students to reflect on and share their learning, although usage of blogs varies – some students create their own blogs and use them specifically as a reflective learning diary, whilst some simply read other peoples' blogs.

I tend to use software such and MS Project and Outlook to organise work and projects. During revision i try and update notes and copy them onto software such as MS OneNote helping me to ensure they are not lost and are ledgible[W106]

Mind mapping is a great way to help me revise[W209]

Sometimes useful break from traditional learning methods (eg. complete an online self-assessment after doing some reading)[AR241]

I use them as aids to get my work done, collect it and store it and present it to myself and others in an understandable manner.[X254]

I use blogging as a personal means to reflect on work and what is seen in practice. Some of this is private some of it is open for viewing and commenting on others[W252]

6.2.2 Experience and activity

Technologies provide a wealth of opportunities for students to engage in authentic and situated learning context – to learn by doing and through experience – from the opportunity to become immersed in virtual worlds through to being able to connect their work-based or vocational learning with their course context. Course Virtual Learning Environments, and indeed just basic communicative tools such as email and msn, mean that students can stay in touch and feel connected to their cohort whilst off campus. The data reveals that the students are very much networked and inter-connected, and that the breadth of technologies available and in particular the opportunities technologies afford in terms of providing access to a plethora of different environments, people and resources provide new and exciting opportunities for students' learning to be more authentic and engaging as well as opportunities for them to experience situated learning.

Experiential learning is frequently evident in activity-based or situated learning – through fieldwork or laboratory based work or whilst students are on placement. There is evidence from the data that the technologies enable students to remain connected to their virtual course whilst in the field or on placement. Access to the resources and information available in institutional VLEs, as well as simple communicative technologies means that students still feel connected and part of an albeit 'virtual' cohort.

Most of my work is still fieldwork and reading/research based. Technologies support that, rather than fitting around it.[AR420]

More interaction with e-learning environment and learning activities. ie old exams, PowerPoint slides, submission of essay through e-learning[AR48]

I use my PDA as a diary to tell me where I need to be and also it has some medical software on it which is useful in the hospital.\\The virtual learning environment is my main form of communication with the medical school.[W228]

I use computers on campus and hospital/GP surgeries as I do not have one at home.[W244]

1. database software - am on placement in an investment bank currently and we do an awful lot to do with databases, and having the database UI to help this makes things a lot friendlier and more helpful[w266]

6.2.3 Conversation and interaction

Dialogic activities pepper all aspects of the reported student activities. Students are able to gain understanding and knowledge from 'other experts' through blogs, wikis or direct

communication. They can check understanding of concepts or compare resources found through peer interaction. They can share drafts and peer critique with colleagues and tutors.

The power of the tools now available enable social and interactive learning on a scale unprecedented before and what is clear is that the students are naturally making use of these forms of learning almost by a process of osmosis – in part because the technologies enable them to do so. There are numerous examples cited in the data where communicative and interactive aspects of learning as an integral part of the learning design implicit in their course, for example by working collaboratively on joint assignments or participating in group presentations.

Instant messaging - I use this to find out the status of group work assignments that have been given, I can find out if a certain area of work has been completed and I can tell others of my progress. \\Email - (same reason for using instant messaging) \\mobile phone - (same reasons as above but used when not possible to..[W279]

Instant messaging - Quick method of communication, could be used more effectively if I used conversations with multiple students, this would be ideal for group work situations. \\ \\ \\email- Quick method of communication, send attachments of group work to other students so it can be compiled[X279]

For the group sections its done by mainly using the SVN to collaborate everyones work together[W297]

Instant messaging was mainly used to communicate with fellow students to keep track of events and discuss group work. Electronic whiteboard was occasionally used to give presentations[W315]

I search for what I need using Search Engines and Wikipedia, and build up a list of things that I need. I reference those through to Word, and send the file to my peers through IM, where I get feedback and additional info. on what's going on and how the things I'm researching relate to the current area of study.[W337]

6.3 Factors determining or influencing technology use

6.3.1 Environment

The data revealed that the students are learning in a complex and changing environment, using a plethora of technological tools to support their learning; USB pens, ipods, mps players, integrated phones and specialized screen displays for reading were amongst the variety of tools cited.

I use my laptop to store data and type my course works. The MP3 player serves as a storage media used to save most of my assignments, electronic journals and articles, while I use MS word application to type most of my course works. The electronic library gives me access to books, journals and articles all of which are important for my study.[102]

The survey data confirmed that this really is the 'nintendo' gaming generation (Morice, 2000) and that the boundaries between students; use of technologies for learning and gaming are blurred. Many of the students on the survey reported that they play games and it is inevitable

that their experiences of interacting with gaming technologies will have a significant impact on how they learn with technologies and their perceptions of and expectations for technologies.

I use technology to email, text and talk to friends, play computer games, watch movies, listen to music, book holidays, look for places to rent, buy items, create websites, programming own software, etc. [AO312]

Much of what I use technology for in my studies are taken from how I use it for my life. Other than Blackboard, most of the technology listed above are used for all aspects of my life. I book coach trips online, play games on my computer, use the calendar[AO98]

The rich, interactive and engaging environment of games therefore has led to an increased expectation of similar levels of quality for learning materials. There is evidence that there is a shift from passive to more interactive interactions across all aspects of their learning (as demonstrated by the examples given in section 6.1 and evident through the learner voices described in section four). Finally as many students now own PCs and have wireless internet access, they have become accustomed to being able to access information or contact people on demand, anywhere.

Thus the environment students are working in is complex and multifaceted. Technology is at the heart of all aspects of their lives – a key question for institutions is whether institutional infrastructures match this rich technology-enhanced environment in which students are working and learning and perhaps more importantly whether courses are designed and delivered taking account of this.

But this multifaceted, always connected, always online environment has its down side too. A number of students mentioned that a downside of technology was that it was distracting, with some stating that they actually need to sometimes switch off/disconnect to be able to concentrate on learning. Of course this again relates to personal preferences, for some students the background white noise of information and multiple communications is part and parcel of their learning palette, others still need to create space, piece and quiet in order to learn.

Have to turn off desktop computer in my room in order to read - too noisy and distracting!\[AR163]

6.3.2 Usability

Despite the many favourable comments about technologies it was also evident that there were still significant usability issues. What is difficult to gauge from the data is the extent to which these are a consequence of the level of maturity of the particular tool or of the level of competency and experience of using technologies of the student. Nonetheless usability issues are evident and are clearly a barrier or at the least an annoyance to many of the students surveyed. Students are critical of software which appears 'old fashioned' or websites which are badly designed and structured so that the information they need is difficult to find. They find having to browse through structured websites frustrating, being used to the (deceptively) simple and apparent effective results available through search engines.

Stats Software - difficult to use!\\Bibliographic Software - ditto. Also, of questionable utility.\\Online assessment - Inflexible assessment method\\ELECTronic Whiteboard - temperamental! [AC242]

I use the concordancer in the Bank of English, but the interface is awkward and clumsy and old-fashioned. Could do with a revamp. [AC379]

I have set it up to forward to my Hotmail account, so it is not a problem, but it has a poor interface and serves little purpose. [AC154]

Some students appeared particularly frustrated – partly because of the design and interface of software but also because of mis-use or lack of use of the tools or other technical problems.

Groupwise is constantly down. WebCT and Blackboard have supposedly been embraced by the University of XXX but content is rarely ever provided by the course tutors and on the rare occasion that it is, it's not normally very useful. WebCT has an absolutely shocking interface and is an extreme waste of money. Our tutor relationship management system is ridiculous because the tutors don't use it, a lot of the problems caused by technology at the university is staff resistance or inexperience. [AC152}

6.3.3 Accessibility

The importance of ensuring accessibility for all in terms of the use of technologies has grown in importance in recent years, in part because of the change in law with the introduction of the Special Educational Needs and Disability Act (SENDA) in 2002. TechDis (<http://www.techdis.ac.uk/>) is dedicated to providing support for the sector and provides a valuable one-stop-shop on accessibility issues and assistive technologies. See Seale et al (Seale 2006) for a special issue in accessibility and e-learning

A number of entries in the survey related specifically to the opportunities technologies provide in terms of accessibility, these ranged from use of in-built functionality in Office tools (such as changing font size and colours) through to use of more specialised tools. The technologies are also being appropriated by learners to play to their strengths in terms of visual and auditory capabilities. Therefore students who have a preference for learning visually described how they used mindmapping and other visual software to support their learning; those who preferred to work from text, illustrated how they combine and annotate different explanations to create their own meaning, and those with a preference for auditory information download and listen to podcasts or create recording themselves.

An example of personalised adaptive use of technologies is nicely illustrated by Learner Voice Five who describes a variety of different ways in which he uses technologies to support his learning, including the use of a projector to revise, using it to present the lecturer's PowerPoint slides, which he supplements with information from internet sites and annotates to aid understanding.

The scanner to scan any material I need, either from books or from handouts. This is then translated into speech for me as I have a concentration deficit, therefore reading is a major problem. I also record lectures onto Mini Disc for the same reason. [W366]

I have to use Dragon, as I'm disabled and can no longer type. Its brill, cos it means I can still study and do my job. I use wp to write what I do, spreadsheets and stats stuff to manage my research data. [X112]

Word Processing I use to clear my thoughts and list what I need to do. Clear, big colourful font helps me learn more efficiently.[X205]

6.3.4 Ownership and personalisation

Students clearly place greater value on technologies they have “discovered” or selected for themselves. Ownership, personalisation and appropriation of technologies is one of the overarching themes which emerge from the data. Scanning the qualitative entries in Appendix C, the audio logs in Appendix D or the description of the learner voices in section four highlight the breadth and variety of the types of technologies students are using, the ways in which they are using them and the perceived benefits. Personalisation and a sense of control come across as key factors of success in the use of technologies. Almost any of the quotes could be used, the two listed below provide examples of the specific and different ways in which two students choose to use technologies to support their learning – in the first the student uses a range of technologies to provide him with an integrated and mobile learning environment, and in the second the student chooses to build his own personalised software to meet his specific needs. Other examples of where students use existing technologies creatively to plan, organise and undertake work or to communicate with others also emphasise the personalised and adaptive nature of the way in which students are using technologies.

I record conversations with lecturers when I go to discuss my assignment for later review and I also use my mp3 player to take notes more efficiently in my lectures and take more time to listen, if I need anything later. E-librarys are great because I'm not tied to being on campus and can work from home or abroad when nessecary. My PDA and laptop also give me increased mobility[W152]

build a lot of my own software (e.g. for bibliographic references) because it better fits my own ways of working.[W406]

6.3.5 Discipline demands

Section Four drew out some of the discipline specific differences which are evident across the fourteen in-depth learner stories. Disciplines, by their nature, privilege some skills and ways of knowing over others (Oliver, Roberts et al. 2007). See also the outputs from a joint JISC/HE Academy symposium held in February 2006,¹¹ and articles which explicitly explore some of the discipline differences with respect to e-learning (Hammond and Bennett 2002; White and Liccardi 2006; Oliver, Roberts et al. 2007). Maths and Science are underpinned by Mathematics, so an ability to manipulate data and in particular numerical data is an essential skills in these subjects. Other subjects have a more subjective or relativist perspective, and others still are fundamentally built on dialogic principles.

¹¹ <http://www.heacademy.ac.uk/eLDisciplines.htm>

Use of subject specific resources and web sites is evident across all the disciplines, but their use of tools varies and can be related to the nature of the subject discipline. For example the Economics students particularly mention using the BBC current affairs website and downloading podcasts, whereas e-Portfolios are specifically mentioned by the medical students because it is a requirement of their course.

I use the internet to keep up with current events via the bbc news website.[AO381]

BBC for information on current affairs and interests, ...bbc webcasts could be used more frequently, are phasing this in at moment, [W4]

I use my PDA as a diary to tell me where I need to be and also it has some medical software on it which is useful in the hospital.[W228]

RFI offers a good range of programmes about many subjects, which are free and downloadable (i.e. not in the awful RealPlayer format), and it's a good way of casually improving listening skills in a foreign language. I use email[X154]

It would be impossible for me to study medicine now without e-learning now. It is very closely integrated with traditional learning activities. Eg I will identify journal papers from the internet and access them on paper in libraries.[AR226]

Access to up to date authoritative information on current world events as they happen is a particularly valuable aspect of the internet and of particular use for students studying subjects such as economics, politics or sociology. Access to up to date, research data, through e-journals is valuable across all subjects, particularly for final year and post graduate students but is especially useful in fast moving research areas such as Science and Medicine. Access to up to date sources of information is also critical for Computer Science students but in this subject domain publishing through mailing lists, blogs, wiki and other more 'immediate', technologically-driven and networked forms of communication is more the norm. The subject differences in terms of the nature of information for their subject disciplines and hence the most appropriate sources for this type of information was evident throughout the Learner Voices and audio logs as well as through responses from the online survey.

BBC for information on current affairs and interests, tv for news and other interests, electronic journals to read up on economics papers, bluetooth to allow access to computer via other mediums [W4]

Electronic journals etc. recently discovered - e books and journals are a fantastic resource via an Athens Account. [W147]

I use search engines to track down reliable sources of information on methods (usually for programming) that are required for what I'm working on or to expand on a study topic. Wikis are good sources of information and I can transfer information onto my PDA to review at a later date - for things I don't need access to a PC for.[W342]

Electronic Library: especially for online journals and other chapters that have been uploaded as PDF files.[W208]

There is not a great deal of e-learning in my course. However, I find things such as the Internet an invaluable resource in order to reaserch up-to-date things in my field. Without this asset, it would be difficult to relate things which we are taught to modern day computing. [AR355]

There are differences evident too given the practical running of particular courses, for example for students on course which include a work-based or placement element, communication via email becomes particularly important.

Email \- most effective method of communication between students/staff. As medical students we are spread throughout the North East. Email allows all students/staff to be contacted no matter where they are based\ [X226]

Not surprisingly views on e-assessment could be associated in part with subject discipline focus. The more 'qualitative', 'textual' or 'visual' the subject, the less appropriate e-assessment (in the form of binary-type MCQ questions) was deemed to be. This maps closely to findings from the e-assessment research literature (ref). The in-depth case studies highlighted some nice examples of where students were using e-assessment for self-reflection formatively and there are some interesting examples from the survey data.

Sometimes useful break from traditional learning methods (eg. complete an online self-assessment after doing some reading)[AR41]

I use WebCT to download course/ lecture notes and complete online assessments.[AR213]

I use it alongside them. If lecturers make self assesment available, i will study for the exam and then do the test and see how i get on. it then tells me the weaknesses in my study for me to then concentrate on them [AR40]

However a number of responses about e-assessment on the survey were fairly negative stressing the impersonal and restrictive nature of simple MCQ tests, although not too much should be read into this as it focuses on a sub-set of possible types of e-assessment and is perhaps an obvious 'target' in the 'technologies least liked' section of the survey.

They [e-assessment tools] are no good whatsoever for languages, because it isn't a right-or-wrong scientific subject [AC177]

I dont like doing online multiple choice tests as theyre really easy to loose marcs in by clicking the wrong box etc. Its good as in you see your result straight away but It doesnt allow you to show your working whereas if you mistakenly pick the wrong answer you may have still got the marks if it had have been a written test and the marker seen your working out.[AC318]

Tools for manipulating data can also be aligned to particular disciplines with mathematical and modelling software being evident in the subjects with a numerical basis and qualitative software and concordance tools for more textually based subjects. Other students cited examples of subject specific software or resources which they used as well.

6.3.6 Learning strategies

The following quotes give some indication of the ways in which the students are using the technologies to support their learning and the different learning strategies they adopt.

I often summarise revision notes using word processing - to see it visually organised helps me. Also, I record reading my revision notes aloud on a digital mini-disk player and then listen to them to revise. I find I remember things better through repetition of hearing and reading together.[AR208]

Best example is revising for exam; I have my books open, my notes ready, and blackboard logged in. Once I attempt a solution, I check the right answers on blackboard. Before going to exam, After I've completely finished revising, I sometimes take the online Multiple Choice Questions...[AR98]

If im stuck on a problem, i will use google for similar examples and work out where i went wrong, then i will revert back to traditional learning activities. [AR114]

Most of my learning is done from books, the internet and electronic divices are useful but they are not an irriplaceable source of info or means of learning. [AR193]

6.3.7 Support and community

Another striking feature to emerge from across the data is the extent to which students are capitalising on the social affordances of technologies, much heralded under the banner of Web 2.0 (Alexander 2006), in terms of peer support and communication – the picture emerges very much of a networked, extended communities of learners using a range of communicative tools (email, msn, phone, discussion forums, wikis, blogs, skype, etc) to bounce ideas off each other, to query issues, to provide support, to check progress. This peer network is particularly valuable to students who favour a social approach to learning but it's almost universally important to some extent.

To what extent this social peer network replaces or complements existing support mechanisms is not clear. Students evidently do still use traditional support mechanisms - contact with tutor, study guides, additional institutional workshops and training – but it would be interesting to investigate further how much some of these are being replaced by students choosing to turn first to a fellow student for guidance. One of the most striking examples of this use of the 'just in time' peer network is evident from one of the extracts from the audio logs:

Today I used my mobile phone to contact a friend from the same course to ask them where I could get my cover sheet for my essay to hand in today. I had to do this basically because I searched the university web site and I couldn't find one and I didn't have one on my computer so I had to ring my fiend because I knew he had printed one out for himself earlier in the day... Well basically the mobile phone, ... if I didn't have one I wouldn't have been able to do this ...I was able to contact XX and ask him where I could find one... I found one on another student's home page who'd put it up there conveniently so that a lot of people could get it so that was pretty handy and I'll remember that in the future. [U3:11]

6.3.8 Institutional infrastructure

One surprising result was that many of the students showed a marked lack of enthusiasm for VLEs. Only one person mentioned a VLE as one of the four technologies they like to use most, and ten listed a VLE as a dislike.

Blackboard - don't like using it as I don't feel that it's a very good VLE system. Not the easiest VLE system to navigate. [312]

I think the VLE is set up very well, but could do with being updated more. [375]

This could be interpreted as the institutional VLE being just taken for granted, or that it is seen as having relatively little value. However it is more likely to be because in those instances the VLEs are being used primarily as repositories for materials rather than being used in more imaginative ways to support learning. A further factor is evident with the Computer Science students who have a preference for building their own environments rather than using off the shelf packages.

But there was also some evidence that use depended on existing practice amongst the students and tutors:

If all the tutorial notes and lecture notes were available on Blackboard VLE it would make it easier than hunting round for notes in a ringbinder. They would all be collated in the one place and there is less clutter round my desk for me to work on. [40]

Rarely, as nobody else uses them (except e-mail). I often use e-mail for my studies in situations where I would prefer to use a VLE or discussion board, but nobody else is using them, i.e. for real discussion. [186]

A key issue appeared to be VLEs which were badly designed or structured, with students in the interviews, audio logs and survey venting their frustration at being unable to find information from course websites.

The design of the 'learning environment' is far from ideal. It is not intuitive to navigate around. Essential documents, uploaded only to this resource, are often hidden in strange corners only to be stumbled upon by a random series of links.[AC226]

Another key issue was where VLEs were set up but not really embedded into the culture of the course, so that uploading of materials or course administration was ad hoc and sporadic, contribution to discussion boards was unstructured or infrequent. Another barrier for some is the requirement to have a password which as one student complains 'no-one can ever remember'.

Blackboard - it is simply outdated. Incredibly poor UI - terribly hard to navigate through the content. Tutors have no idea how to use it and administrate it let alone students. As such it is little used. However it is the main method of communication for tutors to students...[AC252]

They are not used very often by anybody so there is no point[AC262]

WEB CT i dont find for our particular modules is any use - there is much more information on the actual lecturers homepage. [AC318]

6.4 Changing practice

The above findings point to a profound shift in the way in which students are working and suggest a rich and complex inter-relationship between the individuals and the tools. The degree to which students are or are not technically competent clearly has a significant impact on their view and uptake of technologies. Under the section on the survey asking about technologies least used one of the clear barriers to use or dislike of particular technologies unsurprisingly arose where students were confused by the interface or found the software difficult to use. A significant number mentioned in their reason for not using or liking a particular technology the fact that they didn't know how to use them, had used them very little or had received little or no training and support. The follow eight factors emerge from the data in terms of the changing nature of the way students are working.

1. *Pervasive*: Students are using technologies extensively to find, manage and produce content. They use technologies to support all aspects of their study.
2. *Niche, adaptive, utilitarian use*: There is increased evidence of the use of free self-assessment quizzes to test knowledge. They also take part in a wider community of peers, possibly because of the different communication tools they are using. They are members of a range of communities of practice - to share resources, ask for help and peer assess.
3. *Personalised*: They appropriate the technologies to suit their own needs. They use the computer, the internet and books simultaneously. Their learning is interactive and multifaceted, and use strategies such as annotation and adaptation of materials to meet their learning needs.
4. *Management*: Students are sophisticated at finding and managing information (searching and structuring). They see the PC as their central learning tool. They are used to having easy access to information (for travel, entertainment etc) and therefore have an expectation of the same for their courses.
5. *Transferability*: There is evidence of the transfer of practices of the use of technologies in other aspects of their lives to the learning context: for example MSN chat, Amazon, ebay and Skype.
6. *Time*: The concept of 'time' is changing – both in terms of expectation of information and results on demand. There is evidence of a fragmentation of the learning timetable.
7. *Changing working patterns*: New working practices using an integrated range of tools are emerging. The use of these tools is changing the way they gather, use and create knowledge. The value and perceived intrinsic worth of knowledge is also changing. There is a shift in the nature of the basic skills with a shift from lower to higher levels of Blooms taxonomy, necessary to make sense of their complex technological enriched learning environment.
8. *Integrated*: Students are using tools in a combination of ways to suit individual needs. There is evidence of mixing and matching. They are comfortable with switching between media, sites, tools, content, etc. They said that technologies provide them with more flexibility in terms of being able to undertake learning anytime, anywhere.

7. Methodological issues and recommendations

The findings from this study raise a raft of implications for key stakeholders involved in e-learning as well as raising a series of fundamental methodological issues about researching and understanding the student perspective and in particular understanding the use of and impact of technologies on modern tertiary education.

7.1 Methodology issues

As Sharpe et al (2005) review highlighted, undertaking student evaluations raises a host of methodological issues. We were aware of these and built them into our evaluation design approach, adopting a three-part approach to data collection via use of an online survey, audio logs and student interviews.

We aimed to try and adopt an innovative approach to the evaluation to capture real practice and experience hence the two-part approach of an overarching general survey to ascertain students' uses and perceptions of technologies coupled with a series of in-depth case studies (through the audio logs and interviews).

We wanted the survey to be a detailed record of the breadth of ways in which students were using technologies, rather than a simple summary of use. Hence the instrument we developed was very detailed in nature and included a series of matrices to capture use of different technological tools against the different activities students were engaged in (searching for information, collaborating with peers, communicating with a tutor, undertaking an assignment, etc). We used the DialogPlus taxonomy and the learning activities captured in the DialogPlus toolkit and the LADIE use cases as a means of developing these matrices to articulate the categories of technologies and the different student activities. Feedback from the HE Academy subject centres and the e-pedagogy meeting were generally positive but there were concerns that the instrument was over long and too complicated. We were also aware of the methodological problems of trying to capture students' experiences through student diaries, so as part of the later we decided to use audio logs as means of capturing specific examples of practice. To counteract the potential problems of data gathered via the online survey and the audio logs, we used standard semi-structured interviews with students as a means of ensuring adequate data collection and triangulation.

To our surprise the concerns about the survey and the audio logs were not borne out; responses to both were far higher than we expected and the data captured appears to provide a variety of very rich and insightful information on the ways in which students were using the technologies. The survey provided both detailed qualitative responses to students' uses and perceptions of technologies, supported by detailed quantitative data indicated which technologies they were using most and which least and how they were using them. The audio logs provide innovative snap shots of practice – capturing students' experiences of the use of technologies in situ, illustrating both the emotive and contextual aspects in each cases.

7.2 Recommendations

7.2.1 Content

Learners are increasingly looking for educational content to support their studies outside their host institution. The distinction between ‘official’ course supported materials and other content is now blurred. However there is evidence that the resources they find are not always good match to their needs.

Recommendation 1

Institutions need to rethink the value and worth of content produced as part of course provision and take account of course design in a environment where there is access to a vast variety of free content.

Recommendation 2

In order to better serve students across the HE sector, HEIs should take into account the increasing availability of high quality freely available resources and the changing business models/economy of education as a result.

Recommendation 3

In an increasingly open content context, students will expect universities to aggregate relevant and approve material. Shared repositories of content that are approved by the university might be an important partial solution to address this and an important drive not only for perspective students but also for those keen to pursue more individual learning paths.

7.2.2 Interactivity

Interactivity is central to modern students’ learning environment – through actively searching and using information from the internet, to exchanging ideas with peers, to cutting, pasting and remixing across multiple sources and media formats.

Recommendation 4

Courses need to be designed for interactivity (so that students can interact with and adapt content to their own needs) – with recognition that students will appropriate and adapt both the structure and content of their courses, to meet their individual needs.

7.2.3 Social and community learning

Students are working as part of a networked community of peer learners; sharing ideas and resources, exchanging draft reports, providing mutual support.

Recommendation 5

Courses need to capitalise on the social affordances of technologies in terms of how this can provide support for learners. More careful thought needs to be given to how social networking software can enhance the student experience

7.2.4 Assessment

The majority of technology use reported by students related to the completion of work for assessment. Students discussed how beneficial they found formative and summative forms of assessment, ePortfolios were particularly cited by the medical students, but also the use of online tests for formative purposes. Add to this the dominate use of personal learning devices such as laptops and mobile phones, it is clear that universities need to rethink the form their assessment procedures take so that they better reflect the changes in how students access, process and revise material.

Recommendation 6

HEIs should reflect on the nature of the assignments they set, in the light of the strategies adopted by students, to ensure that they optimally assess the intended learning outcomes and respond to the changes in how students are learning and revising material.

7.2.5 Personal devices and anytime, anywhere access

Students made greater use of technologies they owned (eg mobile phones, laptops) than those provided by their universities. They also used publicly accessible websites and services (eg email and instant messaging) more often than university-managed ones. Broadband and wireless facilitates are now enabling students to download and access course material in a variety of places and spaces. The university as the core physical centre for learning is becoming a thing of the past as distributed and networked learning environments become more the norm.

Recommendation 7

HEIs need to conceptually change their perspectives and rethink their positions as institutions of learning within the 21st century media landscape. They will be required to respond to the ever growing body of personalised, handheld devices, which will allow users to access content in contexts which were previously not possible. This will require rethinking not only how content is delivered to such devices, which maybe distributed across wide networks and locations but also how students interact, contribute and repurpose this content within their communities and for their own ends.

7.2.6 Usability

Choice of technology was heavily influenced by usability. The simplicity of Google contrasts with the complexity of many university library systems. Students tended to use Google in preference to their library systems even when it gave unsatisfactory results.

Recommendation 8

HEIs need to address usability shortcomings in their systems as they are significantly limiting use by students. They should also review whether it is necessary for them to provide services that can be readily obtained elsewhere.

7.2.7 VLEs

On the whole, students were not very complimentary about VLEs. In the survey more identified their VLE as a technology they disliked using than one they particularly liked. This dislike appeared to relate more to the inconsistent way the VLE was used than the services incorporated into it. The medical students interviewed however were positive about their VLE, in their case it had been made integral to the working of the medical school and incorporated a wide range of learning resources.

Recommendation 9

VLEs are likely to be viewed as being of only marginal help to students until such time as they are used consistently and effectively by staff across all the courses a student takes. Institutions need to provide adequate support and training in effective use of VLE tools to support students' needs.

Recommendation 10

Course designers need to give careful thought to how VLEs are used to support student learning and what benefits the VLE offers in contrast to other technologies students have access to.

7.2.8 Aggregative portals

Across each of the disciplines studied students displayed the ability to integrate for themselves a wide range of technologies and applications. The majority of the technologies and applications used by students to support their learning were not maintained or supported by their host institutions.

Recommendation 11

As HEIs work to implement portal technology it will be essential that the systems chosen are able to recognise the full range of technologies that students are using now and in the future. In the future portals need to be able to aggregate content in an immediate way, responding to institutions, tutor and students needs, particularly as the digital learning landscape continues to change and becomes more personalised and responsive to individual students needs.

7.2.9 E-Literacy skills

The findings point to a sophisticated and complex use of technologies by students, but more research is needed to unpack this in terms of the appropriateness and effectiveness of that use. It is evident that the Information and Handling Skills of students is changing; what is

not yet clear is how and what the implications are for training and support for both tutors and students in this new context.

Recommendation 11

HEIs need to better understand the changing literacy skills of both students and tutors and use this understanding to more effectively design and support learning.

7.3 Further research

1. The project deliberately focused on four subject centres to work with and attempted to be innovative in its approach methodologically by use of the technology versus activities matrices used in the survey and the use of audio logs as a means of capturing student experiences in situ. It would be interesting to undertake a further study which explored the extent to which these methodological approaches captured students' perspectives over a longer period of time.
2. A logical follow up would be to do more extensive studies in particular a study which had much broader coverage across the HE sector which was more representative of the breadth of students and their experiences. Similarly the study methodology could be extended to other sectors such as FE, adult and community learning, schools, or work-based learning.
3. The study focused on students' use and perceptions of technologies. It would be useful to undertake a comparison study of actual use with expected use in terms of course design and tutor expectations. Additional information could be gathered on pedagogical approaches, course design, and learning outcomes from the tutors and course developers as well as through analysis of course materials.
4. The LXP study provided a snapshot of students' experiences of the use of technology over a short time frame. It would be valuable to carry out a more in-depth longitudinal study which followed a series of students over a longer time period in terms of their use of technologies and how this changes during the lifespan of their learning experience and perhaps beyond into their working practice.
5. It would be valuable to carry out a more in-depth analysis by subject, with significant differences between subject areas being highlighted and discussed.

8. Conclusions

The LXP project tried to capture all of the ways in which learners are using ICT - both in formal and informal learning - for educational purposes and other aspects of their lives. What is transpiring from the interviews, audio voice recordings and the survey is that many learners see technology as integral to all aspects of their lives. A similar study found that people with a prior qualification were more likely to use ICT for learning, regardless of what the course was (Atwell, 2005). This raises the questions not only in relation to how people are constructing or scaffolding knowledge but also how ones access (or not) to digital and media resources can create educational divide. In a climate where it is important to provide equal opportunities for all it is clear that the digital and media resources one has access to prior to and during university and third level education influences how your organise and construct your learning experience.

The increasing use of user-generated content in the form of site such as Wikipedia is challenging the traditional norms of the academic institutions as the key knowledge expert and providers. Through a variety of online and personal devices, students are now accessing digital content from a variety of sources, mixing and matching content from commercial companies, personal blogs, user generated sites, peer networks, professional bodies as well as from academic and non-academic research contexts. If people are now gaining knowledge both formally and informally through these different communities of practice how should the HEIs respond and support students' pedagogical and professional learning in such distributed knowledge contexts?

Clearly new and different skills are needed and a lot of research has shown that despite the fact that learners are now IT-literate (and have experience of using technologies in their daily lives.) they are not academically e-literate and still lack the necessary skills to make appropriate critical use of information. The survey results suggests that learners do not necessarily use the same technologies for learning as for other aspects of their lives, although for some learners there is an overlap. The tools appear to be used as appropriate for specific tasks, for example, some learners appear to separate their communication channels into work and leisure by having separate email accounts. Technology is constantly re-invented and repurposed to support learning activities and there is a complex co-evolution of tools and their use resulting in significant changes in the way students are learning, which we need to take account of in the way we support learning and the institutional environments we provide.

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Project team

Gráinne Conole was co-director of the E-Learning Research Centre at Southampton University which is where this work initiated and is now professor of e-learning in the Institute of Educational Technology at the Open University.

Maarten de Laat was a research fellow in the E-Learning Research Centre at Southampton University and is now a research fellow in the School of Education at the University of Exeter.

Teresa Dillon is an independent consultant, researcher and the director of Polar Produce a Bristol based company who work across the arts, media and technology sector.

Jonathan Darby was a visiting research fellow as part of the HEFCE-funded E-Learning Research Centre at Southampton University and has recently taken up a post at the Open University.