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Abstract

The first year at university is a time of significant flux for students, as they adjust to unfamiliar environments, encounter new approaches to teaching and develop fresh learning strategies on the road to becoming self-directed learners. This sense of uncertainty may be compounded by the need to interact with unfamiliar and frequently complex online systems and technologies, possibly even before arrival. Furthermore, although technology is embedded seamlessly into the personal lives of many of today's students, recent reports have questioned the widespread assumption that young adults have the sophisticated information skills and digital literacy needed to become autonomous learners.

In this paper we present findings from a recently-completed study addressing these important issues. We investigated the utilisation of ICT and learning technologies by first-year undergraduates from a variety of different entry routes and academic disciplines, including Physics, Divinity and Veterinary Medicine, at the University of Edinburgh. The focus of the work was on the impact of technology on students' transition to university and how this changed as they progressed through their first year. The overall shape of the research was based on a student-centred approach, with students' own views and opinions placed central to the study; and used a holistic approach in which students' use of e-learning and technology was set within the context of their learning experiences

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Introduction

Recent reports into the current generation of students' expectations of, and experiences with, the use of information and communication technology (ICT) to support their learning have highlighted a number of common themes. It is clear that university students expect to use ICT routinely as part of their academic studies (ECAR, 2008; JISC/Ipsos MORI, 2007, 2008); indeed, very many UK university students now arrive with their own laptop, both for personal and academic pursuits. The use of the internet as a communication tool is increasing, within both academic and social contexts. There is widespread use of social networking sites for communication, especially between peers, and perhaps in preference to what is now seen as the more 'traditional' email (Salaway et. al., 2008, Oblinger, 2008). Yet despite their widespread social use, the potential of Web 2.0 technologies for learning appears to be less well-appreciated or understood by students. Furthermore, despite having a high degree of proficiency with common software and web search engines, there is evidence that students may arrive at university lacking some of the vital information literacy skills needed to fully support their studies (CIBER, 2008, Oblinger, 2008). There is also evidence of a small, but significant, minority of students who do not actively engage with ICT (JISC/Ipsos MORI, 2008). The majority of published reports have centred on young (typically aged 17–22) adult learners; the 'Net' or 'Google Generation'. However, it is important not to over-generalise these findings and stereotypes to make inappropriate assumptions which do not apply beyond this particular demographic group, especially with the increasing emphasis on lifelong learning and adult returnees in higher education.

It is widely accepted that good course and curriculum design should align learning and teaching activities with the intended learning outcomes, and that assessment tasks should measure the extent to which these have been met. This is the foundation of 'constructive alignment' (Biggs, 1996, 2003), which is based on the (constructivist) premise that students construct their own learning from the activities with which they engage. More recently, the ideas of constructive alignment have been extended to incorporate a wider range of course 'settings' that may influence student learning, including curriculum aims and design; learning and teaching activities; learning support; assessment and feedback; course management; and students' background, knowledge and aspirations (McCune and Hounsell, Hounsell, 2005; Hounsell and Hounsell, 2007). The term 'congruence' has been proposed to describe the interactions between these factors and the quality of student learning. This model is particularly relevant to early-years undergraduate courses, where large class sizes, a relatively low staff-student contact and diverse student cohort—and hence a wide range of student perspectives and experiences—are generally the norm. The interplay between these factors, set within the context of students' use of both institutional and non-institutional ICT and learning technologies to support their learning, forms the backdrop for the present study.

In this paper we present outcomes from a study of a heterogeneous group of first-year undergraduate students from a variety of disciplines and different entry routes at the University of Edinburgh in 2007/08. The focus was on 'critical moments'; specifically, the involvement and impact of ICT and learning technologies on students' transition into university, and the changes in their use of these tools as they progressed through their first year. The overall shape of our research was based on two underlying principles, advocated by Sharpe (2005) and Mayes (2006). Firstly, that it is important to take a learner-centred approach, whereby the students' own views and opinions are central to the study. Secondly, that the research should adopt a holistic approach in which students' use of technology is set within the context of their learning experiences as a whole. Within this framework, the key questions that we wished to address were:

- What are students' expectations regarding the availability and use of e-learning at university?
- How do students adapt and change their approaches to e-learning during their first year?
- What are the factors that influence students' choices of e-learning strategies and their utilisation?
- To what extent do students use non-institutional technologies to support their learning?

The paper is organised as follows. To set the scene, a short description of the selected disciplines is given, including general characteristics of their students, courses and methods of teaching. This is followed by an overview of the methodological approach taken in the study. Our findings are then presented, and we conclude with some reflections and implications for the future.

The context: the disciplines, their students, courses and use of technology

The three subject areas chosen for this study were Divinity, Physics and Veterinary Medicine, representing a cross-section of the wide range of disciplines available at the University. Academic staff in all three disciplines have substantial experience in the innovative use of learning technologies to encourage and support greater self-responsibility for learning amongst students. First year courses in these disciplines have a well-established online presence, marrying online and real environments in a blended approach to learning and teaching. While to some extent, the courses in this study may be slightly atypical of the majority of degree programmes at the University of Edinburgh, it is because of their strengths in e-learning that this was an ideal time to study the student perspective.

Divinity
The first year cohort in Divinity includes a wide age profile from school leavers to mature returnees, providing a population with highly variable ICT literacy levels and engagement with modern technology. E-learning uptake by the academic staff ranges from no engagement to those using a rich blended approach where e-learning, including the use of Web 2.0 technologies (weblogs and podcasts), is an integral part of the teaching programme.

Physics
Physics students tend to be young adults and arrive with high levels of ICT literacy and devices. Within Physics at Edinburgh, e-learning has been used to support face to face teaching on campus for almost a decade, with recent excursions into Web 2.0 territory, using podcasts and wikis.

as a whole. To capture the breadth and complexity of their experiences we used a mixed-mode approach, including a series of reflective diaries recorded by learners (in video, audio or text format) together with surveys and focus groups.

Students do not form a homogenous group, and findings in this area are inevitably complex. They have high expectations and are generally confident with technology; however, they may not always recognise technology's potential to support and enhance learning. The term e-learning does not mean much to them; there is simply learning with strands of technology running through. This is reflected in a strong desire for face-to-face contact, with technology used to supplement and enhance this. Students are social, with informal group learning often facilitated by technology. They find their comfort zones and ways of working that are personal to them, and use technology to suit their own way of learning.

Veterinary Medicine

Veterinary Medicine students are typically high achieving, highly motivated individuals. All students have access to the school Virtual Learning Environment (VLE), embedded within which are a number of resources under the umbrella of the 'Virtual Veterinary Practice'. These include RSS feeds, webcams and wikis, with podcasts under development. E-assessment and e-portfolios are being piloted in selected courses. Individual teachers and courses vary in the extent to which they take advantage of these resources.

Methodology

The methodology used in this study has been reported previously (Hardy et al, 2008) therefore only a brief summary is given here. A mixed-methods approach was used to collect a range of quantitative and qualitative data, including:

- An institution-wide survey, conducted at the start of the year;
- A series of reflective diaries throughout the first year recorded by all 24 participating students, 7–9 students from each of the three target disciplines;
- An end-of-year survey of all 24 participating students;
- A number of focus groups with the participating students and others.

Surveys were conducted either online or using paper and analysed using MS Excel and SPSS. Diaries were recorded in either video or audio (using webcams), or in text format. Information from the diaries and focus groups was organised and analysed using NVivo8.

Reflective diaries were recorded by the students themselves, without anyone from the research team present. Diaries were recorded at key points over the course of the academic year. They were relatively freeform but were based around a number of themes and questions, chosen to reflect significant study-related events, see Table 1.

Table 1: Diary Key Points and Themes		
	Semester 1	**Semester 2**
Early	First impressions and transition	Return after first vacation
Mid	First assessed assignment	Nearing the end of first year teaching
Late	Exam revision	Return from vacation, exam revision

Findings: the student year

Students cannot be considered as a homogenous group, and our findings are inevitably complex and wide-ranging. However, the main findings and messages are summarised under a number of themes, which broadly follow the trajectory of our students' journey over the course of their first year at university.

Learning new university technologies

On arrival at the university, students were asked to comment on their prior experiences of using technology for their studies and how they expected technology to be used at university. At this point, they were just coming to grips with university life and, as might be expected, some things came easily while others were more of a challenge. For many students, the 'flow' from their previous studying or work was fairly straightforward, the use of technology in their courses was mostly free of challenges and they could establish a study-life balance that suited them. In addition, universities

are very different organisations from school and work, and offered some pleasant surprises.

"I knew the university have a lot of resources...which were going to give me a lot of facilities. But I couldn't believe when I saw how much computers and internet are used in each course."

"The resources I have used so far to do my studying are what the lecturers have recommended us to buy and the WebCT...It's a bit different to what we did at school as we never got recommended books. We just used to Google everything and use search engines to find out as much information as we could."

The extensive use of technology from the outset for both studying and administrative tasks was seen by some as a challenge. This was a common view, even among students with good ICT skills, suggesting that the recent movement across all universities to high dependence on ICT has not yet been perceived and internalised by intending students.

"There was an over-reliance on computers in the first two weeks!"

The non-optional nature of the use of technology may be part of this challenge, as personal and social use is to a large extent self-regulated. In addition, the expectations of most new students may be set particularly by use of ICT in schools, which is still generally much less pervasive than in universities.

Over the course of the year, technology was seen as providing a valuable contribution to effective study—one obvious benefit being making materials easier to access—but alongside the advantages were some significant disadvantages. These were often due to limitations in the way technology was used by teaching staff, the inability of students to navigate to important information (either due to poor guidance or failure to take note of it when offered) or access restrictions.

"Lecturers did eventually put everything on WebCT following encouragement (by the students). One was very good and put a good selection of different things—podcasts, internet sources, further reading, as well as her own power points and lecture notes. But it was very lecturer dependent."

"I'm disappointed that [specific e-learning material] is only available in the university computers, it would be better to be available on [online] as I do not like to study in the computer labs."

"I'm just starting to doubt the efficacy of... any online university portal. They are just a maze to navigate through and I am not always able to find what I should."

Using social/personal technologies
Many students used a combination of personal and institutional technologies for fast access to sources of information. Some also had preferences for particular technologies that assisted their studying.

"I can't revise if I'm not in front of my computer. I use WebCT a lot, or msn for asking someone who knows about what I need to know...Also, there are many blogs where you can find many interesting things that you can't find in course books..."

"I found in my own revision, that the use of my own personal computer and 'Inspiration', the Mind Mapping software, was helpful. I did a lot of mind mapping and also going over podcasts, audio files, MP3 files as a revision aid and also for constructing my revision."

For some students, paper was the 'real' place to be working, while others clearly favoured electronic media. However, many felt the key was to obtain a balance between different activities.

"Overuse of computers during revision will shut down creativity—I prefer to scribble down things, even if you are going to type them up neatly later, take notes quickly

while you think about them and compare to other sections rather than searching through and copy pasting, combine bits and pieces, write bullet points by hand."

"Although I feel equally reliant on both, if it came to a definitive choice, I just could not cope without electronic sources and materials!"

"Electronic resources should aid and not replace paper but all the time the two should work in harmony and it's brilliant that the WebCT service has been very useful."

There is an instrumental component in this choice because some current academic activities preclude the use of technology, and so working (and practising) in the traditional medium of paper and pens may be most pragmatic.

"If you are going to be asked to write a [exam] response using a pen and a piece of paper then that colours how you will be using the online resources on the lead up (to the assessment) and you are more likely to 'have a go' at what you would be doing in the exam. If the nature of the exam was different and there was an online aspect to the exam or you could use a laptop, then all of the dynamic might be entirely different.."

Technology undoubtedly made it easier for students to communicate with others for group work, both formal and informal. It is difficult to be certain to what extent this is common practice across all students, or whether we observed a particularly committed, studious or 'tech-savvy' cohort. The Vets appeared to make most use of online group activities, perhaps because the opportunity had been established for them before they arrived (via a Facebook community set up by the previous year's students), by the evident encouragement and support of staff, or simply because they regard themselves as a budding professional cohort. However, the use of online groups was not limited to the Vets, and these tools are likely to rise in popularity with time.

"I find it really helpful to go over material with other students, whether I'm organising that through IT discussion boards or just emailing a person I know on the course and asking their opinion on something."

"I use a lot of MSN and forums to communicate with fellow students and teacher, where I can ask questions and discuss with my colleague."

Assessment and feedback

The diaries showed clear signs of strong personal feelings regarding both the actual and potential roles of technology for assessment and feedback; students were perhaps more polarised about this than on any other topic. The majority of comments on the overall composition of assessment related to the balance (or lack of balance) between what was being learned and the assessment tasks. Written exams are the most common form of assessment at Edinburgh and quite strong views were expressed about the role that is, or might be, played by technology. For some students, 'handwriting is still king' and is expected be around into the indefinite future due to its flexibility, speed, ease of annotation etc. For others it was already a handicap to clarity of expression, with technology helping to avoid illegible handwriting and to align with the rest of their study and life. Some could clearly see both sides of the question.

"I don't mind handwriting exams, I think that way it's fair on everyone, whereas if an exam was to be typed it would be unfair on people who couldn't type as fast as others."

"I hate handwritten exams, I write slowly and it is very messy. This cause me to spend time correcting and writing, which means less time to think. I will definitely do faster and better at electronic exams either by MCQ or by typing."

"Obviously, certain subjects, such as Informatics, are examined via computers by definition, but enforcing ICT on all subjects is progress for progress's sake and will surely have the opposite of the intended effect. Handwritten work is far more natural and personal, and does not require any translation from the brain into which keys must be pressed, which often makes the student lose their train of thought."

We had expected to elicit suggestions for innovative uses of technology (either actual or potential) for assessment. In fact, this was rather sparsely addressed. The few students who responded did so only in terms of the sorts of technology-based assessments they had experienced, with quizzes the most commonly mentioned. Although students were unsure about using computers for long text-based answers, many felt that technology has value for short answer and MCQ tests, especially where it could maintain a high quality test environment.

"I like the online quizzes, it is not long and I can access it all the time at home, so that I can do it when I am ready and gave the best result, well, there is nothing to blame if I get a bad result."

Despite the fact that almost all students have laptops, used extensively for preparing essays and other coursework, no-one suggested a future in which they would take exams on their own machines, and there was almost no prediction of greater ease of use of IT applications, e.g. for drawing or writing equations, or that physical exams involving objects or evidencing skills might move into virtual spaces. This tends to suggest that their limited prior experience of online assessment was restricting their view of what was possible.

There was also no consistent view about how technology might be used to create or deliver feedback, although in general durable over ephemeral formats were preferred, and perhaps textual over aural.

"I think that verbal feedback from a tutor is the most suitable form. It also gives students the chance to ask any questions or address issues regarding the exams that concern them. A recording/ pod cast of this feedback would also be extremely helpful for future reference."

"I would rather have text comments than verbally-recorded ones since I'm a more visual person. I don't retain information well if I just listen to it, so I'd probably have to play recorded comments over and over. I wouldn't want verbal comments from a tutor because I have a bad memory and I'd probably forget what the tutor said as soon as I left the room."

Literacies

Two important transitions focused around students' changing ICT skills and competences — new skills acquired through their studies, and pre-existing skills that were not used and hence may have degraded through lack of practice. Two-thirds of our students reported some new skills development, largely related to the specific technologies used within their courses. Divinity and Vet Medicine students showed the most new skill acquisition, mainly associated with the academic use of blogs (Divinity) or discussion forums/wikis (Vet Medicine). Physics students did not offer much evidence of skill extension except for their use of personal response systems, which are used extensively in their first year courses.

All students used the VLE, which formed the core of e-learning in their courses. Students also used the internet daily for information gathering, especially Google and Google Scholar. There were a variety of strategies for managing information gathered online. Two-thirds of students read materials online without printing, and only a quarter printed out web-pages, e-journals etc. There was a similar pattern in terms of storing materials as files on a computer, with two-thirds of students saved URLs as bookmarks. No-one reported using anything other than the web browser for saving URLs — al-

ternatives mentioned to them included bookmarking applications and online social tagging services, but neither these nor other options were suggested.

One very important skill is the assessment of the quality of online materials. Student's rating of their confidence in this area is shown in Table 2. As a group, albeit small in number, graduate entry Vets were the most confident, with none reporting low confidence. There was no clear difference in confidence by subject studied among the other students.

Table 2: Student confidence in assessing the quality of self-discovered online materials			
Very confident	Confident	Somewhat unconfident	Not at all confident
4/23	13/23	5/23	1/23

Given the extent of the use of Google to find information, this ought to be a frequently practised skill, however students reported little evidence of direct advice from lecturers other than to take care in doing so, to avoid citing Wikipedia etc.

Reflections

As the end of the academic year approached, students were asked what advice about ICT they would offer both to the university and to students following on after them. Advice to students included:

- Purchase a computer before you arrive and make sure you know how to use and maintain it.
- Check the compatibility with university networks and course requirements.
- Practice your keyboard skills, as this will save you time later.
- Log onto systems and check your email daily, as much important communication takes place online.
- University is about self-reliance, so make sure you have acquired skills to support yourself.

Advice to the university related to the quality of facilities and services, which most students rated quite highly at present, rather than about innovation, and overall the advice was pragmatic and perhaps not overly challenging, consisting of desirable actions that would not come as any surprise to teaching staff or support services:

- IT provision is generally good, but do more, and do it better.
- Not everyone has a computer, or uses it on-campus, so availability of access is important (computer labs, student residences and wireless network coverage).
- Promote the university laptop loan service and laptop check-up workshops.
- Consider offering preferential laptop purchase schemes.
- Good training and support is available; make sure students know how to access it.
- Be more consistent in the use of the VLE across courses.

It was clear from the outset that the students in this study anticipated extensive use of technology at university. They had acquired this view from the university itself; from school, work, family and friends; from the media; and probably from a view that 'technology is everywhere' based on general experience. Our students also arrived with, and maintained, a very positive view of the role of technology in their education—they did not need persuading of its value. If anything, over the year they acquired a more critical view of the lack of use of technology in their university courses, and saw opportunities missed for better, deeper and more consistent use that would make their studies easier.

However, to all of them this just appeared to be how they see learning, and to some degree teaching, in the first decade of the 21st century. We did not present this as 'e-learning' to them in our interactions with them, and they did not use the term spontaneously. Most adopted into their daily study lives institutional e-learning technologies on offer; VLEs, online quizzes and assessments, Web 2.0 tools such as the wiki, web-based submission of assignments, email etc without overtly querying their value, appropriateness or effectiveness (as tools). They progressively became regular users of the university's extensive digital library; most of these resources were new to them, e-journals, bibliographic databases and e-books being little available to schools or the general public. Alongside, and interwoven with, these institutional technologies, they used their own technologies — mobile phones, laptops, Facebook, blogs etc — to communicate with each other, with staff and with family/friends, and to study and learn.

No classes required our students to own laptops, but all of their courses required them to carry out a substantial proportion of their studying using the internet and ICT. Students 'moved' their studying from machine to machine as was most convenient to them, making heavy use of both the university computer labs and their own laptops as suited them. What they did not appear to do, was use their handheld devices (almost entirely mobile phones) as tools for learning, e.g. to access the digital library or the VLE, with the exception of podcasts on MP3 players.

Several courses required students to work in groups, but this was often not scheduled or offered in specific time-allocated spaces. Some students adopted IM as a mechanism to support this activity, using this as an alternative to email and sms, either on their own or on university equipment. In this sense, they adopted the institutional technologies that were necessary for them to use to gain access to learning materials and tasks (e.g. the VLE), and adapted their own technologies (e.g. mobile phones, Google) to support their learning activities. They were generally fairly tolerant of system deficiencies (this may change in subsequent years when the pressure is greater), although older students from well-resourced workplaces perhaps viewed university systems as less professionally polished than the commercial systems they had experienced.

These reflections reinforce the commentary offered in US studies of technology in higher education published by ECAR in which they observed that students value convenience and control (Kvavik et al, 2004).

Few of our students offered reflections that pushed the boundaries of what we offer at present in terms of innovation in e-learning. This may be partly due to 'self-selection'; the university does not emphasise substantial use of technology in most of its degree programmes, but presents a traditional university education in its public-facing information. It may also arise from an intrinsic cautiousness; high-achieving students may not generally see risk-taking by the university as a 'good thing'. Similar concerns have been voiced in other research studies, which have presented scenarios for the future use of technology in university education to student focus groups, and with student reactions to e-portfolio pilots (Tosh et al, 2005). This suggests that universities that wish to expand their use of technology into more innovative and non-elective activities need to do so with suitable advance preparation of student attitudes, despite the rhetoric of a few Net Gen proponents.

Conclusions

The students is this study thread technology through both their social and academic lives, learning new skills from the specific application of IT and bringing their own use of technology to bear to suit their own preferences. They do not generally have high expectations from universities in terms

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of novel or innovative uses of technology, but do expect reliability, predictability, and high quality use across their courses. There is a continuing need to understand the student perspective as we move into an even more technology-rich world. The diversity of the student population, coupled with the changing nature of teaching and learning, offers both challenges and opportunities. Keeping students' voices central to research in this area will be key to the success in meeting students' needs and aspirations.

Acknowledgements

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