

Whether it's M-learning or E-learning, it must be ME Learning: a case study of mobile learning in Higher Education

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1. Context and Background

The learning context at the heart of this case study is a course called Interactive Learning Environments, which is offered to third year undergraduate students and to postgraduates from a variety of Master's courses at the University of Sussex. The course aims to offer Informatics students a mix of theoretical grounding, case study examples and hands-on experience with developing technologies. During the course students are required to develop and evaluate their own interactive learning experiences in collaboration with their fellow students. For example, one group of students are required to design a learning activity for their peers supported by technology. Both groups of students are required to design and conduct an evaluation of this learning activity.

As an institution, the University of Sussex has decided to promote the development of in-house technologies such as its Managed Learning Environment (MLE): Sussex Direct, and to encourage small projects that expand upon novel solutions to particular problems or issues within a learning context. As part of this policy, the Teaching and Learning Development Unit at Sussex offered financial support for a mobile learning theme to be developed for the Spring term of 2003. This funding enabled a course team to be set up and appropriate hardware and software to be purchased for what became known as the SMILE project (Sussex Mobile Interactive Learning Environments). The total budget for the SMILE project was £21,300 for the period from October 2002 to May 2003. The project offered the university a viability study for future larger scale implementations of mobile learning devices; an evaluation of relevance to the MLE and VLE programmes under development at the University; and a model of how learners collaborate and learn using mobile on-line devices.

The budget allowed the purchase of eighteen combined mobile phone and Personal Digital Assistant (PDA) devices (see Figure 1 for an illustration). At the time of purchase (November 2002) the range of devices available on the market with the required functionality was limited and the XDA was selected as the one most appropriate for our needs. The XDA offered integrated phone and PDA, along with Pocket PC and GPRS (General Packet Radio Service) so that the phone connection was 'always-on' for web browsing or e-mail applications. The functionality it therefore offered included Internet access and email both via a browser and to the university mail server (available for POP3 or IMAP4). The device has a touch sensitive colour screen, applications such as Word, Excel, Outlook and Explorer and it can record audio.

The course team consisted of two technical experts, two lecturers and a teaching assistant. The students were allocated devices for the term and were expected to use them 'as their own'. Postgraduate students had a device each, whilst the undergraduates had to share them in small groups of 3-4 students (this constraint resulted in undergraduates only having access to their personal email via a web browser on the device and not via direct access to their accounts on the university mail server). The course team also provided a website for information along with access to lecture slides. Two one hour lectures each week were used to cover the syllabus content, whilst the seminar time, two hours for postgraduates, one hour for undergraduates, was given over to an exploration of the issues surrounding the use of mobile technology for learning. Seminars for both groups of students consisted of practical activities using the mobile device, as well as workshops on topics such as personalisation, collaboration, design and evaluation.



Figure 1: the XDA devices used in the project

2. Rationale and problem statement

Initial results on the use of mobile technology, such as those reported in Mlearn 2001, 2002 and in the 2002 IEEE workshop (Milrad, Hopper and Kinshuk, 2002) have been encouraging. Researchers have suggested, for example, that mobile learning enhances autonomous and collaborative learning (Cerejio Roibás and Sánchez, 2002), and that it can be applied to a wide age range of students (Inkpen, 2000; Perlin and Fox, 1993; Sharples, Corlett and Westmancott, 2002 and Soloway, Norris, Blumenfield, Fishman, Krajcik and Marx, 2001). But how do we help our students to understand what this really means with respect to the design of a mobile learning experience?

The XDA technology was introduced to the course in order to give students the opportunity to experience what it would be like to use mobile technology to support and enhance their own learning. When students then came to design a session for their peers using this technology, their approach was grounded in this experience as well as in their understandings of pedagogy, system design and the work of others. From the perspective of the teachers on the course, it gave us the opportunity to assess the potential of such devices for use in Higher Education and to increase our understanding of the ways in which learners use these devices in their own right and in combination with the other course resources. We were particularly interested in the potential of the technology for collaborative work and for increasing students' appreciation of their own learning process.

3. Technology and Infrastructure

The functionality of the XDA technology we used has already been described. Here we consider the implications of adopting this technology and the infrastructure into which it was integrated. The XDA itself was far from the 'out of the box' experience it had promised. The devices were purchased from a local supplier, along with a phone account with a service provider in order for students to use both the mobile phone functionality and the on-line web browsing. Each device had to be tested and all parts logged. This was to be expected. What was more of a surprise was the difficulty we faced in taking all the devices on-line. This required several interactions with both device supplier and service provider. All devices were subsequently connected, but the fact that this was less than straightforward was an early sign of what was to be an unexpectedly tiresome feature of the project: the fact that what we were trying to do was not within the normal patterns of service provision. For each account (associated with each device) we had to set up a method of payment to ensure that the rental and usage costs were paid to the service provider. We also had to ensure that students were unable to run up huge bills which would be the university's liability, for example by downloading large files from websites. Students signed an acknowledgement of their responsibility for payments in excess of the stipulated maximum. In order to try and help students track the amount of material they were downloading we purchased third party software to monitor data traffic. This was unreliable and with no figures available from the service provider, a climate of nervousness was created among the students; they were concerned about incurring debt if they used data above the agreed tariff. No students did in fact run up an excessive bill. There is insufficient space within this chapter to give any detailed account of the time and effort that went into managing our relationship with the service provider and ensuring that the devices were kept on-line without exceeding our budget. Suffice it to say that this was a significant cost to the project.

In addition to the XDA itself, the students had access to a course website that contained all the lecture notes and slides plus references and web links. In addition to this standard content the website also gave students information about all their peers' contact details, e-mail addresses and XDA phone numbers. The access to the course website was logged in a manner that enabled us to distinguish between XDA and desktop access. Information about access was presented back to students through the website so that they were constantly aware of how many times each resource had been accessed. Students also agreed that their e-mail traffic, when between course participants, could be logged from

week 4 (out of 10) onwards. When an e-mail was sent between two or more people involved in the course we knew whether it was sent via the XDA or not. Again this information was offered back to students through the website. In addition to the website students were invited to join an on-line discussion group and at one point in the course this discussion group was explicitly linked to a lecture time slot. Students did not need to turn up to the physical location of the lecture, but were encouraged to view the slides and join in the discussion from whatever location they wished. The group and the website could be accessed via the XDA, any of the desktop machines on campus or in the students' homes. Students were enthusiastic about being offered the devices and all signed up willingly to take responsibility for them and to ensure, as far as they could, that they were returned in good working order at the end. The management of the process of allocating devices was an overhead for both staff and students, as was the management of the finances. This included the offer of back-up sessions on a weekly basis, so that data would not be lost and any software updates could be easily downloaded. This was further complicated by having the ongoing running costs associated with mobile phone network service provision.

4. Engaging with students

In the first session of the course students were given a training session with the devices and technical support was freely available throughout. Our evaluation of the course, a fuller account of which can be found in Luckin, Brewster, Pearce, du Boulay & Siddons-Corby (2003), involved multiple data sources. Here we restrict our discussion to the student questionnaires and discussions, the e-mail and website logging data and an on-line poll.

4.1 What did students think?

Student attitudes to the introduction of the devices and other related technology into the course were assessed in two ways: an end-of-course questionnaire and qualitative data from notes taken during an end of course evaluation session with the postgraduate students.

Most students tried at least half of the functions offered by the device, although e-mail came out a clear winner as its most useful feature with 48% of the votes and web access second with 19%. This suggests that it was the connectivity of the device that students really appreciated. However, only 57% of students could see a clear educational use for the device, with the remainder being unconvinced. The views expressed by students ranged from enthusiastic to antagonistic, with most students recognising the potential of the technology but making statements such as "the device isn't quite there yet".

4.2 E-mail and Web Logging Data

Hits on the course website were grouped into those made by members of the course team who had an XDA each, those made by postgraduate students who also had an XDA each and those made by undergraduate students who shared an XDA between 3-4 students. Hits were differentiated as coming from either the XDA or from a desktop machine on campus or in the students' home. Figures 2 and 3 below illustrate that postgraduate students made more website hits using the XDA than did undergraduate students. Postgraduates made an average of 35 hits per device as opposed to 24 hits for each undergraduate device. However, undergraduates made more use of desktop technology than their postgraduate counterparts with an average of 234 hits per undergraduate as compared to 199 for each postgraduate across the term.

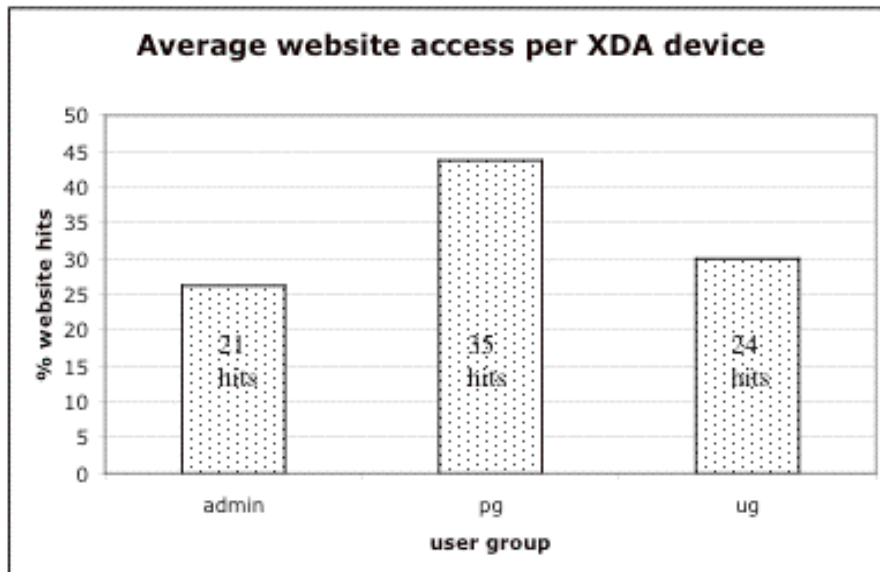


Figure 2 Average web site access per XDA device

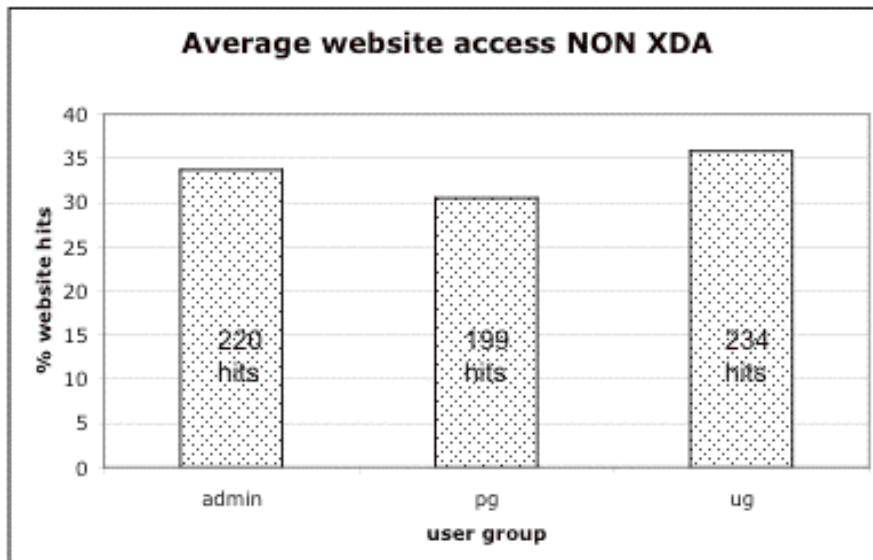


Figure 3 Average web site access per user (not using the XDA)

The logging of e-mail traffic between course participants showed that, not surprisingly, the course admin team sent the most e-mails to course members, both using the device and not using it. The postgraduates were more frequent users of the device overall for e-mail, but the undergraduates were at the severe disadvantage of sharing devices so not being able to use it as easily to access their personal e-mail.

4.3 The on-line poll

We designed the poll to enable us to ask students their views about the key features that need to be part of the design of both face to face and technology-mediated educational experiences. The poll was offered to students through the course website as part of an on-line lecture. The poll has also been conducted with students taking the same course this Spring (2004), which enables us to draw upon evidence over a longer period of time and from a greater number of students.

In both 2003 and 2004 students felt that the most important feature to the success of face-to-face learning was *Approachable, knowledgeable & enthusiastic tutors*. The chance to get hands-on experience of material being discussed in the course such as offered by the XDA, finished third in 2003 and second in 2004. There was a similar consistency between 2003 and 2004 with respect to the feature that students considered vital to the success of on-line learning. This was *Tutor support on-line*, which

finished top in both years with *Conference environments and student collaboration* also proving popular choices. Web resources were considered to be less important for on-line education in 2004 than in 2003, a change which is carried through into students' views about the types of technology that are most important for students in both face to face and on-line learning contexts. Unsurprisingly *Internet Access* was voted the most important technology for on-line learning in both 2003 and 2004, receiving 95% and 85% of the votes respectively. However, the top three technologies for face-to-face learning in 2003 were:

1. Internet Access: 33% of votes cast
2. Notebook and pen: 24% of votes cast
3. On-line multimedia course materials: 14% of votes cast

Whereas in 2004 they were:

1. Notebook and pen: 58% of votes cast
2. Books: 19% of votes cast
3. On-line multimedia course materials AND Internet access: 12% of votes cast

5. Evaluation and Outcomes

The evaluation of this learning experience as discussed above, suggests that as a device the XDA can allow students to experience learning in whatever context they happen to be. The website usage statistics indicate that learners will access resources at any time of the day if given the opportunity. The student evaluations suggest that it is the connectivity of the device that learners appreciated, as opposed to the word processing or other applications. However, the device alone is far from enough. Even those students who were lucky enough to have sole use of an XDA for the term, with all reasonable bills paid for them, still used standard desktop technology to a much greater extent both for course assignment preparation, resource access and e-mail communication. Always-on personal digital assistants are not a replacement for other more familiar artifacts and should not be seen as so. The key feature needed is the provision of a means of communication with others who can offer encouragement and support. As we mentioned in Section 4, we also collected data from an on-line poll. These poll results suggest a rise in the popularity of non-digital technology, such as notebooks, pens and text books. Is this evidence that students now take for granted the existence of good quality internet access, or could it also be evidence of a disappointment in the digital technology on offer or the manner in which it is deployed?

6. Conclusions and Institutional Aspects

The overall feeling from both the course team and the students was that the project had been a worthwhile exercise, allowing as it did an investigation of the use of combined mobile phone and PDA devices within an educational context (Luckin, Brewster, Pearce, du Boulay & Siddons-Corby, 2003). It illustrated that the provision of coherent learning opportunities and episodes mediated by technology and accessible through multiple devices is certainly possible. However, the success of the technology as an educational tool depends upon the extent to which it is integrated into a pedagogically grounded framework. The technology is merely a medium through which the learner can communicate with others. Those others may be the writers of course modules that the learner is reading on a screen, they may be fellow students with whom a discussion is being conducted through an on-line forum, or they might be a teacher who is offering some advice. Whatever the situation, the technology itself should not be the focus. There is a tendency to add a fresh letter to the start of the word 'learn' or 'learning' and to then assume that a new paradigm has been created. The words 'e-learning' and 'm-learning' are examples of this phenomenon. The fundamental feature is still, of course, the learning and that should always be the focus of any educational experience. If we wish to offer learners a particular technology such as a mobile PDA in order to increase their access to the learning experience, the focus of attention should remain upon the concepts to be taught and learnt, not on the technology. We may have to make some changes to the packaging, to the size of the modules for example, but the concepts we want the learner to understand should remain our primary concern.

An analogy with a good take-away springs to mind here. If I fancy a Chicken Tikka for supper, I have various options available to me: I can cook it myself, I can go to a restaurant that I know serves that dish or I can order a take-away to be delivered to my door. My choice will probably be dictated by various constraints including cost and convenience. However, whichever mode of delivery I choose, the meal I eat will still be Chicken Tikka. In fact it may even be the identical meal, since many outlets that offer a take-away service also offer a sit-down restaurant alternative. The food is precisely the same in both

instances. The chef does not differentiate the ingredients or the method because the food is going to be taken away and eaten off the premises. The same should be true for education.

So why is there a problem? In the main the problems occur because the technology or the way in which it has been integrated into a particular learning context results in it becoming the focus of attention. The XDA we introduced to the Interactive Learning Environments course fell prey to this deficiency to an extent. It was not reliable and not all its features were deemed useful or indeed easy to use. The overhead of staff time in terms of technical support, account administration and finding workarounds for features that did not work as required was enormous.

7. What next?

As we stated at the outset, Sussex University encourages small projects that expand upon novel solutions to particular problems or issues within a learning context. The SMILE project we have discussed in this case study increased our understanding of what it means to offer a learning experience that encompasses multiple technologies across varying contexts such as on campus and at home. For the Interactive Learning Environments course in the Spring, 2004 we have opted away from sophisticated kit that requires a lot of maintenance and chosen to offer all students a USB pen-drive, complete with all course materials. Students are required to find their own new resources to add to those we provide and to create a portfolio that they can share with other members of the course by bringing it along to seminar sessions on the pen-drive. The work can then be displayed via a laptop and projector and discussed. We are also once again using the XDA devices. However, despite the students' desire for connectivity the overhead of administering the on-line access and managing a relationship with the service provider was too great last year for us to contemplate its repetition. In 2004 the XDA has been offered as a portable mobile computing resources, but with no on-line or mobile phone functionality. Students can, for example, use it to view and listen to the course material provided, a contrast to the 'black box' of the pendrive, which is merely a storage device. Once again the web resources are available, but this time with the addition of audio lectures for students to download along with a piece of experimental software which enables textual annotation of this audio stream. The emphasis is upon providing learners with simple tools to help them link together the different elements of the course content.

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