Identifying Emerging Issues in Mobile Learning in Higher and Further Education: A report to JISC

by

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Summary

This report describes the results of a series of discussion workshops where experts and experienced practitioners explored visions of how mobile technologies and devices will influence practice in Higher Education (HE) and Further Education (FE) in the near future. The workshop series was funded by the UK's Joint Information Systems Committee (JISC) as part of the Emerge Community within JISC's own Users and Innovation research programme. This exploration focused on identifying emerging issues for the sector arising from the increasingly likely large scale use of Smartphones, PDAs and camera phones by learners in HE and FE, both on campus and in the workplace. This was carried out through scenario generation using three different futures prediction tools in three workshops. The following issues were identified as being the most likely to appear in the future of mobile learning five years from now:

- the increasing use of 'just in time' and 'as and when necessary' training.
- the need for always on affordable connectivity and power.
- increased support for an approach to teaching and learning that is more collaborative than didactic.
- concerns over scalability; learning communities are divided over whether there is a role for mobile devices in formal teaching, especially in large groups and lectures.
- concerns over the merging of personal and vocational information and practice.
- the strong match between affordances of mobile devices and learning opportunities in work based and experiential learning across the board.
- increased peer to peer networking and collaboration.
- the need for design specifications for a secure online all-purpose data repository accessible by different browsers according to device at hand.

Other emerging issues for mobile learning in HE and FE include both ethical and practical implications. These include cultural barriers and resistance to change amongst lecturers and associated teaching professionals. Examples are: fears for the erosion of lecturers' personal time; concerns over security related to the increasing amount of information and number of images to be stored and privacy issues related to the ease with information can be captured in a range of locations. There is also the opportunity to reconsider assessment practices, recording the process of developing an assignment rather than simply marking the product. One last issue, one that is in need of urgent attention, is the need for the development by students and staff of agreed practice, establishing how mobile devices are to be used responsibly in institutions before inconsiderate use or ignorance of their potential to enhance learning results in banning a valuable learning tool.

Acknowledgements

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Introduction

This report details the scenarios developed in a series of discussion workshops exploring visions of how mobile technologies and devices will influence the practice of users in Higher Education (HE) and Further Education (FE) in the future five years hence. The workshop series was funded by the UK's Joint Information Systems Committee (JISC) as part of the Emerge Community within JISC's own Users and Innovation research programme. This current exploration focuses on identifying emerging issues for the sector arising with the increasingly likely large scale use of Smartphones and mobile phones with the capability to record both video and audio by learners both on campus and in the workplace in HE and FE. These devices have become well established throughout the student community, a survey of 177 students at the University of Southampton found that 94% were regular users and owners of mobile phones (Davidson and Lutman 2007). This dovetails with data from Ofcom (2008) which shows that mobile phone ownership in the 15-24 age group of the UK population is stabilising at around 95% and students to come will be even more experienced in their use. For example, older students in schools that ostensibly ban mobile phones are now regularly being allowed to use the cameras on their 'phones to record special events or experiments in lessons to help them revise.

What is mobile learning?

The field of mobile learning has been developing fast as a research topic over the past eight years and accordingly ideas of what exactly mobile learning is have also developed. Winters (2006) noted how various groups researching mobile learning have used definitions that fall into four categories: one - mobile learning as technocentric, where learning is seen as something that makes use of mobile devices, personal digital assistants (PDAs) and mobile phones; two – defined by its relationship to e-learning, where mobile learning is seen as an extension of e-learning; three - as augmenting formal education and four - as learner centred, enabling the possibility of lifelong learning. These does not address the unique selling point of mobile learning which is closely linked to the capability of the mobile learner moving between traditionally separate contexts such as the work place and the teaching base supported by handheld technology that they can work with interactively to capture, access and store quantities of information in different multimedia formats. Thus mobile learning can be best described as "the processes (both personal and public) of coming to know through exploration and conversation across multiple contexts amongst people and interactive technologies" (Sharples, Arnedillo Sanchez, Milrad & Vavoula 2007).

Mobile learning in post-compulsory education in the UK

A presentation from Traxler & Sugden (2007) places the current state of mobile learning in the UK as consisting of considerable numbers of small scale trials and pilots taking place over fixed periods of time. Confirmation that the practice of using mobile technology to support learning in post-compulsory education is not yet embedded in current practice within institutions was demonstrated during the search for previous research for this paper, where no ongoing large scale uses were found. From currently available sources there is little or no indication as to the extent to which mobile devices are being used in Higher and Further Education. Findings from interviews conducted by Bird and Stubbs (2008) with mobile learning innovators in ten Higher Education Institutions (HEIs) were surprisingly consistent with most respondents reporting that they experienced or expect to experience the same kind of issues. These were mostly in the form of barriers to establishing and sustaining an m-learning innovation in a university

environment. Issues which dominated were: skills gaps (in IT support and especially academic staff and somewhat unexpectedly students who despite being heavy users), lack of technical support (IT services provision), procurement and accounting policies based around PC usage, inclusion issues due to cost of devices and/or data, ethical and legal issues, quality assurance especially with respect to data ownership, sustainability (all projects were based on external funding), device limitations, standards churn, privacy and security, and lack of a 'killer application' for the context. Interviews with users trialling PDAs at the Open University (Pettit and Kukulska-Hulme, 2008) indicated that the wireless infrastructure was widely regarded as a critical factor in influencing adoption of the device.

Most papers reviewed for the current investigation referred to theoretical speculation about future potential, others discussed projects outside of the UK in Europe or East Asia, however, in the remaining 20%, an impressive range of pilots with different handheld devices was described. These indicate that there is considerable potential for engaging and supporting learners via mobile technologies. These pilots point to greater use of context relevant information especially images and video in learning and to greater collaboration enabled by easily portable, handheld devices connected to the internet via wi-fi or broadband. The following examples indicate the range of activities tested and are included by sector.

Higher education

Lecturers have evaluated a range of devices from multi-function PDAs and Smartphones to simple texti messaging (SMS). In one of the first examples of the use of PDA's in an undergraduate setting Ramsden (2005) successfully tested giving undergraduate Economics students at the University of Bristol access to VLE's and course materials via internet-enabled PDAs. As well as enabling access to course resources any time, anywhere, having the PDA allowed the students to hold question and answer sessions via the online discussion board during lectures which they found this particularly helpful.

The University of Birmingham has evaluated the use of PocketPC handheld computers to offer multiple mobile applications to university students in the form of a 'mobile learning organiser'. The main uses were for issues of time and course management and access to course materials. Other functions included the ability to communicate via email and instant messaging and to organise notes. The participating students made good use of the calendar and timetable facilities as well as communication tools and were keen for more content to be delivered in this manner. (Corlett et al, 2005)

At London Metropolitan University the Reusable Learning Objects (RLO) Centre for Excellence in Teaching and Learning (CETL) works on the design, development and use of learning objects many of which run on mobile phones. Smith et al (2007) discuss the motivation they have seen in students (sports science in this case) to learn via subject specific learning objects (programs) such as Flash animations of muscle groupings and movements that run on their own or loaned mobile phones. Other animated tutorials, language learning for example, include multiple choice quizzes (Tschirhart et al, 2008). In another study Cook, Pachler and Bradley (2008) found that loaning postgraduate students Nokia N91 phones to make notes and take images for upload to web based media board such as Lifeblog and tribal's Mediaboard led to blurring the boundaries between study, work, and personal time and between formal and informal practice.

In the Spatial Literacy in Teaching (SPLINT) CETL at the Universities of Nottingham and Leicester applications aimed at Geography students are being developed for PDAs and tablet

PCs where the PDA screen is held up towards the real scene to offer additional information about that scene, 'augmenting' reality for the user (Priestnall and Polmear, 2007). For example, trials of a PDA application designed to teach the geomorphology of the Lake District, NW England showed that students the students learned to appreciate the power of geocontextualised visualisation to support their understanding of landscape processes (Jarvis et al, 2008).

The University of Nottingham has used mobile phones and similar software to enable group blogging as a tool to support Chinese students in the process of enculturation as they get used to a new society and to enter the local community. The "learners showed a obvious interest in flexibility of time and space that potentially extends 'antennas' of the group blog to deeper insight of local culture." (Shao, Crook & Koleva, 2007).

Other examples used simpler devices and text messaging. The Mobiles Enhancing Learning and Support (MELaS) project saw the University of Wolverhampton test using text messaging with first year undergraduates in five departments aiming to enhance the student learning experience. In all 27 staff successfully interacted with 938 different students through at least one of: one way (staff to learner) communication, formative assessment with feedback, and a collaborative learning discursive tool (Brett, 2008). In another study sports education students at the University of Bath reported that SMS messages to their mobile phones from faculty were found welcome in assisting them to learn time management skills and as an extension of the tutor's voice beyond the traditional lecture environment. This helped to reduce the perceived psychological distance between students, their peers and tutors (Jones, Edwards & Reid, 2008). SMS messaging has been trialled in lecture theatres too. Elliman (2006) reports successfully using a system that allowed students to provide feedback by SMS on their level of comprehension during a lecture. The system displays a histogram showing understanding level which is continually updated during the lecture together with comments and question in a scrolling area of the screen.

At Brunel University, first year undergraduate Information and Communications Technology (ICT) students found that revision podcasts, downloaded to their personal digital media players were popular and perceived as more effective than revising from traditional textbooks (Evans 2008). In a review of podcasting to support distance learning in the Open University, UK Minocha and Booth (2008) conclude that audio technologies such as podcasts can not only support mobile learning but also entice, motivate, inform and reinforce.

Further Education

Mobile technology has been used in a number of colleges as a means to bring new learning opportunities to students who might otherwise not have access to college education. Many of these projects have been funded by the Learning and Skills Council under the MoleNET initiative or by the JISC e-Learning Programme.

At Pembrokeshire College, an mlearning trial project was carried out from 2005-7 to support NEET students (NEET – not in education, employment or training) with reentry to education, training or work. Giving students access to PDA's helped to engage them and improve communication with a difficult to reach group. The use of SMS messaging enabled the teachers to keep in touch with this very transient group of learners and helped identify opportunities for learning as when they occurred. (Pembrokeshire College 2007). Similar projects working with NEET learners have also been carried out at Accrington and Rossendale College, Tower Hamlets College and Weston College (MoLeNET 2008).

Having the capability to learn anywhere by means of handheld PDAs allowed Dewsbury College and Bishop Burton College, West Yorkshire to provide learners in outreach centres and workplace learning environments with similar access to learning resources as their peers on the main college campus (JISC 2005a).

Mobile phones have also been found useful to help in location based learning. The City of Southampton College has been assisting ESOL (English for speakers of other languages) students to improve their opportunities for meaningful language interactions. Visiting locations within the city to help get to know their locality, students were asked location specific questions answered through SMS messaging and posting images to an interactive website. The project found that such techniques enhanced the students' literacy and numeracy skills and helped to engage hard to reach learners such as those from the multiethnic Southampton community where many students have English as a second language (JISC 2005b).

As in Higher Education bulk text messaging services to support managing learning have proved popular with most students. There are those for whom this sort of service is particularly useful. Derwen College (JISC, 2008a) found that their students who have varying degrees of physical disabilities and learning difficulties responded well to reminders to students for things like surgery and other appointments, dinner times and class notifications. Simple text based interaction was also used at Lakes College West Cumbria (JISC, 2008b) who piloted the use of iPod nanos to provide multiple choice revision quizzes for Construction students, many of whom have learning difficulties and struggle with paper-based revision processes. The iPod quizzes proved popular with every student in the cohort making use of the iPods during the revision period.

The use of handheld devices to record or view multimedia to support learning is also proving popular. At Southwark College students are using low-priced, pocket-sized camcorders to overcome some of the technical and organisational barriers to using video in the classroom and for recording evidence of learning (JISC, 2008c). Examples included recording students' oral presentations in English which were then used by the students for practice and reviewing with each other and Level 2 students in Art and Design recording technique demos and talking about their work to inform Level 1 students hoping to progress. Other projects, such as My Podcast at New College, Swindon (Warren, 2008), involve podcasting with lecturers creating both audio and video podcasts that students can download and play on handheld PDA's or MP3 players for revision or extra support with a topic wherever they happen to be, in the workplace, at home or in college or moving between the two.

Work Based Learning

Both HE and FE institutions place students training for professions, whether medicine, building, teaching or hairdressing etc., in the workplace for a significant proportion of their course. Students, often at considerable distance from their teaching bases, need online access to course materials and other context specific information, to communicate with their tutors and to produce records of their progress and assignments for assessment. Mentors in the workplace need to authenticate and support this student learning. A number of pilots have been set up to test how mobile technologies can successfully be used to support students on work placements.

For instance, mobile devices have been used to give instant hands on access to information that would be difficult to carry around on the job. At the James Cook University Hospital in

Middlesborough, 5th year medical students tested the use of PDA's providing access to formulae, clinical guidelines, electronic portfolios and other web-based materials. They found portable access to these facilities useful, as was the ability for supervisors to 'sign-off' log books using their normal signatures on the PDA. (Cotterill et al, 2008).

Reynolds et al (2007) found that a PDA proved to be a convenient and versatile mode of access to online education for dentistry students at King's College, London. The 12 students were most positive about being able to make notes for individual study, to keep a diary of their commitments to teaching sessions and to having on the spot access to online support materials, particularly videos.

Teaching is another profession where students need access to a wealth of information. Wishart et al (2007) found that when student teachers trialled the use of PDA's in school they deemed the calendar or diary to be particularly supportive. Email was also used, primarily to maintain contact with other students and the university tutor, and the web browser was used to access information both in class and for personal reasons. Some students used spreadsheets to record pupils' attendance and grades and most, in this pilot involving 14 trainees, used the word processor to make notes from meetings and on lesson observations for essays. However, the prevailing sociocultural climate where mobile phones are often banned and PDA's a rarity meant that trainees often felt uncomfortable using their device on school premises.

In FE mobile technology has been used in the work place for just in time problem solving, such as through the Hairdressing Training programme developed by the University of Manchester's data centre, Mimas, and now used by 500 students at Stockport College, which offers step-by step guides to hairdressing techniques for styling, colouring and cutting (Smith, 2008)

Also PDA's have been found to be useful in connecting work based learners in FE who may otherwise be isolated from learning opportunities. Such devices have been used to assist apprentices in remote rural locations in Lincolnshire to give flexible learning options and to build achievement and self-esteem (Lambourne, 2008) and to provide learning and social networking opportunities to care workers in schools and nursing establishments in the Bourneville area of Birmingham (Brown, 2008).

Finally, one of the largest trials of mobile technology in the workplace, currently ongoing with around a 1000 students in five universities in Yorkshire, is that being run by the Assessment of Learning in Practice Settings (ALPS) CETL[1], a Centre for Excellence in Teaching and Learning that focuses on assessment and learning in practice settings and involving nursing and allied health care practitioner trainees. Initial indications (Dearnley et al, 2008) showed that both students and lecturers were positive about a range of benefits having a PDA enables however, introducing mobile technology into the clinical setting will require a significant shift in culture and a significant level of training and support.

[1] http://www.alps-cetl.ac.uk/

Summary

While the above mentioned projects demonstrate the range of learning activities that have been trialled in UK institutions, recent advances in the abilities of the mobile devices themselves offer the chance to deliver new services to learners that have not yet been tested.

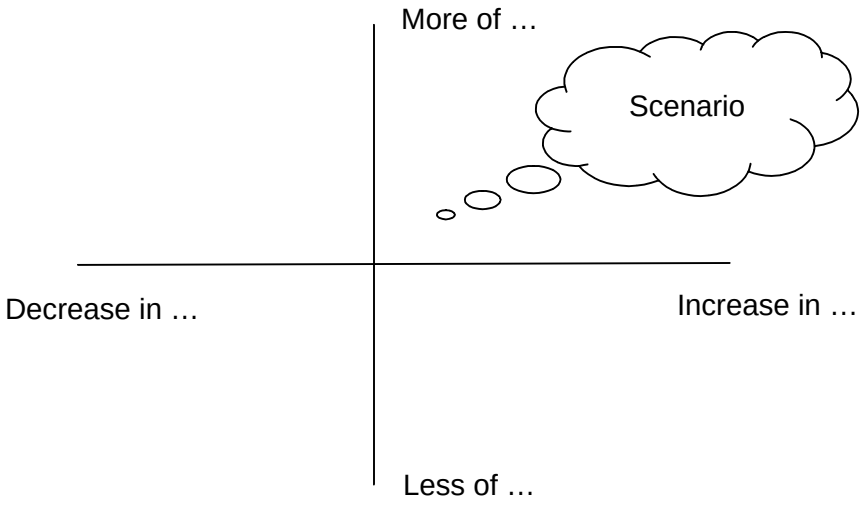
The 2009 Horizon Report notes how the adoption of novel interfaces (like the iPhone), the new ability of mobile devices to download applications and to be location aware through GPS signals, all offer new opportunities for learning. With the addition of broadband-like data connections, the boundary between what is a mobile phone and a portable computer are being ever more blurred (New Media Consortium 2009).

It is in this technology context that the workshop participants came together to imagine future scenarios for the use of mobile technology in learning, drawing on their wide experiences of previous research projects and contemplating how developing mobile technologies could open up new opportunities for connecting learners and teachers.

Methods: Developing Future Scenarios

In this project three different tools were used to support future predictions.

The first used for the workshop focusing on the practice of users in Higher Education (HE) in the future five years from today was the Cognitive Foresight toolkit available from the UK Government Department for Innovation, Universities and Skills (Office of Science and Technology, 2005). It was developed for strategic futures planning and provides guidance on different techniques that can be used in the different stages of developing future scenarios and the ways they can be combined. This first workshop employed driver analysis to build internally consistent future scenarios from an assessment of the way current trends and drivers are influencing the present use of mobile technologies in HE. First the workshop participants 'brainstorm' a range of drivers for the currently observable trends. Next scenarios are produced by taking the drivers identified as having the highest importance and highest impact as orthogonal pairs of axes and visualising up to four scenarios that match the chosen combinations. This method is illustrated in the example below.



The second used the Futures Technology Workshop method (Vavoula and Sharples, 2007) to look at future scenarios in work based learning. This is a structured method whereby people, in this case with experience in the specific area of the use of mobile technologies in education, envision and design the interactions between current and future technologies and an activity. Through a series of structured workshop sessions they collaborate to envisage future activities related to technology design, build models of the contexts of use for future technologies, act out scenarios of use for their models, re-conceive their scenarios in relation to present-day technologies, list problems with implementing the scenarios exploring the gap between current and future technology and activity. The workshop method was edited slightly within the time constraints of the day so that the structured sessions comprised:

i. Imagineering: brainstorm on desired future learning activities.
ii. Modelling: in groups, producing models that demonstrate the envisioned activities, complete with related props.

iii. Retrofit: developing a role play for another group's scenario using only current technologies.
iv. Futurefit Requirements: listing requirements for the future technologies that have to be in place for the scenario to be realised.

The third workshop on future scenarios in Further Education (FE) followed a method devised by FutureLab, an educational thinktank aimed at transforming the way people learn that focuses on the potential offered by digital and other technologies. This method for developing scenarios uses non-specific images of people of different ages in different locations printed on cards as a stimulus to thinking. The workshop used cards such as these shown below from the Building Visions for Learning Spaces sequence of cards.

The workshop participants are then asked to envision first a range of learning activities that could be happening within the image and the people involved in them, then the anticipated outcomes and the technological resources that will be needed. One of these activities is then chosen by each of the groups for fuller development into a future scenario.

In each of the above three cases the workshop was set up to start with two initial keynote presentations designed to stimulate thought and discussion from recognised experts. These keynotes (found under workshops 8-10) are available from the Adding a Mobile Dimension to Teaching and Learning web site[2]. These were followed by a series of discussion activities informed by the futures prediction method being used and facilitated by the research team. A discussion workshop is a recognised method of collaborative knowledge construction through discussion and debate amongst peers or experts. The workshops were run as focus groups with the facilitator encouraging discussion and debate and following a qualitative, phenomenological research approach.

Each workshop group was audio recorded with the participants and the transcriptions used to generate scenarios that can be written up into a report of publishable quality. Participation was voluntary and participants were fully informed as to the purposes of the workshop.

Finally, the developed scenarios were written up by the project team and sent out to the rest of the Adding a Mobile Dimension to Teaching and Learning network for feedback as to the likelihood of each of the different scenarios arising and for suggestions as to enablers and barriers or challenges to its occurrence.

[2] http://www.bris.ac.uk/education/research/networks/mobile/events

Results: Future Scenarios Developed

Three workshops aimed at identifying emerging issues in mobile learning through future scenario development took place, the first on developing scenarios for mobile learning in Higher Education (HE) was attended by 15 participants, the second on scenarios for mobile learning in the workplace was attended by 14 participants and the third on scenarios for mobile learning in Further Education (FE) was attended by 15 participants. Participants' experiences in mobile learning ranged from PhD students (2-3) studying aspects of deploying mobile technologies in teaching and learning, through learning technology support officers (3-4) and staff developers (1-2) dealing with the changing context of e-learning in HE to a range of academics from lecturers to professors (5-6) teaching about and/or researching mobile technologies in education. Also at each workshop were one or two individuals with specific expertise such as using images in teaching in and health care professions at the workshop on future scenarios in HE, using mobile telecommunications in industry at the workshop on work based learning (WBL) and using mobile devices in FE colleges at the workshop on work based learning (WBL).

The scenarios that were developed are detailed by workshop as follows, along with the feedback each scenario received from the rest of the Adding a Mobile Dimension to Teaching and Learning network about the likelihood of it coming into being and any associated challenges and enablers that were suggested.

1. Scenarios for Higher Education – developed using the Cognitive Foresight Toolkit

The following drivers were chosen as those that will have both the highest impact upon institutions and also the highest impact upon learning:

- Usability of mobile devices and the associated systems
- Integration with University systems VLEs, portals etc – the current aim is for seamless
- Funding model – more joint University/ Telecomms tariffs are being seen
- Student practices – using mobile devices for formal vs. informal learning
- Motivation of academic staff to innovate practice and support/training for them
- Increasing choice and personalisation – variety in learners and consequent learner support
- Interest in formative assessment and feedback
- Systems capacity/storage availability/scalability/interoperability

Reflecting on the drivers chosen, the workshop participants are agreed that future trends will include increasingly usable, affordable and interoperable devices and increasing personalisation associated with more formative assessment and feedback. Whether students will increasingly take to using personal, informal devices for formal learning is currently less clear. Using pairs of

drivers as axes (moving from low to high in each case) on which to pin thinking (pairs were chosen from the above list by each workshop group) three likely scenarios were created:

HE 1. My Own Mobile

The consideration of increased 'Choice and personalisation' vs 'Funding models' suggested two clear possible scenarios. One where there were 'free to student' mobile devices at an increased cost to the University. This would clearly lead to good integration with University systems and support and is the model employed by some smaller US Universities such as Abilene Christian University who have issued students with a particular type of handheld, in this case an iPhone. However, this does not acknowledge that students come to University with a wide variety of mobile devices and that research shows that ownership and familiarity are important to being willing to engage with new technologies and developing the associated technical skills to support learning (Cox et al, 1999, Kukulska-Hulme et al 2005). The group felt that no matter how much a University tried in making different technologies available, students would continue to appropriate their own devices for learning. Also students are unlikely to want a second device (free or otherwise), as this may well expect them to carry multiple devices to complete both their personal and study related tasks. Having your own device encourages collaboration and will lead to more potential for innovation. We will see more use by students of mobile devices together with social networking tools and different kinds of 'mashups' and we need to note the potential implications for security. This latter scenario was thought to be much more realistic and characteristic of a future in HE five years hence.

Variety of Mobile Technology in use at Southampton City College (Flickr: jisc_infonet)

This scenario was rated by others in the network as likely to come into play in HE before 2015 however, there were a number of concerns raised about barriers seen in current practice that would prevent its occurrence. These include issues for both the institution and the user. Systems issues at institutional level include cross-device compatibility and adoption of common standards, keeping up with what seems to be constant updating of operating systems such as Symbian or Windows Mobile, the range of technical support that will be needed and lastly, security issues associated with any uncontrolled or malicious software installed on the students' devices. User issues of concern included lack of skill in being able to use their personal devices as effective tools for learning, currently many people do not use anywhere near the full range of functions on their mobile devices, students' attitudes to using a personal device for formal learning which vary widely and the costs associated with, say, sending in an assignment over the cell network. Practices that are likely to enable this scenario where students regularly use their personal Smartphones or PDAs to support their learning include the adoption by mobile phone manufacturers of common communications standards or more mobile manufacturers building web enabled devices and software. Examples of the latter are the Apple iPhone, phones that adopt the Google Android operating system, and phones by LG and Nokia. Either of these will allow institutions to predict the functions available on students' personal devices and implement accessible processes. As ever attention to staff attitudes and investment in staff skills will be needed for staff from the institution.

HE 2. My Feedback

In class (Flickr: petantik)

The consideration of increased 'Formative assessment and feedback' as a driver vs more 'Choice and personalisation' suggested a scenario where mobile devices would be used not only as audience response systems via SMS management systems such as Poll Everywhere or Edutxt, but for feedback from student to tutor/lecturer throughout a unit or module. Where we now see a few lecturers piloting receiving answers to questions or feedback in lectures via text, this will become common and University systems will develop to support a wide variety of mobile devices. It appears likely, as we are only considering five years hence, that text messaging will remain the lowest common denominator and be most successful for simple communications. However, in time increased levels of personalisation and effective integration of this wide level of user choice about devices, platforms and tools with university systems will mean both students and staff will be able to determine how they give and receive feedback. Opening feedback system up to the types of devices students have in their pockets will overcome some of the obstacles to the students engaging with the activity of feeding back on their lectures and tuition.

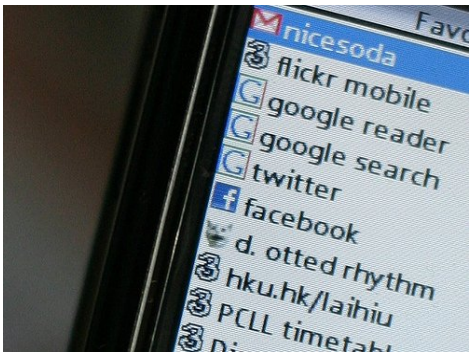
This scenario was thought by others in the network to be less likely to come into play before 2015. The technology of SMS voting systems is currently available however, there remains a question over whether staff want, or students want to provide, this level of micro-feedback. In some institutions there can be a 'defensive culture' whereby asking for feedback from students is seen as seeking negatives. However this is changing and the student voice is being listened to and valued more though students themselves can be reluctant to send in feedback to staff about their teaching. There are also several practical issues. Would this entail a feedback text from every student after every session? How much can they say in 160 characters or will it be a response to a multiple choice question? Whose job would it be to collate and interpret students' feedback into something useful? Staff will find it difficult to manage a large flow of feedback from students. Though students may well feel freer to send feedback to staff through technology than in face-to-face encounters.

Feeding back from staff to students via mobile devices faces fewer challenges. Personalised feedback can be welcome as shown in a trial by a lecturer in Sports Development at Liverpool John Moores University (Roberts, 2008) which indicated that giving verbal feedback (via podcasts e-mailed to students) was valued by students as it is personal (the lecturer speaking to them) and that they take more notice of it compared to a written comment. This could be done more efficiently with mobile devices.

HE 3. My Peer Support

The consideration of 'Student practice in formal and informal learning' vs 'Formative assessment and feedback' produced four relevant scenarios. Two of these acknowledged the increasing likelihood of university students' use of mobile devices breaking barriers between formal education and informal learning, as is now being seen in schools.

In the first, a high level of formative assessment organised as part of students' University programmes and more acknowledgement of their skills and capabilities acquired through informal learning was linked to i) the introduction of ePortfolios including online multimedia records of achievement and ii) new ways of assessing that focus on the process as captured by the mobile device, rather than the end product. Design and Technology (Kimbell et al, 2007), Sports Science and Art are all examples of subjects where mobile phone or PDA cameras are being used to record the process of design, development and/or creation for later assessment.



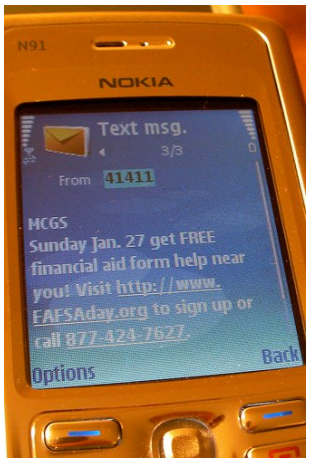
Social Networking (Flickr: laihiu)

In the second, a low level of formative assessment from the tutors and lecturers on their programme will mean that students will tap into their own networks for peer support and feedback. They will do that with mobile devices accessing social networking and chat sites. Staff in HE would need to endorse this activity and, rather than see it as a kind of threat to formal teaching and learning activities, encourage it and show students where the benefits and problems might lie.

Respondents from the network considered that first scenario is clearly to be expected sooner rather than later as the preliminary steps towards assessing the process of learning, rather than the end result (ePortfolios, rubrics, etc) are in place and gaining momentum across the sector. Though several barriers, such as the necessity to set up systems to enable safe access, standardisation and new models of assessment, were cited. Also where there are IT facilities with internet access available, it is unlikely that students will use their mobile phones. However, the network was much less certain as to whether the latter scenario where students prefer to rely on peers for support would come into play before 2015. Costs of social networking associated with study could be an issue for students. It was also felt that staff support for this activity would be an issue. For instance, some course leaders may view such activities outside the lecturer's direct oversight as dangerous, leading to a loss of control of student learning and costly in terms of tutor time to assess the impact on learning. However, that said, we are aware that students are already making widespread use of their social networks for collaboration and peer support in both formal and informal learning and for sharing resources. Such tools could be very helpful for teacher trainees on placement or geography students in the field who do not have PC access during the day. The issue here is whether such uses will become part of any institution's working practices which seems less likely at the moment.

Finally on use of mobile devices in HE it was noted during this workshop that a constant theme reoccurred throughout the day. This was the increasing use of SMS by Universities as information management systems in educational support and administration for students. This leads to another suggested scenario.

HE 4. My Admin



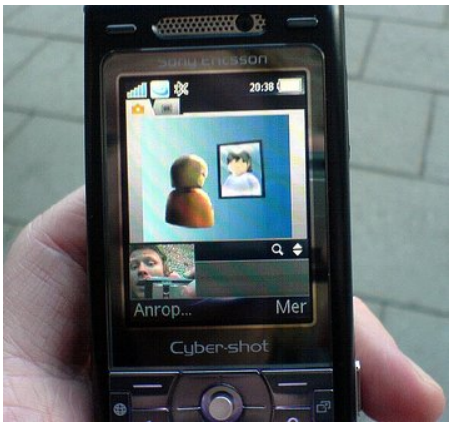
Message about student finance (Flickr: Financial Aid Podcast)

Research by some of the workshop participants (Jones et al, 2008) shows that so long as the texts received are relevant, arrive at sociable times of day and not too often, students are appreciative and opt-in to receive them. Whilst this wasn't developed fully as a scenario it is clear that students find this system sufficiently useful for it to be around, probably universally, in five year's time.

This scenario was thought by others in the network to be likely to come into play before 2015, systems such as Edutxt are being employed widely in FE Colleges and in some university students unions provide cheap SMS services and communicate with the students via text messages. In US Universities SMS messaging is use to inform students of an emergency on campus and the recommended actions to take. The main barriers were thought to be social - when a student's mobile becomes a work tool the definition between social time and work time blurs and financial – the costs associated with sending information. Enablers centred on perceived usefulness. SMS messaging could be extremely useful for updating students about specific tasks where being intrusive is necessary, such as room changes, cancellations, timetable changes, emergencies or social events. Such time sensitive messages would be more effective broadcast to mobile devices than by email. It would be important to retain staff privacy. A system to link e-mails with texts, whereby staff send out an email, which is then sent to students as a text message to their phones and any student text replies are converted back to emails would resolve the issue of privacy for staff members' personal mobile phone numbers.

2. Scenarios for Further Education – developed using the Futurelab Building Visions for Learning Spaces scenario cards

FE 1. Working and Learning Together on Placement in Business Studies:



Video conferencing on 3G (Flickr: larskflem)

College students on placement for Business Studies are generally set a variety of tasks to be investigated and carried out in their workplace. An example might be "describe the recruitment and retention process in an organisation". This programme, in one college, described by the current students as 'boring' and resulting in lots of written work, will be radically revised though students' use of mobile devices, always-on connectivity and multimedia. Mobile devices (handhelds or micro-laptops) will enable students to contact distant peers and college tutors through audio, video, texting and email. This could include multi-way 'question time' video conferencing. Giving or ensuring students have devices with global positioning systems (GPS) would not only allow the teacher to know where all of the students are located, but also to let the students know where each other were. By sharing their work, students would know where the gaps were in their knowledge/skills and could identify someone, a peer or a tutor, to fill those needs. GPS would then enable them to find out who was geographically nearest to the person identified and direct him/her to their location. Students could also share their work while 'out in the field', so as to learn how each other is tackling the same problems. They would not have to wait until they get back to their teaching base before comparing notes. Though, once back at the teaching base, the students would be able to store the assets they have created during their time on placement, such as video, audio, text inputs and other research notes for assessment and/or sharing with their or future cohorts of students.

Outcomes for this collaborative learning scenario enabled through mobile devices will include not only meeting course assessment requirements but also the development of inter-personal skills such as collaboration skills, learning how to reconcile different information from different sources and communication with people of different ages, social groups and skill sets.

This scenario was thought by others in the network to be likely to come into play before 2015 as the technology is already in place and has considerable potential to make a usually 'boring' topic much more interesting for the learners. However there are a number of barriers that would need to be surmounted first such as the training and commitment needed from the college IT support staff for supporting students placed in different locations. There may also be interoperability issues depending on whether the college has decided to provide one standard device or to rely on students' personal devices. Lastly one major question arises with this scenario about the ethical issues of i) using GPS to 'track' people such as the students in this scenario ii) recording possibly privileged information about the workplace's business strategies. While students may not object to their friends knowing where they are through GPS, they may not want tutors to know their location. Whilst employers are happy to train Business Studies students within their organisation they may not want multimedia records leaving the premises. For this scenario to be realised it appears clear that there needs to be agreement in advance between employer and

college about all possible processes involved in students collection and sharing of data for assignments.

FE 2. Recording Experiential Learning in Leisure and Tourism:

Texting (Flickr: adamjinj)

A leisure and tourism student moves between several different trendy venues on a work placement day release scheme. She has been asked to create a portfolio to link conceptual ideas from the course syllabus with her experiential learning in leisure and tourism. The actual technology used would all be online. This would mean that excuses such as 'I forgot my laptop' will be obsolete as everything would be based in an online e-portfolio system including VLE / blog / wiki style tools i.e. with inbuilt, well integrated social networking tools. This online e-portfolio system can be updated by handheld camera phones and Netbooks as well as laptop and desktop computers and assumes high speed mobile broadband is permanently available through wi-fi or the cell network. The system would have both private and public spaces, so that as the student goes around recording her work, she can keep that in a private space. She can then develop her records via a laptop or desktop with a larger screen at college or at home and transfer the resulting assignment to the public space when finished, to be viewed by her tutor, supervisor, mentor and others as required. She would also have access to online tutorials while out in the field, to provide conceptual principles and pointers for her to link them to her practice.

Outcomes for the student would include: an industry recognised qualification from the Institution or FE College; new skills relevant to leisure and tourism and in managing new mobile technologies to support learning. She could keep the e-portfolio as something to build upon in the future.

This scenario was also viewed by other respondents from the network as likely to be in effect before 2015. They considered that this style of assessment is likely to appeal to work placement providers and that leisure and tourism would be a suitable subject. Such students can easily capture their experiences which can be less easy or even disallowed other subjects for example, engineering placement students are not allowed to bring mobile devices near production lines as manufacturers wish to keep their designs under wraps. Respondents disagreed over whether this scenario would be cost effective weighing up the savings of having all assessment completed online against the potential cell phone network costs. Also who would fund the broadband usage? Who would own the technology? There was also some concern over the assumption that all students would have personal access to Smartphones or Netbooks, particularly in this student population where there are many from disadvantaged backgrounds. Nor have e-portfolios been an overwhelming success to date provoking a number of practical, technical and conceptual issues (Adamson, 2006). However the scenario would probably appeal to students (until they discovered how much work it would be?) and, as everything is accessed via a web browser customised for the device it is running on, will not be handicapped by interoperability issues.

FE 3. Sharing Audio in Music Technology

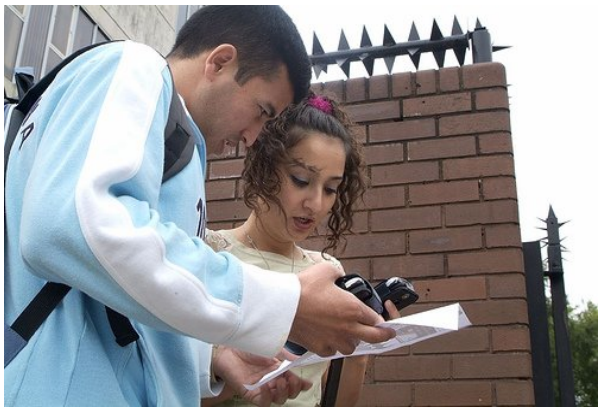
iPhone music (Flickr: martinonflickr)

Music technology students tend to spend time out and about in the community playing and recording their music, other sounds, laying down tracks and swapping information with each other. Ubiquitous connectivity and handhelds with 80Gb files stores such as those found in the latest iPod will enable uploading and downloading of music to/from a server anywhere. They will use a system for swapping all this information and samples that will be rather like the current 'Diigo' system; this is a social networking site where a group of people can share knowledge through comments on web pages of interest to their community(ies). This new system will allow people leave comments on audio (and maybe video) files in the same way as StudioCode is currently used by some college PE students. They can combine recorded video and field notes taken at the time of the recording (on a PDA) back at the teaching base but, in this future scenario, the combination will also be in the field with everyone collaborating from outside college. The tutor would also be able to comment on the student's work, singly or as a group, with comments that would also be in a multimedia format.

Outcomes will include greater collaboration amongst music technology students, a shift in the relationship between lecturers and students and increased learner self esteem through creating resources for and with others.

This scenario was thought to be more than likely to come into play before 2015 with members pointing out that music technology is already a 'techie' subject, so students would take quicker than most to a system of this type and that remote collaboration, even internationally, between musicians is already enabled via desk top software such as Cubase. A number of positive points were noted about such a system. It could be useful for community arts projects as well as FE, it will be more interesting for the learners and will lead to collaborative learning. Only two barriers were identified; the scenario will be demanding of high-end, expensive mobile devices and the question over whether students might be resistant to use of social networking sites for work.

FE 4. Problem Based Learning in Building or Engineering



Collaborative Work at Southampton City College (Flickr: jisc_infonet)

In this scenario students on an environmental building course work together in groups to complete a whole variety of tasks within a problem based learning challenge such as the design of environmentally friendly, wind-proof or energy efficient buildings. This will involve members of the group playing different roles, with designers and modellers at a teaching base equipped with high specification computers (for the necessary engineering maths and modelling) and others in the field assessing buildings and discussing with the architects and the builders about the

environmental features seen and why they were designed in a certain way. The testers out in the field will use mobile devices to gather data on buildings of interest such as their GPS location, number and types of environmental features (including images of them) and to make notes on their discussions with the builders/designers. The mobile devices will also be used for collaboration between testers in the field and modellers/designers who remain back at base processing the data received. From this the modelling and design group will suggest different scenarios, ideas and questions which the testers will try out on the designers and even, adding to or amending building structures in the real world. Lastly the original notes and results of testing the modellers' predictions can then be combined, together with the images sent through, into informative, illustrated reports back at the teaching base.

Outcomes will include authentic learning shown in researched 'proof of concept' papers that can be assessed, looking at various environmental features and what could potentially happen in high winds, freezing conditions or even earthquakes. Also improved collaboration, as students would be working in a bigger team as would happen out in the real world.

3. Scenarios for Work Based Learning in HE and FE – developed using the Futures Technology Workshop Methods

The images in this section illustrate the models made by the groups attending the futures technology workshop sessions.

WBL 1. Projecting Handheld Device

This scenario centres on an organic handset, made out of as much natural material as possible with a small display on the handset and no keys or buttons. It has a projected virtual keyboard on a second separate screen (at the bottom of the image). When not needed as a keyboard, this can become an interactive touch screen acts as an interactive interface, allowing scrolling and selection by touch. A stylus stored neatly within the body of the device, also acts as a digital pen for note taking and can transfer recorded information back to the main unit via Bluetooth. In this scenario it is being used to support science students in the workplace, with a projection display, multi-band communication and multimedia. In the future (but not before 2015) this device will continue to be developed to include a holographic projector display, as in science teaching situations 3D models are effective. The image shows a projected 3D model heart behind the handset and the keyboard/ input at the front. The handset includes a removable universal memory card that can be read by most devices, especially computers, that replaces portable hard drives so students can have separate workplace, college or university and home storage media. There is a solar

panel on the back and removable rechargeable battery packs, to aid use in developing countries. The device is capable of receiving and sending any kind of information, from the universal WiFi connection expected in 5 years time. The disability friendly version has an optional speech to text input device (feather), with the additional capacity to convert to sign language too for deaf students.

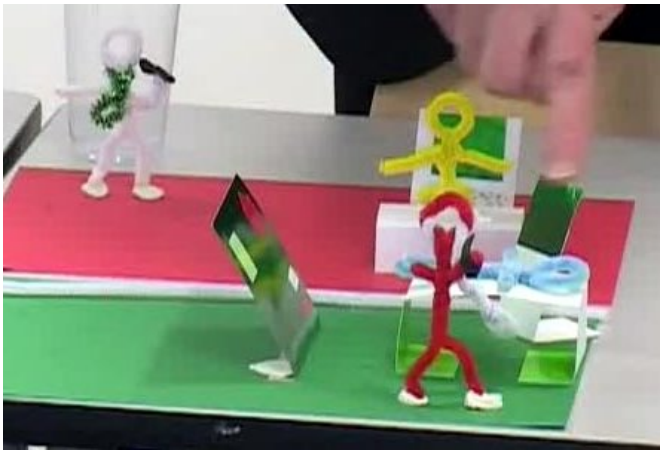
The device would enable two-way multimedia communication between the university or college tutor and the student on a science based placement in the pharmaceutical, chemical or medical industries. The tutor can send images, animations and instructions to be projected so that the student and their mentor or groups of students can discuss them. The student(s) can sketch out diagrams and capture images to send back their tutor.

Whilst aspects of this scenario are fantasy, for instance speech to text remains an issue despite decades of research, others such as pico-projection and solar power are appearing in mobile phones to be released in 2009 as announced by Samsung at the GSMA Mobile World Congress in Barcelona, February 2009. The respondents from the network though were very divided as to whether this scenario would come about within five or even ten years. One makes an interesting and relevant point.

> "Most of these technologies are around now but a change of priorities would be required for manufacturers to produce these. That is they would have to start from the premise that they would make available what education needs rather than adapting something made for a commercial, less price-sensitive market. "

Other barriers include the necessary change in attitude and development of digital literacy skills amongst learners and tutors, not all will be equally well equipped to operate devices such as these.

WBL 2. Connecting Student Doctors

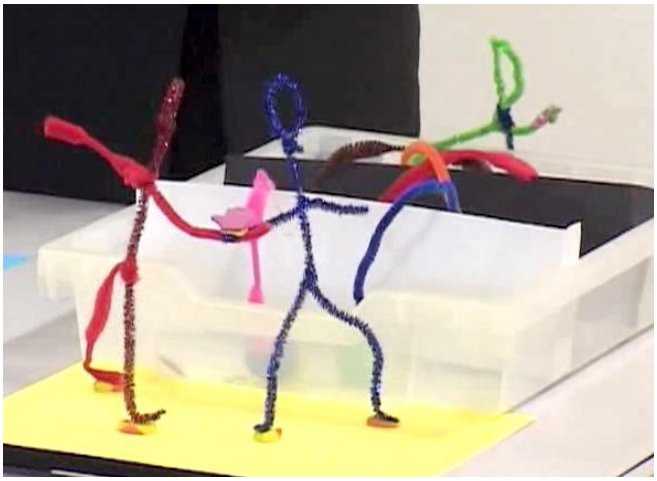


This scenario focuses on connecting student doctors to external services and expertise and using the information sent back and forth to create learning objects. It involves a consulting room in a hospital, with a student doctor and a critically ill patient. The trainee doctor uses a mobile device that will record and display video, the room has a PC next to the bed, and a wall mounted larger information screen for displaying patient information, such as X-rays, calendars, case history, and facilities associated with mobile devices, such as SMS. The student can use the PC to search electronic databases such as patient records or medical bibliographies for information. Using their handheld (which has facilities for speech to text conversion), they can record case notes that are automatically added to the patient's records. Or if necessary the trainee can use it to contact a more experienced clinician, who may be elsewhere in the hospital, or at another

location, and who can supply advice or information via voice and video. The student uses this technology to record their experiences and data for later reflection. With appropriate permissions it can also be shared with peers for joint reflection and stored as a learning object for future use. The content generated by each device may be repurposed for different stakeholders and devices. All content is held in the same shared data store, but different users will have access to different parts of the data, or access to it in different ways, on different devices. This access to a remote store assists in maintaining security and confidentiality, as each device especially the mobile does not retain data, but merely displays it. In terms of creating this technology, all that is needed to achieve this scenario is better, faster versions of what is already available.

Respondents from the network were agreed that this scenario would be very likely to come about within the next five years. Yet, whilst clinicians are proving receptive to new technologies and all that is needed is faster, always-on versions of what is already available, working cultures in hospitals may well still prove to be a tough barrier to cross. One issue would be making informal advice permanent, medical staff might need to say things off the record and the ephemeral nature of conversation between tutors and students can be important to aspects of the teaching process such as maintaining student self-esteem. One final concern about this scenario was that the network felt that the voice to text input method for entering case notes will not be reliable enough to be trusted with medical information without cross checking by a human.

WBL 3. My Life Space



This envisaged scenario involves the collection of life experiences, work experiences and associated prompts to learning and reflection. It is much bigger than an eportfolio and incorporates all of the things that you generate throughout your life. These could include work experience, academia, qualifications, competencies, case studies of things that you've actually done, things that you may or may not wish to share with others. These could be separated out into work versus home/lifestyle experiences. In the life space, there are stores of different types of information, split into separate areas, such as:

- work;
- qualifications, both academic and professional;
- work based learning assignments and
- a personal area.

However these areas are not completely separate. Parts of your life experiences, or part of your academic experiences could both contribute towards your work experience, so these are shared types of information. The store also contains files, be they documents, audio or video, which can reside in/cross link to any of these spaces. As mobile devices become better able to handle data transfer, they will become the medium to handle and transfer items to and from the life store silo. The mobile device is particularly suitable to help you remember that you're learning all the time, at work, in an educational institution, touring or at home and to prompt you to record

that learning. The emphasis would be on the device prompting you or making you become more proactive about recording, reflecting and capturing this information, than being a passive process. The process will be multi input, through voice and tablet or stylus. The device will help your learning as it responds to the way that you organise your work. With appropriate viewing permissions set, a university or college tutor or employer could come along to your life store and look at what you've done, how you've worked at certain tasks, how you've handled situations, the case studies. Then they could look at who you are as a person, to get a rounded picture and how suitable are you for a particular role. This scenario could be augmented by adding connectivity between individual's Life Spaces that supported a learning community as well as individual learning.

Members of the network held strong, divergent views about this scenario split between those who believed that, as a mega personal multimedia wiki in Facebook style with updates easily supported by current phone technology, it was very likely to members who believed it was extremely unlikely to happen. They pointed to cultural barriers between personal and work lives, concern about security of storage, privacy and fears that information could be passed on by the system. For example the current UK government is working on plans to record every email sent and received in the country[3]. These concerns are fuelled by the publicity surrounding systemic failures of recorded assessments of learning such as the Standard Assessment Tests (SATs) marking collapse. Other technical barriers pointed out were the reliance of the scenario on semantic web technologies and intelligent agents that have been predicted for sometime but have been slow in arriving and on connectivity. Currently connectivity and bandwidth are a real concern for university and college IT network teams who are reluctant to allow access to many services especially file sharing, peer to peer networks and even some sites e.g. social networking generally, You Tube etc. Whilst mobile broadband may mean students will no longer have to deal with such institutional mistrust, the cost of mobile data services may make them reluctant to use too much of their own airtime to use any systems or tools other than the ones they have chosen to use.

WBL 4. Just in Time Training and Information Networks

This scenario focuses on using mobile devices to connect networks of workers and experts in a multi-location setting. The three 'islands' shown in the image of the model represent three residential schools for children with a disability, such as Asperger's Syndrome. In this kind of work setting, there is a large team of care workers surrounding the children, who get little training. The nature of the work is that they have to learn as they go along, because each child is really individual. This is a problem for the management of that care. Also a considerable number of outside experts and sometimes others who are tangentially connected with the children are involved. These might include speech therapists, social workers, relatives and/or someone who knows the child's drug plan. Handheld mobile devices will be used for tapping into this local expertise, remote

[3] http://news.bbc.co.uk/1/hi/uk/7819230.stm

expertise and any available peer expertise through video connections between phones. Users could consult their phone to see who is available among fellow workers, SMS all those who are available and then initiate a video call to whoever responds. The phones can also capture stories, through video and voice recording, which could be edited into a suitable snippet. This edited story could then be uploaded to a private video sharing community YouTube style site for access by appropriate colleagues. Another possibly contentious idea would require that the children were assigned tags of 'need' and local experts were given tags of 'expertise'. Then if a difficult situation with a child arose where it was impossible to communicate with the child to find a solution, you could look up their tags of need, which could lead to finding somebody else who had worked with that child and appropriate experts on that need. However it was recognised that there are threats associated with such tags. If you're carrying around information in the form of a tag, that you're not in control of releasing, you need to know who else may get access to that data. Sharing information through channels such as Bluetooth carries risks of interception by others.

This is another scenario where respondents were divided as to the likelihood of its coming into play before 2015 with cultural barriers playing a greater role in their thinking than technical ones. While technically most aspects of the scenario are perfectly feasible, it is questionable whether manufacturers would have the will to make or to support such devices. Currently the rate at which manufacturers change the designs of their Smartphones aimed at the business and entertainment markets is a problem for those attempting to embed their use in education. Also members of the network again raised concerns over data storage and security. One catastrophic failure of care or loss of patient confidentiality caused by a communications failure at a critical moment would destroy all public trust in such an approach. Whilst those young people today who update their My Space, Bebo or Facebook status several times a day clearly share fewer concerns about privacy than members of the network, we have yet to hear much about how those with special educational needs feel. Though results from projects such as those run by the Rix Centre at the The Big Tree[4] on behalf of the University of East London imply many would like to become more involved with web 2.0 technologies.

[4] http://www.thebigtree.org/

Discussion of Emerging Issues for Mobile Learning

From the review of previous research carried out for this project the first issue that emerges for the field of mobile learning is the lack of full scale evaluations of mobile technology in Higher (HE) or Further Education (FE), without scaling up the most promising of the many trials we cannot be sure that the original results are reliable. It is clear from the trials that different people take to mobile technologies in different ways and with the lack of a mobile tool specifically designed for education the volatility of designs on the market aimed at use for business or entertainment means we have yet to attain a stable platform on which to research this. Consistency and stability of mobile device functionality is needed to embed research findings, to allow the sector to develop strategies to resolve the associated practical and ethical implications and allow for the training, development and support that university and college staff will need. This appears unlikely due to the nature of the mobile device market which has reached nearly 100% saturation in the UK and manufacturers need to change their range of features to attract custom. Nor is there any current suggestion that this time for training and development can be made available and, for the time being, we appear still to be looking at bottom up, user driven change as students and early adopters (Rogers, 1995) amongst staff bring different devices to learning situations.

It should be noted though that some of the trials evaluating single functions of handheld technologies such as SMS texting (Jones et al, 2008), video capture and storage (JISC, 2008c) or subject specific animations (Smith et al, 2007) appeared to be the most pedagogically effective. SMS texting for supporting students in managing their programmes is already common in the UK FE sector.

Other issues that arise from reviewing the scenarios envisaged by the three workshops for this project relate more to learning opportunities. The following themes could be seen to reoccur within many of the scenarios; it appears that these will underpin developments that will impact upon the future for mobile learning in HE and FE over the next five years. These include:

- the device that enables ‘just in time’ and ‘as and when necessary’ training.

Scenarios such as HE3.: My Peer Support, FE1: Working Together in Business Studies, FE3: Sharing in Music Technology, WBL2: Connecting Student Doctors and WBL4: Just in Time Training Networks foregrounded the opportunity for learners to seek information relevant to their current context via a mobile device. This information would be both location and activity specific and appropriate to the learner’s current stage in their progress over time. This source of this information could be a person, peer or expert, the World Wide Web or a bespoke subject specific video or animation. The Hairdressing Training programme (Smith, 2008) which allows trainee hairdressers to review videos of cutting techniques on their mobile phone before trying them for real is an example how ‘just in time’ training can work.

- an approach to teaching and learning that is more collaborative than didactic.

In the scenarios listed above and also in FE4: Problem Based Learning in Building and WBL1: Projecting Handheld Device the workshop participants also draw attention to the opportunities for communication in different modes between tutor and student (and workplace mentor where relevant). They view the tutor as taking a more collaborative role than is seen currently in most HE and FE institutions and using the mobile device to support a teaching approach that

facilitates context specific learning opportunities. There is clearly a lot of potential for teaching that takes into account on the spot feedback from students as described in HE2: My Feedback and trialled in Elliman's (2006) and Ramsden's (2005) investigations of mobile device use in lectures. However, the current sociocultural climate and conventional practices mean that it takes a strong minded, confident lecturer to solicit feedback in public.

- always on affordable connectivity and power.

All of the envisaged scenarios rely on permanently available, affordable connections to the world wide web and the mobile phone network. In scenario HE1: My Own Mobile the workshop participants debated the respective merits of University or College supplied devices versus setting up the University's or College's ICT systems to operate seamlessly with a range of student owned devices. Other members of the network opined that come what may students would continue to bring a variety of mobile devices with them and the latter scenario was indeed likely to occur within the next five years. This has implications for the amount of support and training lecturers and ICT support staff will need and for network security. Whilst interoperability is currently an issue it was felt that the increasing number of phones with mobile web browsers such as the Apple iPhone, phones running the Google Android operating system, and phones by LG and Nokia would be likely to resolve this.

- an online repository accessible by different browsers according to device at hand.

The importance of the role of the web browser is clearly an emerging issue for mobile learning, it is looking like online access is the lowest common denominator between devices and will lead to lecturers and learning technologists designing applications for education such as VLE's and other courseware for the different browsers such as IE, Firefox, Safari, Opera, Chrome and their mobile versions. All the scenarios generated by the workshop participants involve, more or less obviously, some kind of large online data store to support the information gathered by the students' mobile devices. It would seem sensible to make access to this central repository via the simplest web interface common to as many browsers as possible. Indeed it looks as if Google has also had this thought with Google Apps Education Edition[5] now being used in dozens of universities and colleges across the world. However, such central repository brings with it huge concerns over managing a huge, ever increasing file store and ensuring its security.

- the merging of personal and vocational information and practice.

Several scenarios pointed to security issues within the online repository described above. In WBL 3: My Life Space this was linked to the combination online of records of informal and formal learning to provide a more "rounded" assessment of an individual's learning progress leading to a loss of privacy. Members of the network pointed out that public confidence in the security of large ICT systems is low, for example, this has held up the development of national electronic patient record in the NHS. However, the way social networking sites such as Facebook and Flickr continue to flourish and the variety of information uploaded suggest that such concerns are not held by everyone. In addition, scenarios such as WBL 2: Connecting Student Doctors, HE1: My Own Mobile, HE 4: My Admin and WBL 4: Just in Time Training and Information Networks rely on using personal devices for communication between students and their tutors or supervisors. Requests for such communication could well occur in personal as well as work time. Cook, Pachler and Bradley (2008) have already found that loaning

[5] http://www.google.com/a/help/intl/en/edu/

postgraduate students mobile devices to use with web based media boards led to a blurring of the boundaries between study, work, and personal time.

- subject specific opportunities.

It is interesting to note that, in the workshop focusing on developing scenarios for work based learning, though the participating group was multi-disciplinary, use of mobile devices within science, particularly bioscience and medical sciences, underpinned three of the four scenarios envisioned. Other experiential learning scenarios generated in the FE focused workshop included science and engineering, business studies and leisure and tourism. An emerging issue for mobile learning is identifying which subjects will most naturally accommodate learning opportunities for students with devices such as camera or web-enabled mobile phones. Early indications from this workshop series point to subjects and professions with experiential learning and work placements and those such as science and medicine where the technology can help bridge contexts and show students the applications of the concepts being taught.

- peer to peer networking and collaboration

In scenarios such as FE1: Learning and Working Together in Business Studies, FE 3: Sharing Audio in Music Technology and HE3: My Peer Support the opportunities offered by mobile devices for student to student communication and collaboration are foregrounded. Members of the network considered this to be a likely outcome of more students bringing more sophisticated mobile devices to colleges and universities as described in HE1: My Own mobile. Concerns were raised over managing the variety of devices and opportunities they offered, about the training and support faculty will need and, common to all collaborative work, issues of of assessment.

Other suggestions made during the workshop such as mobiles with integral projectors are novel and their potential has yet to be evaluated seriously by the community. This is not so futuristic as once thought, pico-projection phones are available in China and Samsung plan to bring one out in the UK before the end of 2009. The potential disruption caused by projecting images as well as audio into a classroom or lecture theatre is clearly an emerging issue to be addressed earlier rather than later.

Whether the learning opportunities described in this report are realised is dependant on whether sufficient numbers of students and staff in HE and FE engage with the new technologies in a responsible fashion with an eye to their potential to support learning. In several scenarios including WBL 2: Connecting Student Doctors, HE3: My Peer Support and FE1: Working and Learning Together on Placement members of the network highlighted concerns over socio-cultural barriers that they believe are more likely to impact negatively on these scenarios than technical barriers. Examples include people's concerns over privacy, potential loss of data, disruption and being 'always available' that may well prevent these opportunities being taken up. Clearly an emerging issue for mobile learning is developing an appropriate cultural climate within the institution(s) involved and that will need ground rules accepted by all parties. It is known that mobile devices used irresponsibly are disruptive, some states in the US and India and even a country, Brunei, have entirely banned their use by students in schools. As Wishart et al (2007) found such bans impact negatively on staff trialling new technologies to support learning even if their own use is not formally restricted.

Thus further emerging issues for mobile learning in HE and FE include both ethical and practical implications. Examples of these highlighted in the discussion workshops include resistance to change, especially potentially disruptive change amongst faculty, concerns about new social practices impacting upon lecturers' and tutors' personal time if transferred to learning contexts, data security and privacy issues. There are particular concerns about how images are used, the ease of their capture and uploading to an online store and their usefulness in supporting learning and revision visually has meant that learner captured multimedia is part and parcel of nearly all the scenarios envisioned. Yet not all establishments who host students on placement, especially those manufacturers who carefully guard their designs, are likely to be as free as suggested in FE2: Recording Experiential Learning in Leisure and Tourism manufacturing with allowing students on placement to take images and use them outside the building even if only for assignments. Wishart (2009) also includes ownership, of the device if the institution has a loan scheme in place and of the data and images collected on it by a student on placement in her discussion the range of ethical considerations relevant to the use of mobile devices for work based learning.

Another emerging issue noted by the network in a previous workshop[6] is that assessment of process rather than product is a feature of using mobile devices to record learning. With the emphases on associations between the use of mobile devices and collaborative learning described earlier and the increased interest in formative assessment and feedback noted by participants in the first workshop the opportunity to use mobile devices to document the process of construction of, say, group project work can be seen to be potentially very useful to both the learner and their tutor.

Finally it is interesting to note how the different futures prediction tools used were related to the scenarios that were generated. Whilst in all workshops participants were reminded that they were considering only five years hence the Futures Technology Workshop led to a greater range of scenarios for which the technology is not yet in place than did the other techniques. Using the Cognitive Foresight Toolkit meant that the drivers chosen for axes on which to pin the scenarios led and, in some cases constrained, participants' thinking. In this workshop two drivers: increasing 'Formative assessment and feedback' and more 'Choice and personalisation' were the most popular. Whilst this gives clear indication that these are areas that dovetail with developments in mobile learning in HE, it restricted the participants. For instance, they were less confident about the HE2: My Feedback scenario and HE3: My peer support scenarios because of the fairly radical changes in current assessment and feedback practice they require. The 3D modelling component of the Futures Technology Workshop was more liberating of participants' ideas than the images in the Building Visions for Learning Spaces scenario cards where the participants tended to make their scenarios fit the image rather than use the image to generate free-flowing ideas from which to create a scenario.

[6] http://www.bris.ac.uk/education/research/networks/mobile/events/iasworkshop5notes

Conclusions

It was found possible to identify emerging issues for mobile learning from recording the discussion of various future scenarios amongst lecturers and learning technologists who, as early adopters of mobile devices for learning, had acquired relevant expertise and experience. In all twelve scenarios were developed in three workshops, each using different futures prediction techniques. Analysing the discussion of the scenarios envisioned for five years from now enabled the identification of the following issues which are believed by the members of the international research network 'Adding a Mobile Dimension to Teaching and Learning' as being most likely to impact upon the future for mobile learning in Higher (HE) and Further Education (FE). They include:

- concerns over scalability, learning communities are divided over whether there is a role for mobile devices in formal teaching, especially in large groups and lectures.
- the increasing use of 'just in time' and 'as and when necessary' training.
- the need for always on affordable connectivity and power.
- increased support for an approach to teaching and learning that is more collaborative than didactic.
- concerns over the merging of personal and vocational information and practice.
- particular learning opportunities in specific subjects, especially those where theory and application are both studied such as in the sciences and vocational subjects.
- the strong match between affordances of mobile devices and learning opportunities in work based and experiential learning across the board.
- increased peer to peer networking and collaboration.
- the need for design specifications for a secure online all-purpose data repository accessible by different browsers according to device at hand.

It was also noted that mobile devices afforded particular learning opportunities in specific subjects which involve fieldwork and data collection such as the sciences, geography and business studies. Other emerging issues for mobile learning in HE and FE include both ethical and practical implications. These include cultural barriers and resistance to change amongst lecturers and associated teaching professionals. They include fears for the erosion of lecturers' personal time, peoples' concerns over security related to the increasing amount of information and number of images to be stored and privacy issues related to the ease with information can be captured in a range of locations. There is also the opportunity to reconsider assessment practices recording the process of developing an assignment rather than only marking the product which resonates with increasing interest in HE in formative assessment. One last issue, one that is in need of urgent attention, is the need for the development by students and staff of agreed practice, establishing how mobile devices are to be used responsibly in institutions before inconsiderate use or ignorance of their potential to enhance learning results in banning a valuable learning tool.

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