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Practitioners as Innovators: Emergent Practice in Personal Mobile Teaching, Learning, Work and

Leisure

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Abstract

Mobile devices have become commonplace tools serving a wide array of purposes that may include teaching and learning alongside work and leisure, in both formal and informal settings. The project reported on in this paper was an investigation of how personal mobile devices are used by 57 students and alumni from the global Masters Programme in Online and Distance Education offered by the Institute of Educational Technology at the Open University, UK. The focus was on the types of activity undertaken, innovative or unexpected uses of mobile devices, and any issues mentioned by participants. Data was collected in 2005 by means of an online questionnaire and follow-up interviews with a subset of respondents. The questionnaire contained both quantitative and qualitative questions relating to the use of four types of device, user communities and groups, the frequency of specific uses, and users' views on the attractions and disadvantages of mobile learning. The research is intended to help inform those who are interested in the potential of mobile learning, who are designing learning with a specific type of mobile device in mind, or who own a mobile device but may not be making the most of it for their own teaching and learning.

Practitioners as innovators: emergent practice in personal mobile teaching, learning, work and leisure

Introduction

Mobile learning has reached the stage where the ‘early adopters’ and ‘early majority’ (Rogers, 2003) are making the use of mobile and wireless technologies visible across a broad range of contexts and applications. At the same time, the technological and social diversification of the field means that it has become much more open to innovation on the part of educators, i.e. practitioners in teaching and training, whereas in the not too distant past it tended to be largely in the preserve of researchers and specialists. Evidence is provided by the availability of case studies that show how educators are taking advantage of mobile learning to bring about significant enhancements and transformations in their teaching practice (e.g. JISC, 2005; Manolo, 2006). Mobile devices have also become commonplace tools serving a wide array of purposes that may include teaching and learning alongside work and leisure, in both formal and informal settings. Consequently learners, too, are often able to contribute more actively to developing innovative educational uses of the technology as they interweave them with other aspects of their lives.

We were interested to find out more about the ways in which those who are engaged in teaching and learning use mobile technologies, and in particular in relation to spontaneous learning and teaching practices and the intersection with daily life and work. We were also intrigued by anecdotal evidence that owning and carrying around one or more mobile devices may encourage users towards experimentation which in turn could lead to innovative uses. Edwards (2005) suggests that users of various mobile devices should try out activities they haven’t tried before, e.g. subscribing to news, accessing location-based content, viewing video

and listening to audio, since “the best place to start is by experiencing first-hand what it’s like to get the information you need in the format and location you want” (p.4). Edwards contrasts this informal and user-driven approach with more conventional, formal learning initiatives that don’t take into consideration current trends like mobile working and the constraints on people’s time.

The project we report on in this paper was an investigation of how personal mobile devices are used by students and alumni from our Masters Programme in Online and Distance Education, offered by the Institute of Educational Technology at The Open University, UK. Students and alumni of this programme are typically experienced practitioners working in the education sector and many of them are keen users of new technology. In 2001–2, a number of students from the Programme had had the opportunity to explore the use of mobile devices as part of a research project aimed at understanding their experiences with PDAs that had been provided for reading course materials (Waycott & Kukulska-Hulme, 2003). Whilst we believe, along with Ally (2005), that issues of mobile ‘content delivery’ are very much alive and need a great deal of attention, our more recent focus has been the complementary activity of investigating emergent practice. By ‘emergent practice’ we mean the ways in which students and alumni use mobile devices as learners and as teachers, spontaneously and autonomously rather than because they have been asked to. We are also interested in the interplay with other areas of their lives such as work and leisure. Edwards (2005) has noted that it is important to think beyond repurposing content for distribution on mobile devices and to focus more on understanding how people communicate, collaborate and learn.

Our research aims to contribute to the understanding of innovative practice at the level of the individual empowered by a personal mobile device and social networks that may amplify or modify its use. In our roles as disseminators of innovative e-learning practice both to colleagues

and students in our university and externally (e.g. Kukulska-Hulme, 2005), we also aim to use our research to help inform those who are interested in the potential of mobile learning, who are designing learning with a specific type of mobile device in mind, or who own a mobile device but may not be making the most of it for their own teaching and learning. We would like to see more widespread discussion of how users can best discover and develop the potential of their mobile devices, individually and collectively, and we hope that our research can help raise the profile of that discussion.

Mobile learning practices in the research literature

In evolving definitions of mobile learning, we are seeing technology-focused approaches being gradually superseded by interpretations that seek to locate mobile learning within broader educational frameworks, taking account of social and philosophical dimensions (Traxler, 2005; Laouris, 2005). The context for this is the rapidly changing landscape of teaching and learning. The growing importance of lifelong and informal learning has a special connection with the affordances of mobile technologies; but whilst this has long been emphasized by Sharples (1999), it has taken some time to gain momentum.

Scanlon *et al.* (2005) have been exploring what possibilities exist for science learners in informal settings, and in projects across many subject domains it is not unusual now to find a stated aim of developing systems or materials for informal learning. For example, Fallahkhair *et al.* (2005) have developed a system to support informal mobile language learning, while Bradley *et al.* (2005) report on the development of materials for a mobile local history tour. This type of 'designed' informal learning may be contrasted with situations where mobile devices are used spontaneously for learning, employing only the device features and software that are already available for general use or that have been sought out by users in response to their own needs or

interests, perhaps for everyday learning. In connection with the latter, Vavoula *et al.* (2004) have studied mobile learning as part of everyday learning, in order to uncover “how people learn on the move or outside their normal learning environment, with the technologies that are currently available, such as mobile phones and PDAs” (p.1). Vavoula (2005) compared episodes of mobile learning (when the learner is not at a fixed location or when she/he takes advantage of mobile technologies) to non-mobile learning, and found “indications that mobile learning is more interactive, involves more ‘bustle’, more contact, communication and collaboration with people” (p. 17).

Informal mobile learning is also a theme in the work of Oksman (2005), who has reported on research at the University of Tampere exploring mobile communication and Internet use among young people, families and older people since the late 1990s. Berth (2005) has been studying the use of mobile phones in the intersection between formal and informal learning contexts. There is also growing interest in the new social practices associated with the use of particular mobile technologies (e.g. pervasive image capture and sharing, Spasojevic *et al.*, 2005). However, overall the research literature in the area of everyday informal mobile learning and its integration with daily life is still limited. If we take seriously one of the main conclusions of the Mobilelearn project - that “Learning is interwoven with other activities as part of everyday life...Mobile learning is integrated with non-learning tasks such as shopping or entertainment” (Sharples, 2005) – then the case for understanding the technology-mediated relationship between learning and other activities is emphasized.

In relation to teaching practices and mobile devices, Leach *et al.* (2005) have been investigating the impact of new portable technologies on teachers’ practices in the context of their professional development. The work shows very clearly that personal uses such as diary

and address book functions go hand-in-hand with successful use of the same mobile device for planning teaching and collecting resources for teaching. Wishart's (2006) research in the use of PDAs in initial teacher training gives similar findings concerning the integration of the PDA as both personal organiser and a tool for making notes on information and events as they are encountered. The first year evaluation of Duke University's iPods initiative reported that academic uses consisted of course content dissemination, data capture in the classroom and in the field (capturing discussions, notes, digital assets), study support, and file storage and transfer (Belanger, 2005). These studies demonstrate that a multifunctional portable device enables users both to attend to administrative tasks and to develop their practice in a variety of locations. The Duke University initiative continues to encourage the development of practice through "creative uses of technology in education and campus life" (Duke University, 2006).

Participants and methodology

Participants in our research (hereafter referred to as *alumni*) were drawn from among those who had successfully completed at least one of the courses in our Masters Programme in Online and Distance Education (MAODE). This is a global, distance learning programme which has been running since 1997. Recent alumni have good or excellent levels of computer literacy (the programme is delivered online and several of the modules explicitly focus on aspects of elearning technologies), but even those who completed courses much earlier could reasonably be expected to have at least some knowledge of ICT. We therefore expected that the alumni would include at least some who had interesting and innovative experience of using mobile devices. Since the MAODE programme is aimed largely at those practising or intending to practise in education and training, it seemed likely that the alumni would throw light on some of the ways in which mobile devices are being used in education and training, and would also reveal how

practitioners are using such devices in other areas of their life – in their own learning, social interaction and entertainment.

Given the geographically dispersed locations of our participants, data for the project was collected in 2005 by means of an online questionnaire and follow-up interviews by telephone or email with a subset of respondents. The questionnaire contained both quantitative and qualitative questions relating to the use of different types of device (namely, mobile phones, smartphones, PDAs, mp3 players) in five types of activity:

- teaching
- learning
- work
- social interaction
- entertainment (including quizzes and games)

It covered the use of mobile devices as part of user communities and groups, the frequency of specific uses (such as browsing websites, reading e-news, sharing media files, etc.) and users' views on the attractions and disadvantages of mobile learning. It was sent out to 150 alumni and elicited 57 responses.

The main section of the questionnaire focused on the use of mobile devices. Respondents were asked to give one or more examples in detail to show how they use(d) the devices for the five types of activity. We were mainly interested in teaching and learning; however, the three remaining categories were included with a view to examining whether the other areas of use might have implications for teaching and learning.

The questionnaire stated that the terms 'teaching' and 'learning' should be interpreted to include informal uses, for example teaching or learning with friends, family or interest groups -

as well as formal situations inside or outside the classroom. For some respondents, 'work' equates with 'teaching' because of their job. When analysing the questionnaire data we were particularly interested in the types of activity undertaken; innovative or unexpected uses of mobile devices; and issues mentioned by users. The questionnaire results are reported with special regard to those aspects. As a means of data collection, the questionnaire had typical advantages and drawbacks: in particular, the open-ended questions elicited a good array of examples that could not have been anticipated in advance, but they also allowed for a few ambiguous responses that proved hard to interpret.

Nine interviewees were subsequently invited to amplify the responses they had made in the questionnaire a few months previously. Our approach was broadly phenomenological; in relation to the data arising from the interviews, we were interested in gathering individual stories but aimed not to take these as unsituated accounts. The interviews illustrate ways in which respondents are using mobile devices in diverse situations, and they provide insights into user choices in relation to contexts of use, ergonomic issues and personal preferences. The nine interviewees were chosen principally because their questionnaire responses suggested they were engaging in interesting or novel applications, but we also took care to include at least some participants from outside the UK. The interviewees were therefore not chosen as being representative of the cohort; nevertheless, they gave the opportunity to move outside the categories of the questionnaire and to capture details of individual accounts and contexts. The interviewees talked about their choice of device, the content of their activities, and the contexts in which they used their devices, both formal and informal. All the interviews were carried out by an experienced researcher who was independent of the project; they were transcribed by an administrative assistant and anonymised before being passed on to the authors of this paper. The

interview findings are only covered briefly in this paper; a fuller account is available in Pettit & Kukulska-Hulme, 2006.

Questionnaire findings

In this section we report the main findings of the questionnaire. About three-quarters of the respondents were aged 35–54 and a little over half (55%) were female. Over half lived principally in the UK, with most of the remainder living in continental Western Europe, and 5 living in Hong Kong, Japan, Peru and the USA. Nearly all described their profession as associated in some way with education or training.

Almost all respondents reported that they had used a mobile phone, and about half stated they had used a PDA or mp3 player. Smartphones were used by 18% of those who answered this question; a smartphone was defined in the questionnaire as: ‘a mobile phone/PDA in one device’.

The findings are reported here firstly in relation to the four types of device and the five areas addressed in the questionnaire, namely teaching, learning, work, social interaction, and entertainment. We believe the most valuable aspect of the findings is the range and variety of activities mentioned by respondents for each type of device, because of our overarching aim to continue using our research to help disseminate innovative practice. For each type of device, we concentrate on listing the activities that were undertaken by respondents rather than the frequency with which they were mentioned. Subsequently we also report on what respondents told us about being part of groups and communities, whether they had undertaken specific activities listed in the questionnaire, their views of what’s special about mobile learning and what they perceive to be the single biggest disadvantage.

Mobile phones

Of those who had used a mobile phone, 96% reported using it for social interaction and 78% for work. Outside these uses, the figures were much lower: 30% for teaching; 19% for entertainment, quizzes and games; and 17% for their own learning. Common mobile phone uses across the categories of activity were contact, scheduling and reminders, and as an alternative means of support.

The main use of mobile phones in *teaching* was for activities relating to contacting students, scheduling and reminders, as an alternative medium for support and as a way to motivate learners to participate. Communication by mobile phone occasionally included the use of photographs and short news. In addition, respondents mentioned teaching others about mobile devices, for example how mobiles can be used for more than just voice communication, but in those cases it seems that the phone was used in demonstration mode.

In *learning*, apart from contact, scheduling and learning support, respondents reported browsing the web, downloading e-books, learning Greek and receiving the table of contents of journals. One respondent used the phone as a modem for PDA network access.

In the *work* context, contact, scheduling and reminders were again the dominant uses. Some respondents gave more specific reasons, e.g. getting taxis, out-of-hours technical support, coordinating location with a colleague. Uses that might be considered slightly more unusual were: text messages in response to correspondence, storing information in Japanese, and telephone interviews for research. The issue of the acceptability of texting was touched upon by one respondent who claimed never to use texting for work.

In *social interaction*, the vast majority of respondents used their mobile phone simply for calls and for texting friends and family. Although this majority use was very predictable, there

were some interesting comments and examples in this category. One unusual use of the mobile phone was as support for mild visual impairment, namely contacting a spouse when the respondent had lost sight of her in a shop. One respondent emphasized the use of very short messages (congratulations, football scores, “where are you now”). Exchanging photos, pictures, jokes, ringtones and multimedia messages were mentioned; also checking the time of the next bus. Circumstances of use were sometimes alluded to: using the phone only to leave an important message (and where there is no option of a public phone), using it mainly when on the move, using free minutes only, primarily as an emergency phone, or to be “always available”; in four cases, running late was a specific reason for use. One respondent referred to health fears (possible danger of exposure).

In *entertainment*, games, quizzes and competitions were mentioned but these were minority pursuits. There were some negative comments regarding the use of mobile phones for entertainment, including the following:

- “Have tried it but not my cup of tea”
- “Did try receiving Virgin bite sized but they were so irritating. Virgin mobile culture seems whacky and crazy and I am neither.”
- “Tried – couldn’t figure it out”
- “Rarely – too slow”
- “Very rarely, when all other sorts of entertainment have failed.”

Photos were mentioned, in one case connected to mobile blogging (“this entertains the community of mobloggers on the site”). Respondents also referred to news as a form of entertainment.

Smartphones

As mentioned earlier, not many respondents had a smartphone but those who did have a smartphone reported some activities that had not been mentioned in connection with mobile phones.

In *teaching* and *work*, use of a smartphone meant access to online documents, a virtual learning environment (Blackboard), a student forum and websites. Communication by email was mentioned by a handful of respondents. Learning activities included use of email, accessing resources on the web, downloading chapters to read, quick access to Alta Vista Babelfish (a translation tool), and groupwork (“participating in groupwork remotely, using handsfree”). It should be noted that each of these uses was typically mentioned by one person, so they were not common activities.

Work activities included note-taking, task list, presenting Powerpoint slides, web browsing and share trading, as well as synchronisation with a Tablet PC. In *social interaction*, messaging, emails and voice calls were prevalent; specifically, the use of SMS during videoconferencing was reported by one participant. In the *entertainment* category, mention was made of games on the bus home, taking and sending photos, email and information such as news.

PDA's

The data relating to the use of PDA's was the most substantial in terms of the range of examples in the work context and the number of spontaneous comments about the experience of using PDA's.

Uses of PDA's in *teaching* included preparing materials; using digital sound files to record progress and achievement; getting students to take photographs (with text labels). Access

to information, e.g. articles, tables of contents and e-books, was mentioned by several respondents, as was administrative support: lists of talks, tutorials, tasks and students.

In the context of *learning*, carrying or reading texts (e-books, manuals, and various documents related to courses) appeared to be the most common activity, although note-taking and annotation were mentioned. A small amount of scheduling and web browsing took place, including web access to a discussion forum. This section generated a number of spontaneous comments regarding usability. On the positive side, it was possible to “use time productively while waiting” and to be “always up to date”; but on the negative side, the screen could be “far too small” for reading, and formatting of blogs was considered not to be good enough “at the time”.

In relation to *work*, the PDA had many different uses, including various ways of holding or capturing small amounts of information: contacts, action lists, notes, memos, as an “aide-memoire”, for “miscellaneous scrappy files”, for agenda-setting, and for mindmapping and brainstorming. Larger files were also mentioned, e.g. e-books, full text papers, a drugs database and medical textbooks. Recording or tracking was another area of use, e.g. recording meetings; keeping a record of continuous professional development; and tracking expenses or the amount of time spent on projects. Typical Office applications (Word, Excel, Powerpoint) were also used, email was sometimes accessed, and there was scheduling of appointments and meetings. A world clock was used by one respondent to check time differences. The use of PDAs for work generated a couple of spontaneous positive comments regarding usability, namely that battery life was better than on a laptop and that the PDA was more comfortable to use in ‘airline’ seats that do not have a proper table – making it suitable for use while travelling.

The categories of *social interaction* and *entertainment* elicited relatively sparse responses but included music/mp3s, photos, video, e-books, and MSN messenger. One respondent had tried conferencing but had found it “too clunky”; another reported using the PDA to synchronize with various news sites.

Mp3 players

Mp3 players, devices that are primarily destined for entertainment (mp3 files were described by one participant as being “perfectly suited to disposable pop music”), were actually used in a wide variety of ways for all categories of activity, particularly in learning.

In *teaching*, they were used to distribute music and sound drills to students, to play files from CDs, to download interviews for classes. Mp3 files were recorded from BBC radio 4 and the World Service. Mp3 players provided background music in workshops, they were used as a voice recorder to record students’ spoken reflections on their learning (subsequently included on a spreadsheet or in Powerpoint), and for gap fill and listening exercises. Several issues were brought up by respondents, namely that the microphone was not good enough to record music; cheaper devices have controls that are “extremely awkward and unfriendly”; and that audio can be good when working with adults with learning difficulties or in practical classes.

In the context of *learning*, respondents downloaded ebooks; copied audio courses onto an iPod (and listened when travelling by bike, train and plane; at home too); listened to podcasts, pre-recorded lectures and recorded conferences; created mp3 files from Real Media lectures; and recorded lectures and conferences. Mp3 players were used in connection with a foreign language – to understand Spanish better (with listening materials downloaded from the web) and for recordings of Japanese language drills and dialogues. They were used as a storage device between work and home or when travelling. Another reported use was recording and playback

for conversation analysis. For one respondent, the iPod was their “favourite personal learning device”.

For *work*, the devices were used as a backup for Contacts; to transfer files between home and work; to carry a kiosk version of Firefox browser; to carry presentations; to share audio, video, and photo materials; with speakers, to play sample music to clients; and on business trips (“when can’t sleep”).

In *social interaction*, they were used (with speakers) on holiday, to play music to friends; for iPod parties and for photos. In *entertainment* they were used for pleasure during journeys, in the office, for walks and jogging; to play solitaire; to hold a database of an entire DVD library and important contacts; to download BBC documentaries; and for music ‘audio books’ and ‘talking books’. One respondent saw music as a potential distraction when concentration at work was needed.

Being part of groups and communities

In this part of the questionnaire, we aimed to find out whether participants had used a mobile device to be part of a group or community. Only nine respondents answered this question. Two types of group were mentioned: traditional and online. Traditional communities or groups were teachers, a group of students, colleagues in the same department, a work group, former clients, family, community groups focusing on historic preservation, and a residents’ association. Two online communities were a gaming community and moblogging, the latter involving sharing and discussing photos (“the moblogging community are more rewarding and reinforcing than family/friends”).

General benefits that respondents derived from group or community activity were keeping abreast of developments, keeping in touch, a sense of satisfaction from fulfilment of

civic responsibility, support from peers, and being able to offer support back to others. The online gaming community enabled meeting people from around the world (“my partner doesn’t like computer games so the community is important to me”); the moblogging community was an occasional distraction from the respondent’s job.

Specific uses for mobile devices

In this section of the questionnaire, participants were asked about suggested specific activities they may have undertaken using their mobile device, and to indicate the frequency of use by choosing one of 6 options (ranging from ‘at least once a day’ to ‘never’). Twenty-three specific activities were proposed in the questionnaire, such as browsing websites, reading an e-book, taking a photograph, making a video clip, recording their voice, using a location-based service, etc. More unusual and more overtly interactive activities were also included, for instance “linking your device to someone else’s, to play a game”, making a video-phonecall, sending a sound file, sending an image. In this section, the activities were not related to the use of any particular type of device.

The most frequent activities, performed ‘at least once a day’, were:

- text messaging (38%)
- browsing websites – both ‘ordinary’ and set up for mobiles (20%)
- listening to an audio file (13%)
- reading e-news (9%)
- using a mobile device to make notes (7%)
- taking a photograph (6%)
- viewing a photograph or other image (6%)

When uses occurring ‘at least once a day’ and ‘a few days a week’ are combined, the most frequent activities were:

- text messaging (57%)
- browsing websites – both ‘ordinary’ and set up for mobiles (35%)
- using a mobile device to make notes (29%)
- moving files between a mobile device and a PC (28%)
- listening to an audio file (23%)
- reading e-news (23%)
- viewing a photograph or other image (21%)

Figure 1 shows a chart representing the above activities.

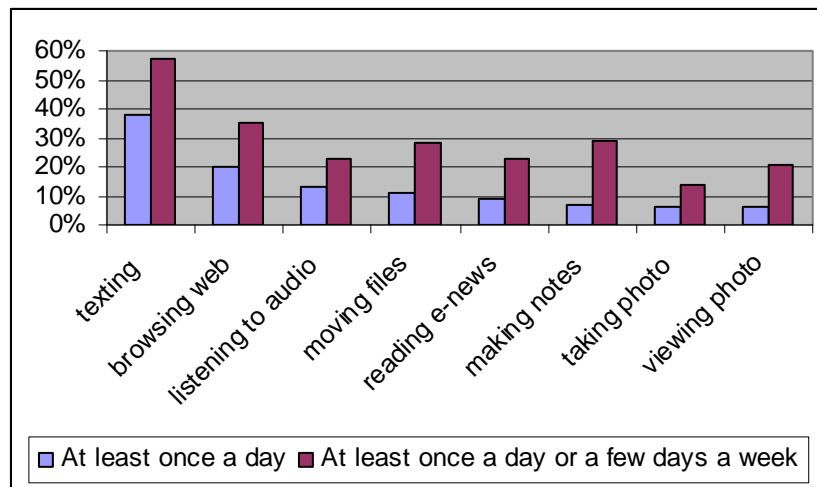


Figure 1. Most frequent activities

All twenty-three activities had at least one person indicating that they had undertaken that activity on a mobile device.

What's special, what's a problem?

When asked about what they considered to be *new and innovative* about their experience of learning with mobile devices, respondents mentioned that the devices were always available;

flexible; convenient; portable; inexpensive; easy to check again and again; and they mentioned the sense of being in control. Other aspects highlighted were as follows:

- Access to online data to support fieldwork
- Immediate contact with parents of disruptive pupil
- One can retrieve the most up-to-date material
- I can learn while on the move
- multimedia modules on the fly
- To be able to read blogs while travelling
- Ability to carry different types of media
- Using “dead time/hostage time”
- Could log thoughts electronically
- To keep up with email and online discussions
- With headphones, more immersive than a book or video

When asked about the single biggest *disadvantage* that mobile devices bring them in relation to their learning, respondents mentioned issues of cost, privacy, and security or confidentiality of one’s mobile number. Technical or ergonomic issues were:

- Battery problems, lost files
- Device is unreliable, it jams, speakers are poor
- Lack of wi-fi in many locations
- Fiddly small screen, tasking on the eyes; best as audio devices

Interaction issues were also signalled:

- Easy to get distracted
- Text based message lacks inflection

- Lacking interactive multimedia
- Interaction can be clumpy and stilted
- Everything has to be short and small, how can we get any meaningful interaction
- Limit to the depth of thinking and learning

Interview findings

As mentioned earlier, a report on the follow-up interviews can be found in Pettit & Kukulska-Hulme (2006). One of the distinctive contributions of the interviews was to illustrate how the participants wove particular devices and practices into their daily lives, especially when travelling. The interviews indicate the particular importance of travel periods for study, for informal learning or for engagement with news and other material. They also highlight dependence on factors often outside the control of the individual. When participants chose or rejected a particular device, they cited a number of unpredictable factors such as changes to the design of buses or train seats, improvements in typing skills, whether a device ‘looks stupid’, or individual trade-offs about the value of carrying a larger device in order to gain a keyboard.

The interviews provided a particularly vivid account of the use of a moblog – where photographs were uploaded, news captured and discussions initiated. The interviewee spoke of the satisfaction of receiving positive feedback on photographs, and highlighted the role of individuals in capturing powerful and almost immediate images of the aftermath of the London bombings in July 2005.

Discussion

In this project, we were particularly interested in the types of activity undertaken, innovative or unexpected uses of mobile devices, and any issues mentioned by participants.

Our findings show that mobile phones were largely used for interpersonal activities including contact, coordination, interviews, as an alternative means of support and a means to motivate learners, but they also appeared to be personally useful as a practical tool and a reference tool. They could support some multimedia content and some forms of entertainment. Having additional functionality in a smartphone was associated with more options for communication, online resources and tools, the possibility to create and share simple content, and to synchronize with a PC.

PDAs came across as highly versatile tools that enabled access to a wide range of information; the preparation of materials; recording and tracking, including records of progress and achievement. They seemed to encourage various ways of holding or capturing small amounts of information, mindmapping and brainstorming, whilst also being suitable for larger files and databases. They supported administrative tasks and the use of typical Office applications, music files, multimedia content and news. Communication was a lesser feature of PDA use but there was mention of email, MSN messenger and web access to a discussion forum.

Mp3 players were widely used for entertainment but also turned out to be useful in a much wider range of activity, particularly in learning. In terms of receptive use, participants reported downloading podcasts, audio books, documentaries, lectures, conferences, interviews and other listening materials from the web. In more active mode, they recorded conversations, lectures and conferences, the BBC being a common source of material. With mp3 players, materials and listening exercises were sometimes distributed to students, and the voice recorder facility was used to capture students' spoken reflections on their learning. A connection with PC applications could be made by subsequently including audio files in a spreadsheet or Powerpoint. Participants were quite active in transferring files to other media, perhaps for the sake of

convenience: they copied audio courses and CDs onto their mp3 player and created mp3 files from Real Media lectures. The mp3 players were used as a backup, storage and transfer device and a means of sharing audio, video and photos. Although a favoured personal device, the mp3 player was also used in social ways, with the addition of speakers, to provide background music in workshops, to play sample music to clients and to play music to friends.

It seems that compared to other devices, the mp3 player was particularly conducive to creative and social uses that may not have been anticipated when we started this project, when mp3 players were largely perceived to be personal entertainment devices for private listening. Some activities are easily identified as new, for example a teacher using mobile devices to capture students' reflections on their learning, or the person who posts photos to a mobile blog and gets feedback from an online community. The 'newness' of the activity of course depends on whether it has been heard of before, which may be difficult to verify in relation to informal uses that frequently go undocumented. Other activities may be new, but in a less obvious way. From the nature of our data, it is difficult to determine the extent to which an activity performed with a mobile device might have been transformational, for example in that it constituted a new way of working for the individual concerned. Note-taking or mindmapping may seem like ordinary activities, but the possibility to perform them on a personal device that is used in situations involving mobility may significantly change the nature of what is noted and how. Unexpected uses include ways in which mobile devices may be used in conjunction with other technologies, for example the use of SMS during videoconferencing, or as an alternative medium when other avenues of support are (perhaps temporarily) unavailable.

In this project sample, the use of mobile technologies in connection with groups or communities was not at all widespread, which we had anticipated. Although the project

participants would all have had experience of online collaboration within the MAODE programme, the idea of using mobile devices to be part of a group or community was still relatively new in 2005. How rapidly this may change would be worth tracking through ongoing research. The extent to which mobile devices were already being used to browse websites was a slight surprise to us. The presence of activities relating to a foreign language (Greek, Japanese, Spanish) suggests that this may be a fruitful area for informal learning with mobile devices.

Issues brought up by questionnaire respondents related to some social aspects of use, travel, and technical problems. Depending on the context of use and the individuals concerned, texting may or may not be socially acceptable, and people may prefer to use their mobile phone in exceptional circumstances only or to remain always switched on and available. There appeared to be a clash between emerging mobile cultures (e.g. Virgin) and the preferences of a group of participants who may not see themselves as belonging to that culture. Mobile phone messages are typically very short and social, which may need to be considered when introducing more formal communication, e.g. between learners and an education provider. Spontaneous comments relating to use of PDAs were largely positive, with the devices keeping their users up to date and enabling productive use of time.

Technical issues surfaced in responses relating to PDAs (small screen, difficulties with blogs and conferencing) and mp3 players (poor microphone, awkward controls). Battery problems, lost files, reliability issues and lack of wi-fi in many locations were among the issues highlighted as disadvantages of mobile learning. These seemed to inhibit making best use of the devices but we did not ask specifically whether the problems were perceived as major ones or whether they had been overcome.

If we were to look for evidence, in common with Vavoula *et al.* (2004), that mobile devices were being used in ways that are more interactive and involve more contact, communication and collaboration with people, the high usage of text messaging is clearly important. However beyond that, the most frequent uses out of those proposed in the questionnaire were those that were largely self-contained, such as browsing websites, making notes, listening to audio and reading news. Participants expressed some reservations about the quality of interaction in mobile learning. Perhaps the fact that these are distance learning alumni with experience of high quality online interaction contributes to their behaviours and views.

Is it possible to say on the basis of this research that the ways in which participants are using mobile devices in work, social interaction and entertainment might have implications for teaching and learning? There were certainly many instances of general activities (e.g. action lists, notes, records, etc.) that may have been mentioned in relation to one sphere of activity but could easily be transposed into another. Mobile blogging was mentioned under ‘entertainment’ but blogs are general purpose tools that are currently being exploited in education. An entertainment tool such as an mp3 player was used for the more ‘serious’ task of recording and playback for conversation analysis. It seems that for an individual, it is largely a matter of coming up with the ideas and perhaps making the mental leap that takes one from seeing a device in one light to being able to use it in a different way altogether. The bigger question here is how do we enable people to discover the full potential of their mobile device? We may be moving away from a world in which the use of any new technology was associated with going on formal training courses in order to become proficient at its use, towards a world where more informal learning will happen among colleagues and friends. Is a high level of comfort with mobile technology associated with increased personal innovation? And what are the best mechanisms for sharing

with others ideas for new ways of using mobile devices in teaching and learning? Future research must try to address these broader issues.

Conclusions

Our research confirms that amongst the participants of this study, mobile devices have indeed become commonplace tools serving a wide array of purposes that include teaching and learning alongside work and leisure. The education practitioners in this sample come across as active, sometimes experimental individuals, who are taking advantage of the capabilities of mobile devices to meet their own needs and the needs of their colleagues, clients and students. Our research connects with current interest in tracking teacher-led innovation, the focus of the UK Futurelab 'Teachers as Innovators' project which has set out to investigate where innovation is occurring in UK schools, factors contributing to innovation and methods for sharing and disseminating innovative practice with digital technologies (Sutch, 2006).

Thanks to mobile devices, learning appears to be occupying a new space that gives individuals the capacity to make use of electronic resources and tools in flexible ways that suit their circumstances and lifestyles. We have uncovered a vast range and diversity of ways in which a mobile device can be used to support different aspects of an individual's teaching and learning, and interactions with others. Since the devices are so personal, we think it is both challenging and important for educators and learners to find out how others are managing to use their mobile devices to help them in their teaching and learning. To enable this to happen, we need to find good ways of sharing and disseminating information about making effective use of the capabilities of mobile devices in education.

References

- Ally, M. (2005). *Use of mobile devices in distance education*. Mlearn 2005 conference paper, Cape Town, 25-28 October 2005.
- Belanger, Y. (2005). *Duke University iPod first year experience final evaluation report*, June 2005. Retrieved November 10, 2006, from http://cit.duke.edu/pdf/ipod_initiative_04_05.pdf
- Berth, M. (2005). *Mobile learning – methodologies for the study of informal learning with mobile devices*. Mlearn 2005 conference paper, Cape Town, 25-28 October 2005.
- Bradley, C., Haynes, R., & Boyle, T. (2005). Adult Multimedia Learning with PDAs – the User Experience. *Mlearn 2005 Conference Proceedings*, Cape Town, October 2005, 23-27.
- Duke University (2006). *iPods enter Duke classes*. Center for Instructional Technology website. Retrieved November 10, 2006, from http://cit.duke.edu/ideas/newprofiles/ipod_faculty_articles.do
- Edwards, R. (2005). Your employees are increasingly mobile, is your learning? *Mlearn 2005 Conference Proceedings*, Cape Town, October 2005, 50-52.
- Fallahkhair, S., Pemberton, L., & Griffiths, R. (2005). *Dual device user interface design for ubiquitous language learning: Mobile phone and interactive television (iTV)*. IEEE International Conference on Wireless and Mobile Technology for Education (WMTE) in Tokushima, Japan.
- JISC (2005). *Innovative practice with e-learning*. Case Studies. Retrieved November 10, 2006, from <http://www.elearning.ac.uk/innoprac/index.html>
- Kukulska-Hulme, A. (2005). *Case studies of innovative practice*. JISC-funded project outcomes. Retrieved November 10, 2006, from http://www.jisc.ac.uk/whatwedo/programmes/elearning_innovation/eli_oucasestudies.aspx

- Laouris, Y. (2005). *We need an educationally relevant definition of mobile learning*. Mlearn 2005 conference paper, Cape Town, 25-28 October 2005.
- Leach, J., Power, T., Thomas, R., Fadani, X., & Mbebe, A. (2005). 4D Technologies: appropriating handheld computers to serve the needs of teachers and learners in rural African settings. *Mlearn 2005 Conference Proceedings*, Cape Town, October 2005, 95-102.
- Manolo (2006). *Guidelines for integrating E-, W- and M-learning*. Project Deliverables – Mobile Case Studies. Retrieved November 10, 2006, from <http://130.37.78.10/Projecten/Manolo/>
- Oksman, V. (2005). *Young people and seniors in finnish mobile information society*. Paper presented at the Symposium on Portable Learning – Learner and Teacher Experiences with Mobile Devices. The Open University, Milton Keynes, UK, 15 June 2005. Retrieved November 10, 2006, from <http://kn.open.ac.uk/public/index.cfm?wpid=4378>
- Pettit, J., & Kukulska-Hulme, A. (2006). *Going with the grain: mobile devices in practice*. Ascilite conference paper, Sydney, 3-6 December 2006.
- Rogers, E. (2003). *Diffusion of Innovations*. 5th edition. London: Free Press.
- Scanlon, E., Jones, A., & Waycott, J. (2005). Mobile technologies: prospects for their use in learning in informal science settings. *Journal of Interactive Media in Education*, special issue on Portable Learning: Experiences with Mobile Devices, eds. Ann Jones, Agnes Kukulska-Hulme and Daisy Mwanza, 2005/25. Retrieved November 10, 2006, from <http://jime.open.ac.uk/2005/25>
- Sharples, M. (1999). The design of personal technologies to support lifelong learning. *Proceedings of CAL '99 Conference on Computer-Assisted Learning*, London.

- Sharples, M. (2005). *Re-thinking learning for the mobile age*. Kaleidoscope Network Viewpoint, posted on 5 October 2005. Retrieved November 10, 2006, from <http://www.noe-kaleidoscope.org/pub/lastnews/default-0-read159-display>
- Spasojevic, M., Ito, M., Van House, N., Koskinen, I., Kato, F., & Okabe, D. (2005). *Pervasive image capture and sharing: New social practices and implications for technology*. PICS workshop position paper at Ubicomp 2005. Retrieved November 10, 2006, from <http://www.spasojevic.org/pics/papers.htm>
- Sutch, D. (2006). *Teachers as innovators*. Futurelab project, October 2006. Retrieved November 10, 2006, from http://www.futurelab.org.uk/showcase/teachers_as_innovators/teachers_as_innovators.pdf
- Traxler, J. (2005). Defining mobile learning. *Proceedings of IADIS International Conference on Mobile Learning 2005*, Malta, 261-266.
- Vavoula, G. N. (2005). *D4.4: A study of mobile learning practices*. MOBIlearn project deliverable. Retrieved November 10, 2006, from http://www.mobilelearn.org/download/results/public_deliverables/MOBIlearn_D4.4_Final.pdf

Figure Captions

Figure 1. Most frequent activities.