St Edmund's College

Using Mobile Technology for Learner Support in Open Schooling

A Report to the Commonwealth of Learning

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February 2009

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1. Executive Summary

'Recently (10th February 2009) Amazon's vice-president for digital business, Ian Freed confirmed that it plans to let mobile-phone users download Kindle books'. Quoted from the New Statesman 23rd February 2009. (see www.newstatesman.com)
If there is any doubt that mobile technologies are here to stay, this statement shows that Amazon believes that smartphones, not digital readers like the Kindle or the Sony e-book are the next big thing for e-books.

In Japan, 'mobile phone novels-or mbooks (*Keitai shosetsu*) have become a publishing sensation. Some are professional novels, downloaded onto mobiles, but more startling are the novels - mostly high school romances - that are actually written on mobiles by……. Texters and read by millions of Japanese teenagers'. (The Observer Review 22.02.2009. See http://www.guardian.co.uk/theobserver/review)

It is quite clear from this report that mobile technologies are here to stay and are likely to be regarded as an integral medium in all kinds of education in the future. Such technologies are of particular interested to distance educators, but in the UK at least there is just as much if not more activity using mobile technologies as an additional medium to support face-to-face teaching.

Six issues stand out from our research into the current state of play in Europe:

1. There is a wide range of roles for mobile technologies supporting the learner in many ways ranging from relatively simple use of SMS texting to the more advanced use of smartphones for content delivery, project work, searching for information and assessment. Some proponents of mobile learning believe that it will only 'come of age' when whole courses can be studied, assessed and learners accredited through mobile devices. We do not subscribe to this view.
2. Absolutely critical is the need to put pedagogy first. Although the quote above indicates that books are now being downloaded onto mobile devices, we strongly believe that to support the learning process a great deal of

thought has to be given to the structure of the learning and assessment material. However, it is true that for some, mainly at higher education level, mobile phones offer the opportunity to access institutional learning management systems. This provides greater flexibility to the learner without any new pedagogical input.

3. Costs are coming down rapidly; new first generation simple mobile phones will not be available on the market from 2010. All mobile phone users in Europe will be using 3 or 4G phones within the next two years. A welcome associated step is a move towards some form of standardization by the mobile phone companies as exemplified by the shift to common charging devices over the next two years.
4. The value which is put on possession of a mobile phone, especially by young people is surprising and the data on ownership suggests that this will be a ubiquitous tool for all very shortly. (see 2.2 below) and that it will be well cared for: there is evidence that ownership of devices brings responsible use and care.
5. Large scale educational usage in schools currently depends on governmental investment but in higher and further education it is safe to assume that all learners will have their own devices. Institutions will need to advise potential students on the range of devices most suitable for the curriculum, as they do currently with regard to computers. The convergence between small lap tops and handheld devices will continue until they are regarded as different varieties of the same species of technology.
6. There is a great potential for educational providers to work with large phone companies, both to reduce costs and to co-develop appropriate software.

2. Background

2.1 The scope of the report

The Cambridge Distance Education Consultancy (CDEC) was asked by COL to undertake a survey of the ways in which mobile technologies are contributing to learner support systems in Europe, particularly those which may be relevant to open schooling.

The report has been structured as far as is possible and appropriate within a similar framework to the parallel report on mobile technologies in Africa, prepared by SAIDE (SAIDE, 2008). This is to enable comparisons where relevant. However, the technological infrastructure of many EU countries is currently very different to that of much of Africa and some developing countries and so some EU examples may be less easily transferable to different contexts. The rate of change is such that the report includes examples of particular significance in terms of scale, pedagogies, impact etc even where some of the technologies may not currently be available everywhere.

The European Union to which the desk research is confined comprises 28 countries (for the purposes of this report we also include Norway). Clearly not all countries could be included in the audit so we have focussed on those where there has been significant activity which has been documented in published reports. There is a vast amount of activity across Europe but most of it is of a project nature. Access to further information is provided in the bibliography (Appendix 5).

The UK is one of the leading European countries in the use of mobile technologies in schools and colleges and therefore this report focuses on the UK whilst also including brief accounts of significant work in higher education in other European Countries.

2.2 The growth of mobile technology

On 1 February 2008 Carl-Henric Svanberg, the Chief Executive of the mobile phone manufacturer, Ericsson, announced: "There are now 3.300.000.000 mobile

subscriptions in the world – and every month an additional 50 million people in the world start using their first mobile phone. This figure of 3.3 billion mobile subscriptions far outstrips all previous forecasts. All this is for a world population of 6.5 billion" (1).

See:

http://www.ericsson.com/ericsson/corpinfo/programs/the_role_of_mobile_learning_in_european_education/products/wp/socrates_mlearning_wp4.pdf

The dependence of citizens today on mobile telephony in every country of the world is demonstrated by a 2007 study carried by the London School of Economics for the United Kingdom company, Carphone Warehouse. The major findings are striking and surprising:

- One in three people would not give up their mobile phone for a million pounds or more, with women leading the way on those most likely to refuse.
- 76% of people believe it is now a social requirement to have a mobile phone.
- 85% of people think having a mobile phone is vital to maintaining their quality of life.
- One in five 16-24 year olds think having a mobile phone increases their quality of life.
- Most young adults who took part in the ethnographic experiment felt mobile phones were not just a tool, but a critical social lifeline for feeling part of a friendship group.
- Most of 16-24 year olds would rather give up alcohol, chocolate, sex, tea or coffee than live without their mobile phone for a month.

The above findings seem a little extreme but are based on *The Mobile Life Youth Repor*t, one of the biggest ever social studies to examine how mobile phones have changed the way young people live, was published in 2007 by The Carphone Warehouse, advised by the London School of Economics and Political Science.

The report is the second from Mobile Life, a forum set up by The Carphone Warehouse earlier this year to study how mobile phones change the way we live. It offers an unprecedented insight into the world of young people and mobile phones, creating a real sense of the complexity of young lives today. Over 1,250 young people aged 11 to 17 who own mobile phones were surveyed by polling organisation YouGov.

See:
http://www.lse.ac.uk/collections/pressAndInformationOffice/newsAndEvents/archives/2006/Mobile_Life_Youth_Report.htm

The EU is also funding major new projects in the area: one from 2008-10, for example, is looking at the ways in which mobile technologies can contribute to the inclusion of marginalised young people; see http://www.comein-project.eu/. Reports from this project (the first will appear in March 2009) will be of interest to the COL team.

3. Introduction

The purpose of this task is to identify and highlight areas where mobile technology is being used systematically for learner support, where information about costs and effectiveness is available and where activities might be transferable in support of open schooling.

Addressing these questions is not straightforward and some of the issues are raised in this introduction. Definitions of mobile technologies and of learner support are needed at the outset. This in itself is difficult given the speed of change, especially in the technological field but some definitions are given in 4.0 below.

There is a multiplicity of ways in which mobile technologies are becoming either the main vehicle of the learning process or one of its integral parts and these are described in the body of the report. The literature abounds with examples of small projects which use mobile technologies in part and which report on student reactions. Small screens and small keyboards are a limiting factor and one which does not seem likely to be resolved by innovations such as fold-up and projected keyboards or screens. This gives strength to the argument that new pedagogies are required rather than simply transferring what is currently available on-line to a hand-held device. Such new pedagogies are beginning to appear and involve bite-sized learning opportunities, with graphics, quizzes, a restricted amount of text and the provision of opportunities to receive or report information from work-based or other locations. Examples are provided in the site visits. (see Appendix 4)

As with all new technologies there is a great temptation by 'early adopters' to acquire technology first before thinking through how this might be used to benefit students. As Arthur C. Clarke (3) commented "when it comes to technology most people overestimate its potential in the short term and underestimate it in the long term". Indeed, "distance education development is littered with examples of how expensive technology has been introduced and then not used or not used to capacity" (see Mills et al, 4). The best mobile technology developments have avoided this pitfall. In this report we have identified examples where the pedagogy of a particular programme has

been enhanced by the use of mobile technology and where learner support is provided in a manner which is not readily available through other means.

The quality of the learning experience provided by mobile technologies is of vital importance and student views should form a key element of any evaluation. We give some of the results of evaluations based on student feedback where these have been significant and/or substantial (see section 8 below). As Lord David Puttnam, Chancellor of the OU UK (5) points out "failure arises from decisions made by people in their 50's to be implemented by those in their 30's and 40's for people in their teens and 20's." Early adopters are vital to any development but their enthusiasm should always be tempered by evidence that students actually find that their learning is enhanced.

The estimation of costs is also problematical: there is very little in the literature about costs which are so context dependent as to make it difficult to extrapolate from one situation to another. Costs also depend on whether the hardware is loaned or owned by the student. In the UK, this very often depends on major investment by the Government (see the case study on MoLeNET, section 8); or by companies who have a community remit (see Learning2Go, Appendix 4). One finding of this report is that when students and parents are subsidised by government or other funding so that they take ownership of the devices, there is minimal damage or loss to equipment.

The advantages of mobile technologies in Europe, however, are very evident. At least in theory, they enable 'learning anywhere, anytime'. This is an attractive slogan and the delivery of content - text, videos, podcasts etc., through PDAs and smart phones is seductively straightforward: send out the video of the professor's lecture and the 'tyranny of distance' is overcome! (see Norwegian National Technological University description in Appendix 2). The BBC has recognised the potential popularity of GCSE revision via mobile phones for example with several alternatives available from www.bbc.co.uk/mobile. These include 150 revision questions for GCSE English, maths and science, daily quizzes, and MP3 audio revision guides which can be downloaded straight to selected mobiles.

Interestingly, Nikoi and Edirisingha (6) show that learner support is also required 'anywhere, anytime'. Their work highlights the importance of technical as well as other kinds of support and demonstrates the role of partners, children, fellow students and friends in providing such support.
Logistically, for institutions, the provision of learner support 'anywhere, anytime' seems more challenging that the provision of content. This is an area where 'self-help' rather than institutional help might be most appropriate.

The flexibility provided by mobile technologies can be valuable as additional support and convenience to students who already structure their learning with the aid of institutional learning management systems; but more importantly it can be the best way of teaching in particular environments, for example field work and other context-based learning experiences and in particular, work-based learning.

In many cases, however, mobile learning, through PDAs and mobile telephones may provide more than additional activities and be the only way in which many students can access both content and learner support. These may be of particular relevance to Open Schooling. We comment on all these possibilities in this report.

Finally in this introduction it is worth commenting on the argument that the use of mobile telephones 'leapfrogs' the need to have PC-based systems.
A direct consequence of the development of G3 and G4 phones and smaller, more portable PCs is that access to the internet 'anywhere, anytime' is becoming the norm. The convergence of "mobile" and "PC-based" systems within European contexts therefore makes distinctions about usage more problematical with reference to developing countries where access cannot currently be assumed.

If the costs of hardware and connection charges continue to be reduced, with governments in the South being prepared to challenge the prices charged by telephone companies, this convergence may lead to portable connected handheld//PC devices which probably would be cheaper than a smartphone.

The only advantage of a phone would be in those situations where the phones are very much cheaper to buy or rent and where SMS messaging and oral communication can

be used effectively in learner support. Many of the mobile learning projects in the school sector in the UK have enabled learners to access learning and support in their own time. This is particularly true of those that are SMS based and utilise *learner owned technology*.

4. Methodology

The study has used the following methodologies:

- A desktop audit (using web search engines), to identify sources of good and relevant practice which were captured in a matrix. (See Appendix 1)
- Based on this audit, further investigation of current and future activity and research in the area was undertaken by information gathering at relevant European conferences: EDEN, Paris (Roger Mills); BETT, London (Anne Gaskell).
- Expert consultant input (Merritt Associates – see Appendix 3).
- Identification of projects which warranted further exploration as case studies or site visits: The Open University, The Mobile Leaning Network (MoLeNET), Tribal CTAD, Learning2Go, Learnosity, Corvinus University, Budapest.
- Visits/interviews for in-depth exploration at Learning2Go, The Open University and Cambridge Tribal-CTAD

Case studies and site visits were selected on the basis of the following criteria:

- They used mobile technologies to support learners in Europe
- They were well established and used mobile technologies at scale rather than being small scale short-term projects
- They provided evidence of impact on learning through evaluations, publications etc.
- They developed software and provided consultancy services to institution
- They were undertaking significant research in the field of mobile technologies

5. Definitions

5.1 Mobile technologies

Attewell (7) (MoLeNet) proposes a definition as follows:

> "The exploitation of ubiquitous handheld (or very portable) hardware and wireless mobile learning networks to facilitate, support, enhance and extend the reach of teaching and learning.".

There is much technical literature on the range of mobile devices and their functionality but these are changing so quickly as to make reporting on the detail redundant. One main distinction is that between devices which rely on telephonic access only, for the receipt and transmission of voice or SMS data and those which, in addition, have access to the internet. As noted, with the new generations of G3 and G4 mobile phones these technologies are merging in many European contexts. However, in developing countries such as Africa the advantages of mobile telephony are the support of those students without internet access of any kind, who cannot afford a G3 mobile phone but who can, through a simple mobile phone, send and receive SMS messages and make telephone calls quite cheaply.

Learndirect/Kineo UK, (8) in their document 'Mobile learning reviewed' report give a more detailed description of mobile technologies which was used in the SAIDE report see:
http://www.ufi.com/home/section5/10_goodPracticeGuides/Mobile_learning_reviewed_final.pdf

5.2 Learner Support

While learner support can be characterised in many ways, a broadly acceptable definition is that of Tait (9) who describes learner support in Open and distance learning as " the range of services both for individuals and for students in groups

which complement the course materials or learning resources that are uniform for all learners" (p.289).

Tait argues that learner support covers three main functions:

> "1. *cognitive*: supporting and developing learning through the mediation of the standard and uniform elements of course materials and learning resources for individual students;
> 2. *affective*: providing an environment which supports students, creates commitment, and enhances self-esteem; and
> 3. *systemic*: establishing administrative processes and information management systems which are effective, transparent and overall student-friendly."

This provides a framework for examining the use of mobile technologies in Europe and for reviewing how far and how successfully they fulfil these learner support functions.

5.3 Open Schooling

Open Schooling can be defined as an alternative system of education at pre-degree level that provides learners with options for learning that are not limited to traditionally timetabled classroom hours covering a standard course duration, and that have time and /or location flexibility. Open Schooling therefore attempts to improve access opportunities and address a variety of teaching and learning styles (10).

This concept is not widely used in Europe although there is an EDEN (European Distance and eLearning Network) open classroom group (See http://www.eden-online.org/eden.php?menuId=89). However there are some examples of schooling for children who are unable to take part in a conventional face-to-face environment for reasons of geographical, social or other forms of isolation e.g. hospitalised, children of military families and those who are excluded as a result of disruptive behaviour. The recently established EU project *ComeIn* is looking at the possibilities of mobile technology support to marginalised young people across Europe http://www.comein-project.eu/.

6. Key findings

This is the core of our report and distils the vast range of information obtained from discussions (telephone and face-to-face), from web audits of institutional practice and from literature searches. It covers a classification of mobile technology for learning with examples of its use.

6.1 A classification of the use of mobile technologies for learning with examples

Mobile technologies in education can be classified in many different ways, for example by hardware, by level of education, by country, by level etc. For the purpose of this report we will use a classification based on the range of ways in which these technologies are used in education at all levels.

It seems useful to make the following distinctions as to how mobile technologies are used for:

- simple (but important) administration
- monitoring student progress and being proactive to encourage students and support retention
- learner support
- the delivery of course content
- teaching 'niche' subjects e.g. languages
- quizzes and games designed to enhance learning
- context specific activities (e.g. museum visits) and as a tool to enhance classroom learning
- whole course delivery including assessment and accreditation
- work-based and just-in time learning
- the disabled and institutionalized

Taking each in turn:

6.1.1 Administration

There are a large number of examples of how SMS text messages can be used to provide information of an administrative nature and to give students (and parents of younger students) a greater sense of their links with the institution concerned. The University of Pretoria used bulk messaging to provide basic administrative support and Brown (11) reports some major successes: in response to a reminder for registration, 58% registered before the closing date compared to the normal expectation of below 40%. He concludes that 'm-learning is the gateway to e-learning for most learners in Africa as the rapidly growing wireless infrastructure increasingly fulfils their access needs'.

6.1.2 Monitoring student progress and the prevention of drop-out

There is important evidence from the Open University UK that telephone contact can aid student retention and persistence. While in this institutional context it was undertaken through landlines the direct and personalised nature of the communication is replicable through mobile devices. The key issue here is that the institution must have the necessary systems in place to be able to monitor the progress of individual students both on individual modules/courses and as an overview of their student career. After pilot studies, the Open University UK has introduced a systematic approach to making proactive contact with students at several points in their student journey and this forms a key element in the University's Learner Support Framework.

The Open University: summary of some key findings
(see Appendix 4 for the main site visit)

Proactive contact by the institution or a student's tutor has been shown to have a significant impact on student success. Large scale research projects involving thousands of students, with the use of control groups, have demonstrated that proactive contact, undertaken by telephone in most cases,

- before course start can improve end of course retention by 5-7%
- mid-course can improve end of course pass rates by 30%
- after course end can improve student re-registration by c. 20%

The success of these projects has led to proactive contact being incorporated at three points within the OU's 10 point Learner Support Framework.

6.1.3 Learner support

SMS messaging is used to provide students with advice on study skills, time management, examination preparation (see Appendix 2). More sophisticated mobile devices, PDAs and smartphones, are used for diagnostic quizzes, to help examination preparation as well as a range of more interactive exercises to help with study skills, for example at Learning2Go (see Appendix 4).

Some institutions e.g. NKI in Norway (see Appendix 2) offer a service where the whole of the learning management system, available as standard on laptops or desk computers is also available though mobile telephones. This service is welcomed by students who find it convenient to have 24 hour access to the learning management system, which provided access to course content, power point slides of lectures and self assessment tests etc. Such a provision is a useful addition to an already well developed on-line service but cannot be regarded as something to which open schooling in developing countries might aspire in the short term.

Much more relevant to open schooling is the use of mobile telephones to supply purpose designed learning materials, with self assessment in short modules. This can is best demonstrated by the work of Tribal-CTAD (see site visit report in Appendix 4)

6.1.4 Teaching 'niche' subjects e.g. languages

A number of institutions have developed programmes to support language teaching both for new languages and for those studying English for Speakers of Other Languages (ESOL) courses. Learnosity in Ireland provides one example of this use of mobile technologies

Case Study: Learnosity (See Appendix 3 for full case study)

Learnosity - Using mobile phones for language learning

Scale: 69 learners aged 14 and 15 in 2007

This Eire based pilot project uses mobile phones and laptops linked to a website to support learning and teaching in Gaeilge. There are several components to the Learnosity system that, taken together make it unique. These are:

- The use of mobile phones with the Interactive Voice Response (IVR) system
- Questions are selected at random from a question bank
- Students can re-record and repeat the process as required
- Answers are recorded as WAV files and saved to a server from which they can either be marked online through a website or saved and marked as a podcast
- Students can hear not only their own, but exemplary answers as well
- Feedback is given in the form of a printout or email – which can be saved to an e-portfolio if available
- New vocabulary can be delivered by SMS text each day for use in class or written work.
- Text chat with peers through Google Talk. In the pilot this was done with PCs but it could be via PDAs. Teachers can mediate in real time and assess later with the scripts also recorded and saved for self-assessment. Access to an online dictionary supports further language development.

Outcomes

- 67% students reported that they had made significant progress with oral Irish language in the 6 weeks of the pilot. There are plans for further trials in 6 schools, task-based and role-play conference calls and potentially, biometric voice recognition. However, wireless access in schools can be a barrier in remote areas.

See http://www.learnosity.com/go/client-ncca-ireland

6.1.5 Quizzes and Games

Increasingly mobile phones are being used to add a dimension to classroom teaching, especially but not solely in schools. Today's children find it exciting (and perhaps less threatening) to give their answers to teachers anonymously. Teachers can ask children to vote on issues, to set out their ideas and can synthesise and report on outcomes to the whole class.

Principles of gaming technology are also increasingly used to develop material for use in classrooms to keep and maintain childrens' interest.
See, for example, "Radius of the Lost Arc" in the Learning2Go Site Visit in Appendix 4).

6.1.6 Context specific activities

Several institutions report that mobile technologies are helpful in a range of context specific situations ranging from museum visits, to field work and project work. "Learning out of the classroom is an example of the creative use of handheld mobile technologies. The latest gadgets are opening up ever more possibilities for innovative teaching and learning. Drawing on functions such as GPS, camera, video, audio and 3G internet access, which are often now incorporated within one device, teachers of all subjects and across all ages can capitalise on opportunities for using these technologies in fieldwork. And in a time when children spend huge amounts of time indoors in front of computers, enthusiastic practitioners see an opportunity to turn this on its head - take the computers outdoors and use them imaginatively to engage them with the real world!

WildKey, a spin-out company formed as a result of an Oxford Brookes University research project, now creates a digital tool-kit for outdoor learning that enables teachers to make the most of mobile technologies. This 'tool-kit' comprises three software packages: *WildForm* enables any pen-and-paper data-gathering exercise to be replaced by a digital form on a handheld computer (the forms can also incorporate fields such as GPS readings, taking things beyond what can be achieved with paper); *WildMap* enables the creation of multimedia, GPS-led, interactive trails; and using *WildKey* interactive keys, young people can identify and record minibeasts, pond and rock-pool creatures, birds, and many other wildlife groups while out and about." (extract from Appendix 3)

Case Study: MyArt Space (See Appendix 3 for full case study)

MyArt Space
Scale: 3000 school students with a final study involving 23 11-14 year old learners MyArtSpace connects a web-based client that can be accessed on a desktop computer in classrooms or homes with software running on mobile phones in the museums and gallery. Typically, the teacher will set one or more questions or goals to guide the visit. Small groups of learners are given a pre-programmed phone on arrival at the museum and enter a unique identifier. As they tour the museum, each group can 'collect' an object by typing the exhibit code, which accesses an image and brief presentation on the artefact. Learners are prompted to type in their reasons for collecting the object, and shown a list of who else has collected it. They are able to add their own audio or text interpretation to support the learning outcomes and goals. The collected content is automatically transmitted over the GSM phone connection to the MyArtSpace website, which builds a personal record of their visit. Back in the classroom, or at home, the children can log into the MyArtSpace website for further discussion and exploration of outcomes and the production of a completed gallery. http://www.myartspace.org.uk/web/index.php

6.1.7 Work-based and just in time learning

There are many examples of the use of mobile technology for work based learning ranging from just-in-time instructions as to how to stack supermarket shelves (with appropriate explanation and self assessment) to the on-the-job training of hairdressers. Here students have access to the Hairdressing Further Training learning technologies wherever they may be, via their mobile phone, which develops the concept of the mobile phone as a learning device.
The content was redeveloped by industry professionals who aimed to bridge the gap between learning in colleges and the experiences of the workplace. As an unobtrusive learning tool, they found the capabilities of mobile technology effectively supported this new style of learning engagement. See http://www.jisccollections.ac.uk/news_and_events/news_articles/hthandheld_winner.aspx

Lorraine Estelle, CEO of JISC Collections, (12) said that: 'Creating a service for students to actively and independently engage with learning resources as well as their future industry is an innovative way of managing the student experience. Mobile learning devices enable students to take lessons with them into the workplace, a significant benefit to their further education'.

Case study: Lifetime Health and Fitness (See Appendix 3 for full case study)

Lifetime Health and Fitness - Recording evidence in disparate workplaces
Scale: 2000 learners in 2007/08 working towards Apprenticeships, NVQs or Key Skills Qualifications Learners are scattered throughout the UK and need to be assessed in workplace settings. Lifetime Health and Fitness is seeking both greater efficiency in the assessment process and provision of learning resources in a range of media to suit a range of learning styles. Assessors are equipped with tablet PCs and digital pens supported by handheld smartphones, digital cameras and portable scanners and printers for collecting performance evidence in the workplace. Evidence is then uploaded online to an internally developed e-portfolio on a central server. This has had an impact on performance: improved reporting capability enables tracking and analysis of trainers/assessors activity and regional contracts. This enables timely and targeted management interventions and results in improved retention and success rates of learners. Success rates doubled in 2007 and are now significantly above average for the sector. See http://www.thefitmap.co.uk/new/services/training/lifetime.htm

6.1.8 Support for disabled and institutionalised people

A paper from TechDis- a JISC funded service -on m-learning and accessibility raises some important issues

From the projects in this report, mobiles and handheld devices are more often perceived to be a positive step towards accessibility. The key reasons are:

- " They are personal, and private, removing some of the awkwardness around learning in certain situations (for example the Foyer study working with people in hostels).

- They are more able to reflect the learner's lifestyle. This covers both young(er) learner familiarity with what are primarily social networking tools in common currency, and the benefits of mobility to busy people on the move or unable to access a suitable learning location.
- They are (relatively) cheap and (relatively) ubiquitous (although care needs to be taken with assumptions here, particularly in sectors dealing with older generations). They can provide access to learning where none was previously available.
- They can work with visual and auditory input and output as well as text.

However:

- Wireless access is not uniform, or reliable across even the UK
- The text size can be hard to read. Older learners and those with sight problems can struggle. Text to voice technology is improving, albeit slowly, and needs to be considered where the learner constituency demands it, (and borne in mind where there is currently no demand).

One recent publication (see Appendix 3, section 9 for a fuller account) draws on the experiences of those working in the vanguard of mobile learning and inclusivity in independent specialist colleges and further and higher education institutions, *'GoMobile! Maximising the potential of mobile technologies for learners with disabilities'* passes on some of the lessons learnt to make mobile learning a more achievable aim for those working with learners with disabilities."

7. Strategic Issues for Institutions

It is vital for institutions to think through their strategy for the use of mobile technology. All too frequently small projects are developed by keen individuals within an institution which may be of immense value to small groups of students but which may not be sustainable or transferable across the institution. However, project work can be important and, if controlled, can lead to the increase in knowledge and understanding of the power of mobile technologies within the institution as well as leading to small sustainable activity around a particular subject. There needs to be institutional commitment and/or external funding to engage in large-scale change.

Strategic issues facing institutions can be grouped as follows:

7.1 Pedagogy first:

It is very tempting for institutional leaders to adopt new technologies before being absolutely clear as to how such technologies will enhance student support and learning. Distance education is littered with examples of where expensive technological equipment has been purchased in advance of a clear plan for how such equipment will be used and in the absence of staff trained in its use. The use of mobile technology is no different. Advice from the early adopters is that pedagogy should come first. The Learning2Go projects are developing new pedagogies to make the most of mobile technologies (see Appendix 4).

7.2 Who makes decisions?

As Puttnam (5) has emphasised, it is critical that decision-makers listen to learners and understand that the mobile phone is now the most ubiquitous of communication devices and one which many people, young and old (but especially young) see as part of their day to day life. This provides an especially opportune moment for education and learning to be seen to be a normal part of life. Decision-makers must be aware of the potential of new technologies for mobile learning whilst at the same time resisting

the temptation to buy into a new technology without thinking through the way in which it will be used for teaching and learning and how it can be sustained.

7.3 Who provides the hardware and software?

In many cases institutions expect students to have their own mobile device and it is acknowledged that the functionality of such devices will vary from one student to the next, so institutional decisions need to be taken about minimum specifications. In other situations, hardware is provided by the institution on loan or permanently to the student for use in class and for homework (for quizzes and games for example). MoLeNET (see section 8) and Learning2Go (see Appendix 4) provide excellent examples of how external funding or resources provide equipment with institutional and parental involvement so that children can keep the devices and feel a sense of ownership and being valued.

Where software is required, for example, for course content etc., this is always provided through the institution

7.4 Costs

This is where real difficulties arise in providing useful data. Two principles emerge.

a) many learners, especially those in higher education institutions are likely to have their own mobile devices and keep them upgraded. Thus there are no hardware costs for the institution apart from the purchase of equipment for staff.

b) where learners do not have the equipment or it is not of high enough specification, institutions need to purchase and loan (or restrict use to the classroom). Some feared that the lending out of equipment would result in damage, loss or would be stolen. In fact in the project described in 8.2 below, only 150 out of 10 thousand mobile devices were damaged or lost and similar very low damage figures have been recorded at Learning2Go.

Case Study: Learning2Go: summary of funding arrangements.

For full site visit, see Appendix 4

Learning2Go: summary of funding arrangements

Learning2Go has developed a new method of joint funding in schools which takes place over two years and involves, school, parental and external resources. In summary, their website notes that it rests on:

- Device - Joint funded by Parents / school over 2 years or 100 payments
- Content/ Memory card - Funded via e - learning credits
- Wireless infrastructure - School funded
- Insurance - included in device price and joint funded as above.

The UK's eLearning Foundation has been a key partner in this model – see http://www.e-learningfoundation.com/

Learning2Go Further, the extension of the project to secondary schools and projects, has developed a significant partnership with O2, one of theorld's largest telecom providers. This has included a redesigned business model which appreciates the education sector and has moved to a structured affordable model with an emphasis on e-Safety.

See: http://www.learning2go.org/

Connection charges also need to be taken into account. The general lesson from this is that any institution wishing to develop its mobile learning activity must research costs well in advance of the start of such activity.

Tribal CTAD (see Appendix 4) has a clear pricing policy which can be seen by accessing the M-Learning Suite though the web site www.m-learning.org and clicking on 'How to Buy'. However, the cost of the full Suite is around £2800 including VAT for a licence to support 50 Tutors/authors and 1000 learners for a year. Clearly this will seem expensive for a limited open schooling provision but for the major institutions it might be an option worth considering. In addition this does not include the cost of mobile devices which are significant at the higher end of the scale and can cost up to £300

The speed of development of 3G and 4G phones will inevitably bring costs of these sophisticated devices down and enable more functionality to be available at lower prices; governments must continue to work to bring down the connection costs.

7.5 Staff Development

One of the key issues noted by the leading authorities at all site visits and in case studies was how essential it was to have staff development and continuing support for teachers in the use of mobile devices. Leaders at both MoLeNET and Learning2Go said this extended beyond teaching staff and included technical staff – it was also essential to get these staff on side first if using mobile devices in school contexts.

Some of the issues raised were that children are frequently more competent and confident in trying out new technologies and this can feel threatening to teachers who have been more familiar with a didactic model of teaching, where they are the experts. At Learning2Go, however, Dave Whyley, the project leader, noted that the really good teachers welcomed the growing expertise and confidence of their students and drew on this to encourage peer support and collaborative learning. He had undertaken some recent teacher development activities and considered that one of the main difficulties was that teachers lacked models for using mobile devices for learning. Once they had been provided with models, they became less anxious and more enthusiastic about their use. Further details can be found in the site visit in Appendix 4.

7.6 Getting started- some practical advice for institutions

Keegan et al (2006) in their seminal work, the Role of Mobile Learning in Europe suggest a four stage approach to the introduction of mobile learning within an institution.

> "use of mobile devices in educational administration,
> use of mobile learning for study help,
> use of mobile learning for course modules,
> use of mobile learning for location sensitive activities (e.g. museum visits) and context sensitive education and training (e.g. workplace learning) "

Level 1: Use of Mobile Devices in Educational Administration

The first level of mobile learning recommended is the use of mobile devices in

educational administration. Illustrations of this usage are given from school and college administration, in the combating of drop-out and use in distance education. If a lecture/tutorial, or examination, has to be cancelled at short notice, and the institution communicates with the student body concerned by SMS (short messaging system), all of the students will receive and read the message, no-one will turn up, no-one will be inconvenienced SMS messages can be sent in this way either to the whole student body, or a faculty, or a department or a class grouping.

Other examples of use of mobile telephony in educational administration are:

Message from headmaster to parents: 'Your son/daughter will be late home from school today as he/she has received a detention'

Message from parent to school: 'My child is ill and will not be in today'

Changing the date, time or location of examinations
Change of deadlines for enrolment
Change of deadline for the presentation of an assignment.

Level 2: Mobile learning for study help

Messages can be sent from the institution to the student focusing on course summaries, help with a difficult assignment, assistance with a part of a course that has given difficulties to students in the past, notification of enrolment or assignment deadlines, tutorial advice or multiple choice questions.

- communication and interaction with peer learners and study groups
- browsing e-learning course material
- downloading study guides/manuals
- receiving tutorial letters
- complete multiple choice assessment with immediate feedback
- generic feedback on assignments and examinations
- motivational messages
- downloading of material (sections of learning materials, assignments, letters etc.)
- access to examination and test

- access to financial statements and registration data via mobile service number

Level 3: Use of Mobile Learning for Course Modules

The next step is the provision of full course modules on mobile devices or via podcasting.

Level 4: Complete Incorporation

Keegan et al (2006) *The Role of Mobile Learning in Europe* (see Appendix 5)
Finally, they suggest the goal is that mobile learning should enter into mainstream education and training and no longer rank as a project in the institution. For acceptance into the mainstream four criteria are required: accreditation, curriculum, assessment and fee-paying. For example, they believe that the enrolment of mobile learning students into accredited courses is a goal of mobile learning. If a course is not presented as accredited in the prospectus of the institution, it remains at the level of a research project and has the fragility of project status".

In our survey we have found no examples of level 4 activity and indeed we suspect that this is step too far for mobile learning at this stage. There may be some downsides to mobile learning if it is taken as the sole method of learning.

8. Evaluation, student feedback and quality assurance

Clearly, effective evaluation is vital if small projects are to enter the mainstream and to become sustainable. Almost all the myriad of small projects over the past five years have involved evaluation and almost all of it has been based on learner feedback. Whilst this is of central importance there appears to be little feedback from teachers (other than those who designed and developed projects) and little external assessment of individual projects. Learning2Go provides an exception in this area (see Appendix 4). Educational research is complex and it is extremely difficult to isolate factors which lead to improvements in learning and retention rates in the short term. In our researches we found only a few examples of experiments involving control groups and few surveys which were based on samples large enough to make conclusions reasonably valid. However there are some research projects which provide some useful information; these include the European M-Learning project (13) and the case study of MoLeNET.

8.1 Student Feedback from the European M-Learning project 2005 (13)

Here some 128 learners from the UK, Italy and Sweden took part in a research programme and the outcomes of this are summarised as follows:

a) Demographics of the learners

55% under the age of 19
51% female
49% in Further Education institutions
89% were judged to have literacy or numeracy needs
78 learners had either dropped out (59) or were at risk (19)
80% were unemployed
39 were homeless
9 were nomadic travellers

These demographics indicate that here are students who have had significant difficulty in learning in conventional educational settings.

b) Basic results

Students were mostly enthusiastic with preferences for future learning highest for PCs and lap tops, second for mobile devices and last, face-to-face at college.

82% respondents reported help with reading and spelling but mentors suggested only 29% had developed a more positive attitude to reading.

78% of respondents thought mobile devices could help their maths.

The above is fairly typical of research results in general- notably that mobile devices can attract young people to learning, maintain their interest and provide some help.

c) Some observations

Mobile learning helps:

- in identifying where learners need support
- to combat resistance to ICTs
- to remove some formality from the learning experience and engage reluctant learners
- to help students remain focussed for longer periods
- to raise their self esteem and self confidence

Case Study: MoLeNET: Mobile Learning Network

Mobile Learning Network
MoLeNET describes itself as "a unique collaborative approach to encouraging, supporting, expanding and promoting mobile learning, primarily in the English Further Education sector, via supported shared cost mobile learning projects. Collaboration at national level involves participating institutions and the Learning and Skills Council (LSC) sharing the cost of projects introducing or expanding mobile learning and the Learning and Skills Network (LSN) providing a support and evaluation programme. The LSC and institutions are investing over £12 million in MoLeNET. The MoLeNET support and evaluation programme includes technical and pedagogic advice and support, materials development, continuing professional development, mentoring, facilitation of peer-to-peer support, networking and resource sharing, evaluation and research". See: http://www.molenet.org.uk/

On 17th January at the 2009 BETT exhibition at London's Olympia centre, Jill Attewell (7), the UK director of the UK Learning and Skills Council's £12 Million investment reported on 32 projects, in 75 Colleges and 18 schools which involved 10 thousand students between the ages of 14-19 and 2,000 staff. They reported as follows:

- Most institutions bought smartphones and MP3 players
- Key research indicators were retention, achievement, improved attendance , behaviour and satisfaction
- Students with mobiles made faster progress
- Produced better quality coursework and were more engaged and better behaved
- Confidence and self esteem increased especially for those with learning difficulties or disruptive behaviour

Large scale comparative data on 5000 students compared with the previous year's cohort who did not have mobile technology, indicated that in terms of:

- Retention: 93.3% said they intended to continue learning, compared with 85.3% previous year.
- Withdrawal: 4.6% withdrew, compared with 12.5% in the previous year.
- Achievement improved by 7% and attendance also improved.

Staff feedback from 112 teachers indicated that 73% agreed students were helped to learn, 46% that it helped personalise learning, and that 89% wanted to use mobile technology again.

8.2 Quality Assurance

Although the UK Quality Assurance Agency does not provide specific guidelines for mobile teaching and learning it does set out comprehensive guidelines for distance education in higher and further education.. Fundamentally, the principles on which quality assurance processes for distance education are based, apply equally to mobile learning.

See:
http://www.qaa.ac.uk/academicinfrastructure/codeOfPractice/distanceLearning/contents.asp#intro

9. Conclusions and Recommendations

There is no doubt that the use of mobile technology in education is here to stay. Costs will come down and functionality will increase. From 2010 all new phones will have connectivity of some kind (e mail/ internet). The balance between portability and larger keyboards and screens is one which will be crucial in the next 2 years

The younger generation of 'digital natives' will drive developments but will need support. However it is not at all safe to assume that because someone is young they will be able to obtain the maximum benefit from mobile learning without support.

Mobile technology will continue to be used in a variety of environments e.g. within the classroom, anywhere, anytime and particularly at home, on field trips for a variety of purposes e.g. administration, learner support, whole course and perhaps, in due course for fully accredited, stand-alone courses.

There is considerable evidence that mobile technology encourages reluctant learners to take up learning activities but mentoring support is a crucial element for success

In higher education mobile technologies are used as additional tools which provides easy access to web based learning management systems which are already accessed through PCs. Where there is no access to the internet or where learners cannot afford PCs, mobile phones (owned or rented) can be invaluable for administrative information, leaner support and short bursts of learning especially through games and quick quizzes if the phones functionality supports these activities.

Specific recommendations drawn from the report include:

1. Clarification of outcomes:
it is important to be clear about the desired outcomes for the use of mobile devices – this will have a major impact on the type of device, costs and support systems. To use Tait's (9) distinctions, if learner support is intended to be mainly:

- administrative: it may be possible to use cheaper phones and SMS messages

- cognitive: more sophisticated devices and software may be necessary
- affective: a range of devices could be used but the level of messaging and options needed would need careful research in context.

2. Clarification of learner contexts and learning purposes:

As an extension of the above, it will be important to be clear about learner contexts in terms of the range of devices and software needed, for example whether the device is being used:

- to enhance existing teaching and learning
- to support students who have no other access to learning
- to support reluctant learners
- to undertake fieldwork

3. Research into costs:

This includes research into the possibility of partnerships with large commercial providers such as O2.

4. Putting pedagogy first:

Research so far indicates that simply transferring computer content on to a small screen does not support learners in the most effective ways. New pedagogies and materials are being developed and the lessons learnt from this process should be maximised.

5. Institutional or high level commitment

The introduction of mobile devices has not been straightforward in any of our examples and their advice is that it will not succeed without high level commitment.

6. Supporting the staff who are engaging with pupils/students/parents

Many of the main difficulties in effective implementation of some of the projects examined here have been the lack of engagement of staff and hence their reluctance to use devices or to explore their potential. Support and staff development is essential to overcome the first hurdles in this area. Where schools are concerned it is vital to

engage parents by providing information and explanations of the use of mobile technology in the school

7. Supporting the pupils/students

Projects reported that the use of mobile devices is not always intuitive, even for the so-called digital natives (in the UK the average age for first ownership of a mobile phone is eight Telegraph 18.2.09). Some students therefore may need support in the use of the devices, and this may involve some technical support.

Wherever possible, it is clear from projects cited that personal ownership of the device by a student is to be recommended, and that the funding arrangements which involve parents, schools and external agencies in the purchase of equipment can make this provision possible in some contexts.

Finally, Dave Whyley of Learning2Go, recommends "trusting the children": they rarely break or lose the devices; they learn responsible use of mobiles and the internet; they develop skills in peer support.

8. Evaluation and QA

It is essential to build in evaluation from the start and this will involve tracking student performance and behaviour across several years with control groups where possible. Other forms of evaluation and QA also need to be embedded from the outset.

9. A specific recommendation is that COL should identify one or two institutions and suggest they might work in partnership with Tribal-CTAD. Geoff Stead, Software Director of Tribal-CTAD comments as follows:

> *If the COL would like to work further with us, and use some of our tools we would be very happy to support this.*
> *We could offer a few sponsored versions of our tools (free), for researchers, or if you were looking at a larger scale deployment into the 3rd world, we would of course be happy to offer significant discounts on the UK price, because we strongly support the role of technology in transforming learning, and if that is what it takes to enable take-up in Africa, we will be more than happy to support it.*

CDEC would be very pleased to act on COL's behalf to pursue this further.

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Appendix 1

Summary of web and personal contact audit of institutions using mobile technologies in Europe

Higher Education

Higher Education in the UK

1.Project/Institution	**University of Wolverhampton-MELaS (Mobiles enhancing learning and learner support)**
2.Country	**UK**
3.Target	Many projects for undergraduates and others (much work in Southern hemisphere- but excluded here) MELaS selected because most transferable
4.Brief description	Text messaging to enhance the student learning experience. Simple text messages, texts with learning questions, Conference texts
5.Technology used	University revision software and students' own mobiles
6.Area of focus	Using sms for admin information and subject based teaching and learning enhancement
7.Evaluation/QA	Substantial
8.Cost	Not available
9. Sources of information	http://www.wlv.ac.uk/default.aspx?page=15227 http://www.exact.ie/ebook/mobilelearning/
10.Project or Permanent	Initial project 2006: aiming to be embedded
11. Relevance to Open Schooling	Yes; students can use basic mobile phones if institution can provide the software

1.Project/Institution	**London Metropolitan University**
2.Country	**UK**
3.Target	Undergraduate students
4.Brief description	A range of projects including 'learning hints' sent to mobiles. Also a multimedia message board
5.Technology used	Students' own mobiles
6.Area of focus	Reminders of seminars, course work deadlines and pointers to resources
7.Evaluation/QA	Student surveys indicate that MediaBoard had mixed responses but 'learning hints" were very positive
8.Cost	Not available although students' own mobiles used
9. Sources of information	http://www.rlo-cetl.ac.uk/joomla/index.php?option=com_content&task=view&id=17&Itemid=98 http://www.exact.ie/ebook/mobilelearning/
10.Project or Permanent	A range of projects being developed
11. Relevance to Open Schooling	Learning hints can be sent to students' own mobiles

1.Project/Institution	**The Open University**
2.Country	**UK**
3.Target	A wide range of research projects targeting different audiences across the world. Many projects use sophisticated handheld devices. Undergraduates: One example for learner support selected here
4.Brief description	Part-time tutors develop resources to support students
5.Technology used	Tutor use own equipment; not provided with additional hardware or software
6.Area of focus	Developing student support resources to enhance their teaching
7.Evaluation/QA	Surveys of students and tutors
8.Cost	Low because of low number of tutors involved
9. Sources of information	See http://www.open.ac.uk/mLearn/index.php. See http://www.open.ac.uk
10.Project or Permanent	Multiple projects
11. Relevance to Open Schooling	Probably not except for externally funded international projects in SSA because of internet access, VLEs And sophistication and expense of tools

1.Project/Institution	**The University of Nottingham**
2.Country	**UK**
3.Target	Many projects including 1) school students learning science (with the OU) 2) children learning languages 3) tools for children with life threatening allergies
4.Brief description	1) Gathering and assessing evidence and conducting experiments 2) Making language learning fun Using games technology. 3) Supporting anaphylactic allergy sufferers through e.g. help with Epipens, sensors to detect if used
5.Technology used	Handheld computers
6.Area of focus	Various
7.Evaluation/QA	Projects based on earlier research
8.Cost	External funding
9. Sources of information	http://www.lsri.nottingham.ac.uk/research.php http://www.exact.ie/ebook/mobilelearning/
10.Project or Permanent	Projects
11. Relevance to Open Schooling	Longer term outcomes may be relevant

1.Project/Institution	**Oxford Brookes University**
2.Country	**UK**
3.Target	Children
4.Brief description	Handheld devices are used to identify and record wildlife
5.Technology used	Wildkey:hand held devices such as smartphones and pocket pcs
6.Area of focus	Environment
7.Evaluation/QA	Early trials reveal that after using handhelds, knowledge recall is excellent. In a pilot test, pupils' scores rose from 8% to 84%. Feedback from 1000 schoolchildren under way.
8.Cost	Not available
9. Sources of information	http://www.exact.ie/ebook/mobilelearning/
10.Project or Permanent	Projects
11. Relevance to Open Schooling	Some principles could be used with simpler phones

Higher Education in Europe

1.Project/Institution	**National University of Science and Technology**
2.Country	**Norway**
3.Target	HE science students
4.Brief description	Use of videos on mobile phones
5.Technology used	Smartphones
6.Area of focus	To prepare for lectures
7.Evaluation/QA	Yes- significant student feedback
8.Cost	N/A- but would include cost of preparing videos
9. Sources of information	http://www.exact.ie/ebook/mobilelearning/ e-mail: marit.rismark@svt.ntnu.no
10.Project or Permanent	Projects
11. Relevance to Open Schooling	Only if resources available to make and transmit videos

1.Project/Institution	**NKI**
2.Country	**Norway**
3.Target	HE and Upper Secondary Students
4.Brief description	Access to web based learning management system provided via mobiles
5.Technology used	Student-owned mobiles with infra red connections to PDAs
6.Area of focus	Administration/learner support/discussions/submitting and receiving assignments. Course materials in ebook format
7.Evaluation/QA	Yes. Much research has been completed over the 6 years
8.Cost	N/A
9. Sources of information	http://www.exact.ie/ebook/mobilelearning/ http://www.nki.no/in_english.xsql NKI Fjernundervisning, Hans Burums vei 30, 1357 Bekkestua.Tlf sentralbord 67 58 88 00, salgsavd 67 58 89 99, telefaks 67 58 89 94, post@nki.no
10.Project or Permanent	Permanent
11. Relevance to Open Schooling	Quite sophisticate approaches using VLE. Would depend on availability of VLE

1.Project/Institution	**Corvinus University, Budapest**
2.Country	**Hungary**
3.Target	3000 HE students
4.Brief description	Download a range of support provision to mobiles. Supplementary to other teaching platforms
5.Technology used	Students' own smartphones
6.Area of focus	On-line course contents(lecture notes, summaries) on-line real time feedback to teachers Facility to ask questions
7.Evaluation/QA	N/A
8.Cost	N/A
9. Sources of information	http://www.uni-corvinus.hu 1093 Budapest, Hungary http://informatika.uni-corvinus.hu Phone: +3614827414
10.Project or Permanent	Permanent
11. Relevance to Open Schooling	Yes; a real possibility here for feedback to learners

1.Project/Institution	**Dirksen Opleidingen**
2.Country	**Holland**
3.Target	Private distance and face to face institution
4.Brief description	Administration and learner support
5.Technology used	Mobile phones, iPods or pDAs
6.Area of focus	Electronics and information and communication technologies
7.Evaluation/QA	Limited
8.Cost	No
9. Sources of information	(http://www.dirksen.nl/) http://ec.europa.eu/education/programmes/socrates/minerva/descrip1_en.html
10.Project or Permanent	Permanent
11. Relevance to Open Schooling	Yes, basic administration and learner support activity

1.Project/Institution	**Trinity College Dublin**
2.Country	**Eire**
3.Target	Children in Hospital
4.Brief description	Brings new and exciting learning experiences
5.Technology used	Range but not oral phone calls as banned in hospital sms OK
6.Area of focus	Empowering children who are very ill
7.Evaluation/QA	N/A
8.Cost	N/A
9. Sources of information	www.solas.ie
10.Project or Permanent	Project
11. Relevance to Open Schooling	Possibly for children who are institutionalised

1.Project/Institution	**Biocaching 2008**
2.Country	**The Netherlands**
3.Target	Ist year university students
4.Brief description	Help students collect, process and analyse data from field trip
5.Technology used	PDA with GPs
6.Area of focus	Ecology
7.Evaluation/QA	Positive student reaction
8.Cost	Not available
9. Sources of information	www.biocaching.nl
10.Project or Permanent	Projects
11. Relevance to Open Schooling	Yes if biology field work undertaken

School, College and Further Education

In Europe

1.Project/Institution	**Health care in the Aabenraa municipality**
2.Country	**Denmark**
3.Target	Health workers
4.Brief description	Content relevant to work
5.Technology used	Text, graphics , sound , video files
6.Area of focus	Health subjects: developed for learners with limited reading abilities
7.Evaluation/QA	No
8.Cost	No
9. Sources of information	www.mobil-e.dk
10.Project or Permanent	Permanent
11. Relevance to Open Schooling	Yes; useful for work-based learning

1.Project/Institution	**Melflo, University of Copenhagen 2006**
2.Country	**Denmark**
3.Target	People with reading difficulties
4.Brief description	Enables training in the home, canteen and on the spot guidance in the work place
5.Technology used	PDA
6.Area of focus	Construction industry
7.Evaluation/QA	No
8.Cost	No
9. Sources of information	http://english.melfo.hum.ku.dk/
10.Project or Permanent	Project
11. Relevance to Open Schooling	Yes for literacy work

1.Project/Institution	**De Zingende Stad, Yo! Opera, Waag Society, OBS de Rietendakschool**
2.Country	**The Netherlands**
3.Target	Age 9 – 12 (groups 5-8)
4.Brief description	Pupils map their environment vocally by combining music lessons with location based learning. Aims to motivate pupils and teachers to sing. Within each year, pupils create a musical quest or game, using Games Atelier Software. Other pupils follow the game.
5.Technology used	Mobile phone with GPS
6.Area of focus	Music for primary education
7.Evaluation/QA	Limited as pilot; but pupils learn to read maps and navigate as well as sing. Boys singing more than usual.
8.Cost	Not yet assessed
9. Sources of information	www.dezingendestad.nl
10.Project or Permanent	Project from May 2008
11. Relevance to Open Schooling	Could be an interesting way of students reporting on their own location to a central repository and choosing a local song to represent it. Older pupils might develop quests round this.

1.Project/Institution	**Lopend leren (learning on foot) 4 primary schools**
2.Country	**The Netherlands**
3.Target	Primary school pupils (6-11)
4.Brief description	Use PDA to find pictures and sounds to match letters
5.Technology used	PDA and separate digital camera
6.Area of focus	Use in teaching reading
7.Evaluation/QA	Pupil feedback positive; leads to collaboration and autonomous learning
8.Cost	No details
9. Sources of information	www.lopendleren.nl
10.Project or Permanent	Project
11. Relevance to Open Schooling	Useful for teaching reading

1.Project/Institution	**Frequentie 1550 2007**
2.Country	**The Netherlands**
3.Target	History learning 11-13 years
4.Brief description	Game played in 4 teams; street players and web players
5.Technology used	Mobile phone with GPS
6.Area of focus	Players learn about the size, organisation and function of a medieval town (Amsterdam); techniques of analysis and interpretation developed
7.Evaluation/QA	Yes. Pupils who played the game scored better in a knowledge exam than those who took 2 regular lessons
8.Cost	Not clear but pupils loaded PDAs by schools
9. Sources of information	www.frequentie1550.nl
10.Project or Permanent	Projects
11. Relevance to Open Schooling	Only if it is used in situations where learners can work together.

1.Project/Institution	**Mobile Math (3 schools)**
2.Country	**The Netherlands**
3.Target	Advanced secondary/pre-University
4.Brief description	Game to help learning about geometrical figures and how to apply knowledge strategically
5.Technology used	PDA with GPS and specialist software
6.Area of focus	Geometry
7.Evaluation/QA	Good pupil feedback
8.Cost	No information
9. Sources of information	www.mobilemath.nl
10.Project or Permanent	Project
11. Relevance to Open Schooling	Probably not

School, College and Further Education in UK and Eire

1.Project/Institution	**Learn2Go**
2.Location	**Wolverhampton**
3.Target	Primary and early secondary school children
4.Brief description	Wide range of educational activities
5.Technology used	2,500 PDAs distributed across schools
6.Area of focus	Maths English, science
7.Evaluation/QA	Positive results ; 'Boys who would never open a paperback book will happily read an e-book'
8.Cost	Not stated
9. Sources of information	www.learning2go.org
10.Project or Permanent	Permanent
11. Relevance to Open Schooling	Significant if funds for purchase of PDAs can be sourced

1.Project/Institution	**Learnosity**
2.Country	**Eire**
3.Target	14-15 year olds
4.Brief description	Language learning
5.Technology used	Mobile phones and laptops linked to a web site
6.Area of focus	Students working towards learning certificate in Irish as a second language
7.Evaluation/QA	Student feedback only
8.Cost	Not stated
9. Sources of information	http://www.learnosity.com/
10.Project or Permanent	Project
11. Relevance to Open Schooling	Could be of interest in teaching English as a second language

1.Project/Institution	**Lifetime Health and Fitness**
2.Location	**UK-wide**
3.Target	2000 adult learners in 2007/08
4.Brief description	Training of Health and Fitness employees
5.Technology used	Smartphones, digital cameras, portable printers and scanners, HP swivel-screen tablet PCs
6.Area of focus	Working towards apprenticeships, National Vocational or key skills qualifications
7.Evaluation/QA	Yes
8.Cost	Funded by employers
9. Sources of information	http://www.lifetime.co.uk/
10.Project or Permanent	Permanent
11. Relevance to Open Schooling	Of interest for vocational training

1.Project/Institution	**Foyer**
2.Country	**UK-wide**
3.Target	1000 homeless young people
4.Brief description	Skills for life assessments
5.Technology used	Pocket Pcs linked to on-line tracking system
6.Area of focus	Training and assessing homeless young peoples' life skills
7.Evaluation/QA	Evidence that it provided a 'bridge to IT'
8.Cost	Funded by the European Union
9. Sources of information	http://www.m-learning.org/archive/index.shtml
10.Project or Permanent	2005 project
11. Relevance to Open Schooling	Of interest in introducing young people, constantly on the move, to possibilities of IT

1.Project/Institution	**Learning and Skills Network/Tribal CTAD (Cambridge Training and Development)**
2.Country	**UK**
3.Target	Originally hard-to- reach young adults not in full-time education or training; now more widely used through Teachers Toolkit
4.Brief description	M-learning 3 year pan-European project with handheld technologies; 249 learners involved in UK, Italy and Sweden
5.Technology used	Not identified
6.Area of focus	Literacy and numeracy
7.Evaluation/QA	Not available
8.Cost	Cost of service provided on web site
9. Sources of information	http://www.ctad.co.uk/content/view/92/168/ http://www.ctad.co.uk/content/view/185/277/
10.Project or Permanent	Permanent
11. Relevance to Open Schooling	Institutions could consider whether Toolkits or authoring tools would provide useful in the creation of resources for Open Schooling in different contexts

Appendix 2

Non UK European HE Examples

1. These brief case studies are typical of the range of activity taking place in Europe and are taken from the Socrates-Minerva funded project Mobile Learning in Europe. Keegan etc al 2006
It is important to note the context, which is almost universal ownership of mobile phones by students and staff of institutions.

> *Never in the history of the use of technology in education and training has there been a technology as available to citizens as mobile technology. It is clear that in the EU countries penetration is between 90% and 100%. Recent data from Telecom Austria shows that penetration of mobile services in Bulgaria currently exceeds 130 %. Thus it can be safely assumed that every student in every course in every further and higher education institution possesses one. What is more, they use them constantly in every walk of life – except their education and training.*

(The role of mobile learning in European Education 227828-CP-1-2006-1-IE-MINERVA-M).

The institutions referred to are as follows:

- Corvinus University, Budapest Hungary
- Norwegian University of Science and Technology (NUST)
- NKI Norway
- Dirksen Opleidingen-a Dutch Private College

2. Corvinus University, Budapest Hungary

2.1 The first developments started in 2001-2002. From spring 2007, 3000 students are able to reach and use mobilized learning content through their mobile devices.
The technology supports the following student activities:

- *Adaptive self assessment.* An ontology based tool helps students to discover their gaps in their factual knowledge, when they prepare for an exam.
- *Tailored on-line course contents* for mobile phones (lecture notes, lecture and seminar summaries, glossaries). Students are able to download all course contents to their mobile devices
- *Using mobile-forums*, an on-line, real time feedback is provided for the teachers during the lectures with students encouraged to ask questions and to indicate difficulties and problems via their mobile phones.

2.2 Another example is the use of mobile technology in a context sensitive course, called “Urban Architecture”. The topic covers the history of door-making in Budapest. Students walk around in a certain district of the city and investigate buildings themselves using information on their mobile phones and recording their investigations and photographs on the phone.

2.3 see: http://www.uni-corvinus.hu
1093 Budapest, Hungary
http://informatika.uni-corvinus.hu

And Kismihk, G (20070
The Turkish Online Journal of Educational Technology - TOJET October 2007 ISSN: 1303-6521 Volume 6, Issue 4, Article 9

3. Norwegian University of Science and Technology (NUST)

This example involving the use of video(podcasts) to prepare students for forthcoming lectures and the use of mobile phones to access updates from the university's learning management system (LMS)on the also provides an example of student evaluation of the service.

3.1 Background

The Norwegian University of Science and Technology, located in Trondheim, has a long tradition of positioning itself at the technological cutting edge (www.ntnu.no). Virtually all students in Norway have private computers. Both students and staff have wireless broadband access at the indoor and outdoor campus areas.

3.2 Podcasts

Mobile technology was introduced to provide new opportunities for learning. The observations and interviews show that the students now prepared before lectures and that they used their mobile phones to watch specially prepared videos. Some used the service on a regular basis while others did not. Students claimed that watching the video before attending the lecture raised their awareness of upcoming issues and may have contributed to active participation during lectures. The new arrangements also allowed for flexibility about how, when and where to prepare for lectures.

In the analysis three categories of use were identified:

- students used the mobile phone to view the videos without further preparation, orienting themselves in the forthcoming lecture topic.
- students used the mobile phone to watch the videos before they read the subject material proposed by the teacher and the tasks assigned
- the students used the mobile phone to keep updated on news that was on the learning management system

The students would often claim that lack of time was a factor in the cases where they used their mobile phone in this way. They could view the video over breakfast, on the bus or during breaks between classes. One student tells about what it means to be able to use the mobile phone in this way:

"I'm really bad at working on the material beforehand, so I think it's really good that we get these videos, if not I wouldn't have done more ... [...] ... so I view the video immediately before (the lecture) ... especially on Mondays because then I have a lecture from eight to ten, then the histology class starts at ten fifteen, and I usually forget to do it on Sundays, but then I only need to view the video."

The students stated that they complied with the professor's instructions on the video. When they were performing preparation activities they also used the Internet or other sources of information:

"...he'll give some tasks, then I do the tasks, and then I'll read parts of the book and read the introduction to various chapters ... [...] ... and then occasionally I need to look up things in an encyclopedia or something on the Internet." (Int. 3: 1-2).

In contrast one student did not see how the mobile phone could support preparations, since other learning materials were needed anyway. For this student all preparation took place at the university within working hours at a desk with PC and books. In contrast another student comments

"I found it smart to use it (the mobile phone) in the reading room, ...[...]... because I didn't have a laptop there, so it has useful to watch the video and do the exercises there, where I have the books in the reading room."

3.3 Using the mobile phone for updates on the LMS

The new arrangements enabled students to connect to the LMS by mobile phone. Besides watching the videos, the students used the mobile phones for general updates about the latest news related to their subject. The students praised the opportunity to keep updated at *any time and any place*. Being able to connect to the LMS by mobile phone brought about new opportunities.

"... and then it's really good to be able to check with "It's learning" (the LMS) whenever you want, check whether there's something new ...[...]... to see whether new messages have arrived on "It's learning", or mail, then it's really useful to have this option available, that you don't need a PC to, well, check mail or whether there are new exercises, and watch the video..."

3.4 Conclusion

It is argued that it is reasonable to believe that wireless portable technology will have a role to play in the way we learn .Affordance of constant access to LMS by mobile phones may represent new learning opportunities in higher education. One key issue is that the use of technology must be driven by *pedagogical rather than technical reasons*. Our findings about using the mobile phone to get an outline of the upcoming lecture, for more extensive preparations and for updates on the LMS, come about in a context with a balanced interrelationship between student, subject matter and the technology used.

4. NKI Norway

4.1 Background

NKI Distance Education, was a pioneer in developing online learning, and has experimented with mobile learning as an integrated service of the online learning system for many years.
However, most NKI courses are not designed to function as online interactive e-learning programmes, although some parts of the courses may involve such interaction with multi-media materials, tests and assignments. The courses normally comprise intensive study, mainly of text based materials, solving problems, writing essays, submitting assignments and communicating with fellow students by e-mail or in the web based conferences. NKI students are mainly offline when studying.

4.2 Principles of development

When developing system solutions for mobile learning, it is assumed that the NKI students normally will have access to a desktop or laptop computer with Internet connection. This means that the equipment and technologies used when mobile are additions to the students' equipment used when studying at home or at work. It is also assumed that mobile learners study in the same group as students not having access to mobile technology. Thus, the learning environment of NKI is designed to cater efficiently for both situations and both types of students.

4.3 Examples

Initially NKI developed solutions for mobile learning using mobile phones and PDAs with portable keyboard. Learning materials were developed mainly for downloading to the PDA and off line study, while online access to forum discussions, supplying forum messages, reading in forums and communication with fellow students and tutors and submitting assignments were handled online via mobile equipment when students were on the move. Later, NKI developed and tested solutions for an "always online multi-media environment" for distance learners based on the use of PDA with access to wireless networks. It installed software and solutions that in principle made all online courses accessible independent of devices on the receiving side, e.g. most types of pocket PCs and mobile phones. One of the main challenges concerning the mobile devices was to find acceptable solutions adapted to the small screen. There is simply not enough space on a small screen for all the information found on a traditional web page. Another problem was the limited data transfer rate and processing power found in mobile devices. When people use a mobile device with Internet connectivity, the connection speed is traditionally lower via a mobile phone.

The next step was to develop mobile learning course content and services that will enter into the mainstream and take mobile learning from a project-based structure and into mainstream education and training.

4.4 Evaluation

4.4.1 Students' and tutor's use of technology when mobile

When mobile – and using mobile technologies – NKI found that it wasgenerally satisfactory for the student (and the tutor) to have the course content available to study on the Pocket PC. In addition, the following communication possibilities were seen as necessary. When mobile, the student must be able to:

- Access the course forum archive to read messages (if necessary) (messages on the forum are also sent to participants as e-mails)
- Access the course forum to submit contributions to the discussions
- Send e-mail to fellow students, to the teacher and to the administration (study advisor)
- Receive e-mail from fellow students, from the tutor and from the administration
- Submit assignments by e-mail including attachments
- Receive assignments corrected and commented on by the tutor including attachments.

To access e-mail and discussion forums, mobile phones with infrared connection to the PDA were used.

4.4.2 Evaluation: Student and Tutor feedback

NKI found that downloading and synchronizing learning materials to the students' PDAs caused few (or rather no) problems. The learning content was delivered in two versions, HTML and Microsoft Reader e-book format. As the preference *for the e-book format was so clear from the first trial*, in a second trial, the course applied e-book materials only. Illustrations were considered unacceptable on the PDA. Taking notes was found to be a problem, so for the second trial it was found to be necessary to equip the students with keyboards, that actually solved the problem, including writing longer texts in connection with assignments etc. Communication via mobile phones for submitting assignments and writing messages to the course forums were found to be easy, with few problems and with acceptable costs – on the condition that texts normally were produced offline. The main aim in designing solutions for mobile learners at NKI was to maximize student freedom and to support online learners who also are mobile when studying.

5. Dirksen Opleidingen-a Dutch Private College (http://www.dirksen.nl/)

5.1 Examination Feedback

The first mobile service tried out by Dirksen Opleidingen was information on exam results. Before the exam all candidates were asked to supply their mobile phone number. Those who did, received information on their exam results within

three hours after the exam was finished. Evaluations showed that the students were very satisfied with the service. Most of the users said that the system was easy to use and 68 percent said that the service was helpful. From an institutional point of view there was a huge reduction of telephone calls about exam results and thus a significant amount of personnel time was saved. Close to 90 percent of the students took advantage of the service.

5.2 Exam practice

Another service offered by Dirksen Opleidingen was SMS questions for practice before exams. The service was offered to a group of 60 students in a 3-5 months course for technicians working in one company. 68 percent found this valuable

All in all Dirksen Opleidingen considers mobile applications increase service, quality and flexibility of distance education (van der Mark 2008).

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Appendix 3

The UK Schools and Further Education scene in 2008, prepared by Merritt Associates

1. Introduction

CEDC asked for 'a note about how mobile technology is used in FE/schools in the UK together with 3 or 4 examples of institutions using it systematically'. This follows.

2. A definition

A mobile technology device includes – phones, personal digital assistants (PDAs), personal media players, portable games consoles, and UMPCs. See Futurelab Report 11 (23) for detailed classification of mobile technologies.

3. Background

3.1 Overview

This overview report for CEDC represents a snapshot of the use of mobile and handheld learning technologies in education settings within the UK. It covers all learning sectors and some workplace training initiatives, with examples of both small and large scale projects and practice. The report aims to give a broad-brush approach to understanding the scale and rationale of these mobile initiatives, rather than an in-depth look at their impact. However, there are a number of project views that are noted in more detail where they represent good practice examples of a particular aspect of using mobile technologies.

There are large numbers of mobile learning projects and initiatives across all sectors. What was quickly apparent from the initial research for this report was that very few of these projects had specifically undertaken any serious evaluation of the impact on learning and learner support as part of their focus.

3.2 Key messages

1. The practice differs by sector. Schools are more likely to use mobile technologies to improve practice in the usual learning environment and tend therefore to focus on benefits of cost-effectiveness and portability of UMPCs or handheld voting systems for classroom use. With some notable exceptions the use of mobile phones is prohibited as 'disruptive technology' – creating what some commentators see as a digital divide experienced by pupils between the home and the school.

2. Further Education and Personal and Community Development Learning by their nature, view mobile technologies as useful in multiple locations. Many projects have been initiated by single institutions or enthusiastic practitioners to explore handheld technologies used for support in learning and assessment. Work based learning initiatives tend specifically towards capturing evidence of competence in the workplace or solving the problems of assessing learning in diverse locations.

3. There is a good body of evidence in the work of Tribal CTAD for the practical usefulness of mobile technologies for quick fire quizzes (mostly multiple choice questions), electronic voting systems; supporting numeracy, literacy and other key and basic skills. Handheld devices also offer portability, flexibility and privacy for screening and diagnostic tests of English for Speakers of Other languages (ESOL) and Skills for Life (SfL) ensuring maximum engagement on tasks with no other distractions.

4. Some new (or extended) learning techniques are emerging. These include the use of mobile technologies to support learning narratives (or trails), particularly in the world of art galleries, museums and similar environments where in-depth understanding of context is difficult to achieve.

5. The development of games consoles for 'edutainment' continues apace. In Scotland, the Consolarium is funded by Learning and Teaching Scotland to explore, promote and develop the use of games-based learning in schools. More recently, the Wii is being developed in some schools and colleges (such as Joseph Priestley College and Hull College) as summarised in Lilian Soon's blog of July 17th.

6. In WBL the use of mobile devices for digitally recording evidence of competence not only resolves some issues of assessing candidates in widely dispersed workplaces, but can maximise the use of scarce assessor time and resources and reduce the need for paper checklists – although some audit issues remain to be resolved. There is some evidence of both financial savings and performance improvement from private sector providers.

7. Mobile technologies can be linked to 'media boards' and discussion forums to support peer review and professional discussions by practitioners as well as reflective practice by learners. Schools and colleges in regional consortia and across the UK are discovering new opportunities for collaboration in this way.

8. The size, shape, weight and portability of mobile devices can make them particularly useful for assessing learners with disabilities. However, small buttons and screen size can also be a disadvantage. PDAs cannot be easily customised as required for visually impaired learners with colour, text size and font changes especially for viewing web pages.

3.3 Access to technology

The Futurelab Report 11 (23) pointed out in 2006; the high proportion of UK residents owning mobile phones (75% general population, 90% young adults) that can handle both voice calls and SMS texting. Newer phones now have mobile internet connection and personal digital assistants (PDAs) are becoming more widespread. Laptops can now use mobile phones as an internet connection, and newer models of 'Ultra-mobile PCs' such as the ASUS Eee PC are even more portable.

The Q1 Mobile Trends report from the Mobile Data Association (MDA) for the UK (38) shows a 40% growth in text messaging in 2007 – to a staggering 57 billion. The first ever aggregation of data from mobile operators shows picture messaging was also up during the year -to almost 450 million, with 17 million people accessing the internet on their phone in December alone.

The 2008 Edition of the Horizon Report from EDUCAUSE and the New Media Consortium (41) looks at key emerging technologies over the next 1-5 years and reiterates each year globally more than a billion new mobile devices are manufactured. ***'In this market, innovation is unfolding at an unprecedented pace. Capabilities are increasing rapidly, and prices are becoming more affordable. Indeed, mobiles are quickly becoming the most affordable portable platform for staying networked'.***

Among the critical challenges identified in the Horizon Report is a new emphasis on collaborative learning that is *'**pushing the educational community to develop new forms of interaction and assessment'.*** A new generation of learners is using technology to develop fluency in information, visual and technological literacy rooted in Web 2.0 tools and social networking sites. As Bobby Elliot from SQA also states in his 'Assessment 2.0' discussion paper (1):

"Students' lives outside of schools and college are increasingly media-rich and stimulating – which reflects the wider technological revolution taking place in society. As a result, education is becoming disconnected. The classroom is a sort of 'virtual reality'; a drab, technology-free zone that bears little relation to the increasingly technological reality of the lives of students outside the classroom"'.

The challenge for education and training policy is not only to recognise the potential impact of these mobile technologies on current models of e-maturity, but more importantly to find an approach to *'21st century pedagogy'* which incorporates the use of mobile technologies where appropriate, and which can be supported by learners, parents, teachers, employers and other stakeholders.

At the recent Handheld Learning conference Mike Sharples of the University of Nottingham gave a presentation on disruptive and connected technologies in schools (14). Even today, with mobile phones banned in many schools, he quotes Becta research on over 2500 children in years 8 and 10 which found:

- 36% of pupils had accessed the internet on their phone whilst at school
- 33% had sent a text message relating to their work
- 23% had taken and shared a photo

This report attempts to identify some of the key initiatives which are aiming to help to bridge this new 'digital divide'.

4. Schools

The blunt tool of a search on the DCSF website for "mobile" brings up a large list which is overwhelmingly concerned with cyberbullying, school policies on confiscating mobile phones and the particular challenges of working with mobile learners. It is only in this last area that mention is made of the potential of wireless technologies (in this case, laptops with data cards) for learning benefit.

Despite the lack of formal national policy drivers for m-learning, there are a number of connected policy directions around modernising learning in schools that would be difficult to achieve without the use of handheld technologies and ubiquitous access to learning and assessment.

Key amongst these current initiatives are:

- Personalisation
- Learning out of the classroom
- Working with mobile learners
- The home access initiative
- Games based projects
- 14-19 opportunities

4.1 Personalisation

Both the DCFS 5 year strategy and the Becta Harnessing Technology policy see the personalisation of learning as a key aim for education reform. These strategies (and the 14-19 reforms and the Qualifications and Credit Framework (QCF)) support innovations in education that offer more choice to the learner about how, when and where they learn. As we can seen from the impact of the mobile learning projects featured in this report, handheld technologies are one of the tools that enable learner choice.

Many of the mobile learning projects in the school sector have targeted personalisation of learning through enabling learners to access learning and support in their own time. This is particularly true of those that are SMS based and utilise learner owned technology. The BBC has recognised the potential popularity of GCSE revision via mobile phones for example with several alternatives available from www.bbc.co.uk/mobile. These include 150 revision questions for GCSE English, maths and science, daily quizzes, and MP3 audio revision guides which can be downloaded straight to selected mobiles.

However, more structured personalisation can also be achieved with loaned technology if it is sufficiently flexible. The large scale PDA work in Wolverhampton is aimed at encouraging learners to learn in their own way, at their own pace, and in the place that suits them. As the Learning2Go website (20) states:

"Learner voice" has been the key to the success of the project so far. The Learning2Go project has as its ethos the belief that learners should have the choice and self-confidence to learn when, how and where they want. The project promotes a personalised learning experience, in which the learner is responsible for managing their own mobile handheld computer and helping to shape their own learning."

- The learner has the device 24/7
- The teacher is KEY to the whole project
- Learners can and will become more expert than adults!
- There is complete wireless coverage in the school
- Content and applications are of equal importance
- Learning can take place at different rates and at different times
- Collaboration and peer support are to be encouraged
- Learners show their families the technology
- P-learning (Play/Learning) is valued.

The Learning2Go project is now described as 'the largest collaborative mobile learning project in the UK'. Started in 2004, the project uses a bespoke system with PDAs for

reading improvement and has seen a significant increase in literacy levels, particularly in the harder to reach groups such as young and teenaged boys. For a full case study see 'Handhelds: learning with handheld technologies from Futurelab' (15) or the Learning2Go website (20)

A single school example of a pilot project in the use of the use of PDAs and mobile technologies to support personalisation is St Hilds secondary school in Hartlepool (45). In this project Year 8 pupils in maths and geography used PDAs as an encouragement to become more independent learners, develop thinking skills and undertake peer coaching for personalised learning tasks both in class and out of school.

The Learnosity pilot scheme in Eire (44) provides another example of mobile technologies being applied to a specific curriculum area – in this case teaching Irish as a second language. Mobile phones were used in class to provide access to an interactive voice response system, SMS vocabulary was delivered automatically each day for use in class or for written work. In addition to text 'chat' with classmates, internet links from PDAs enabled MSN messenger to be used with scripts being recorded by teaching staff and used for formative assessment. An online dictionary was also available.

4.2 Learning out of the classroom

Learning out of the classroom is another example of the creative use of handheld technologies. The latest gadgets are opening up ever more possibilities for innovative teaching and learning. Drawing on functions such as GPS, camera, video, audio and 3G internet access, which are often now incorporated within one device, teachers of all subjects and across all ages can capitalise on opportunities for using these technologies in fieldwork. And in a time when children spend huge amounts of time indoors in front of computers, enthusiastic practitioners see an opportunity to turn this on its head - take the computers outdoors and use them imaginatively to engage them with the real world!

WildKey, a spin-out company formed as a result of an Oxford Brookes research project, now creates a digital tool-kit for outdoor learning that enables teachers to make the most of mobile technologies. This 'tool-kit' comprises three software packages: *WildForm* enables any pen-and-paper data-gathering exercise to be replaced by a digital form on a handheld computer (the forms can also incorporate fields such as GPS readings, taking things beyond what can be achieved with paper); *WildMap* enables the creation of multimedia, GPS-led, interactive trails; and using *WildKey* interactive keys, young people can identify and record minibeasts, pond and rock-pool creatures, birds, and many other wildlife groups while out and about.

The possibilities are endless. Drama teachers could use GPS-linked, multi-media maps and 'interest points' to facilitate the use of the school grounds as an open-air theatre (getting the students to video and upload their acting to the internet while on the move). History field trips to local archaeological sites can be brought to life by allowing pupils to access historical photos and re-enactment videos and record their own interpretations at the point of inspiration. In outdoor science lessons, students could create a database of GPS-tagged local wildlife records to be shared across the internet with other schools and used to create Google Earth maps showing the exact wildlife recording positions.

Futurelab have developed a useful taxonomy (23) which places such initiatives within a Constructivist paradigm where learners use handheld technology to play an active role in a

real or simulated dynamic system or learning process. Perhaps the best example is the Savannah project (39) - a collaborative project with the BBC and the University of Bristol in 2004 that explored whether children could learn about ecology and ethology by 'being an animal'. PDAs provided a window on a ‘game world’ with visual and auditory stimuli combined with GPS tracking.

Another of the more recent location-based games is the Futurelab project in collaboration with Goldsmith called ‘Mudlarking in Deptford’ from 2006 (36) which involves pupils as co-designers, producing a tour by making use of mobile technologies to both initiate and respond to a scattering of located nodes in and around Deptford Creek. Key Stage 3 students walked usually inaccessible and fenced-off areas of Deptford, making imaginative connections between large and small-scale relics that connect histories and stories embedded in the creek itself.

Within the trails model, as it has developed so far, there are many possible variations. Trails can be explicitly created about particular topics, or generated after the fact from data captured from random points of interest. Meaning is made and knowledge is constructed by connecting these individual learning objects into a coherent – usually narrative – representation.

Trails can also be created by learners for other learners. Trail construction can benefit the trail constructor at least as much as the recipient of the trail; making connections as part of a trail is analogous to making mental connections. Thus the value of a trail is not just as a device for navigating physical space, but also as a cognitive tool for the construction of meaning making.

The following two studies of the work undertaken by Art projects such as the Barking and Dagenham Art Initiative (15) and MyArtSpace (35) look at the creation of learning trails to develop (self-assessment oriented) skills of reflection and critical thinking.

4.3 Working with mobile learners out of school

There is ongoing work by DCSF for school supported distance learning with communities that have a travelling tradition. The e-learning and mobility projects (ELAMP) (6) used laptops and datacards to support distance learning for pupils whose families are away from school for parts of the year because of parental work patterns such as those that work with the circus or fairgrounds. The National Association of Teachers of Travellers (NATT) estimate that in addition to these, there are around 10,000 – 12,000 school-age traveller children in the UK who are mobile for at least part of the year. Evidence suggests that the use of ICT can provided a significant shift in both motivation and attainment for many pupils.

Some fairground children miss for example over a hundred days of school per year or go to 20-30 different schools in the academic year, so the ELAMP Project was designed to bridge this gap - providing e-learning opportunities for pupils with a base school. The project offered guidance, training and support to the families and enough budget to provide the student with a lap-top + data card, 50mgbs per month of data, printer, scanner, £250 of software and teacher support for 9 months. The project was delivered by the base school and included a contingency fund for repairs and a spare computer.

As a result of this project many new similar set ups are emerging- Essex, Thames Valley and Derby. The DfES has agreed to extend the work to cover the following regions- Bolton, Cambridge, South Gloucestershire, Surrey, Devon, Derby, Hertfordshire, Northamptonshire, Northumberland and Leicestershire. The majority of uptake for this initiative has so far been showman children at Key Stage 2&3.

Over the 3 years of ELAMP projects around 250 pupils and their parents have had access to laptops and evaluation shows at least 80% have used these to access courseware online and to exchange messages with base schools about their work. Time spent on school-work was found to have increased dramatically, now ranging from ten to twenty five hours per week, and this work was reported to be well-focused. As one young learner put it "*When you are in a class you are bring told about something….but not always 100% there. When you are searching and following up (your own learning) you ARE 100% there*." Indeed one of the most encouraging themes which ran through all the interview feedback, from parents and pupils alike, was evidence that pupils were increasingly taking control of their own learning and extending their (distributed) cognitive skills; looking to the web as well as being active in contacting teachers if they had problems, searching out and collating information for projects, exploring different ways of presenting schoolwork and developing their own learning interests.

The mobile lifestyle of ELAMP pupils has always offered the particular challenge of how to link learners to the internet, and consolidation is critically dependent on effective solutions to this challenge. Back in 2003-04 there were two options, the use of satellite or of GPRS accounts with mobile telephone companies. The latter option was both significantly cheaper and more readily available and since the project started the wireless coverage offered by mobile telephone providers has improved significantly, although there are still communication black spots where children find it impossible to link to the internet. A more recent initiative has been to work with Becta to provide an approved service offered by 'Synetrix' which offers a range of connectivity solutions with competitive costs and with a centralized back up service.

It is hoped that the Becta 'Home Access' initiative will provide further support for ELAMP children.

4.4 Home access

At BETT 2007, Jim Knight launched the Home Access taskforce. Membership of the taskforce is from Becta and other educational bodies, industry and the 'third sector' (charity, voluntary etc). This presents an excellent opportunity to embed some well-tested elements of mobile learning. The Becta document on home access notes that:

"Research indicates that the common uses of technology in schools are: 'unlikely to encourage the range of competencies increasingly demanded by employers and the economy more generally. It also potentially presents a risk of further dislocation between learners' informal experience at home and those in education possibly at the expense of learners' enthusiasm for educational experiences. This is at a time when personalisation debates increasingly recognise the need for closer links between formal and informal learning'. *(Harnessing Technology Review 2007, Progress and Impact of Technology in Education, Becta.)"*

The core vision for the Taskforce is stated as:

"Home access to technology providing all learners, irrespective of their circumstances, with access to learning where and when they need it, achieved through:

- ***increased opportunities for all learners to engage with the curriculum and interact with its resources beyond the confines of the school day***
- ***increased opportunities for all learners to extend their learning into areas that match their personal interests, abilities and aspirations***
- ***increased opportunities for all learners to develop the skills they will need to pursue and drive their learning independently***
- ***increased opportunities for all learners to participate in, and to develop the skills needed to participate in, an increasingly 'connected' world***
- ***increased opportunities for the families of learners to become more involved in supporting their learning and to develop their own skills and capabilities.***

The Personalisation by Pieces initiative (37) and being piloted in several schools is one example of an approach which epitomises these ambitions and in which the use of PDAs is strongly featured.

However, the Task Force is not without its critics, focussing funding almost entirely on the supply of laptops for home use and being accused by Graham Brown-Martin (Handheld Learning Forum) of acting *as* ***'a cartel of suppliers to the UK education sector and as if the consumer electronics and mobile handset industry never existed'.*** There is certainly a disappointing lack of vision in the future role of mobile technologies in education in the 21st century or indeed, the reality of connectivity for leisure and games playing which already exists in many homes in the UK

4.5 Games based projects

One of the best current examples in the UK is the Consolarium Project (5) funded by Learning and Teaching Scotland (LTS).

This research project will look at the effect of Nintendo's 'More Brain Training' from Dr Kawashima on pupils' maths ability. More than 900 pupils and 32 schools across the country are involved in the project, which began in April 2008.

A small-scale study carried out with P5-P6 pupils in Dundee's St Columba's Primary School by LTS last year found a daily dose of the computer game helped improve pupils' attainment in maths and their concentration and behaviour levels.

The pupils were given a maths test at the beginning and then they used More Brain Training from Dr Kawashima on the Nintendo DS for 20 minutes at the start of each day for 10 weeks. It featured challenges including reading tests, problem-solving exercises and memory puzzles designed to exercise the brain. They were then tested again and the results showed a 10% average increase compared to before the experiment. The average time taken to complete the tests also dropped from 17 minutes to 13 minutes and 19 seconds. Some children halved the time it took to complete the test while maintaining or improving their score. There was also a notable improvement in the pupils' behaviour and concentration during the study.

LTS is now working with the HMI and the University of Dundee to carry out a larger pilot of the scheme. Sixteen schools will use the game every morning while another 16 will act as the control group. Derek Robertson, LTS Development Officer for games-based learning, said: ***'LTS is committed to exploring and developing new technology to support learning and teaching in the 21st century. Game-based learning can provide dynamic and culturally relevant contexts that engage, motivate and challenge today's young learner'.***

4.6 14-19 policy and practice

The unpublished Becta report (42) on the potential of mobile learning to support the 14-19 agenda in the FE sector highlights several key messages for the sector, for organisations and for practitioners.

Particularly noteworthy in the context of this research are the statements that:

' the underlying pedagogy of programmes using mobile technology focuses upon learner support and engagement and reinforces functional skills through access to the means of recording skills in employment and other context inhabited by the learner and providing feedback for assessment for learning'……' In the context of mobile learning, learners are expert users and should be consulted and engaged in peer learning and collaborative activities showcasing their skills and knowledge'.

Despite the opportunities opened up by this new flexible phase of 14-19 learning, the timescale for the piloting and live launch of the first tranche of new Diplomas has meant that there is very little that is forward looking in the use of mobile technologies. All of the contributors to this report, from national organisations and educational institutions have been frank about seeing the Diploma rollout as a missed opportunity for creative teaching and assessment. Some of the Diploma Development Partnerships have left openings for future developments, which will be the best opportunities for exploring the use of mobile technologies.

One example (which also trialled Personalisation by Pieces (37) is from City College Norwich in a project called 'Harnessing Technology Towards Personalisation'. In a useful presentation made at the recent Handheld Learning conference (14) the team describe how the college and 10 local schools worked with 500 14-19 year olds and 70 staff on a range of programmes to develop a 'mobile learning blueprint for 14-19 curriculum partnerships'. Among the many lessons learned was the danger of the technical issues swamping the pedagogical aspirations, and the fact that the project was financially unsustainable. However, there was widespread enthusiasm from all concerned and the college is now committed to making 'm-learning everyday learning'.

Another presentation at the conference by Havering Sixth Form College with Keri Facer of Futurelab (14) illustrates the use of the ASUS EEC PC with minority subjects such as geology, modern foreign languages and health and social care. In addition to innovative use on field trips, the technology enabled podcasts to be developed for revision and camcorders to make recordings for final presentations.

5. Further Education

Some of the JISC Regional Support Centres have a focus on the potential role of mobile technologies to support learning. Among these, the North West RSC features work at Thomas Danby College, Bishop Burton College and Dewsbury College for example. However, in common with most of the early Further Education initiatives found in this research, the focus tended to be on using mobile technologies to replicate current pedagogy, albeit in the community or offsite settings.

The literature research and expert interviews revealed relatively few case studies in this sector that indicated a strategic or integrated approach to m-learning. Most initiatives were piecemeal and the result either of short term funding or individual/departmental enthusiasms. Many of these are well summarised in publications from LSDA and LSN (22), (30), (28). The last of these 'Mobile Learning in Practice' (28) (LSN, 2006) supports the findings of the JISC publication 'Empowering Learners' (9). From the learners' perspective the use of mobile technologies in the learning environment can change a mindset*:*

'In their everyday lives, many young people feel comfortable with their use of mobile phones and for them it is an important device for communicating with others. A number of tutors in this study noted that the use of mobile devices for learning was a 'good hook' to capture the imagination of certain groups of students, as a step towards changing their attitudes to learning'.

A more recent focus on the use of mobile technologies in the FE sector has come with the LSC-funded MoleNET project. The Mobile Learning Network (MoLeNET) project represents an investment of over £7 million in 2007/08 with 32 projects involving 136 education and training partners in Phase 1. A further 30 colleges have been approved to share £ 4 million in 2008/09. See the MoLeNET website (32).

The stated aim of the project is to ***'promote mobile learning and to increase the capacity of the Further Education sector to implement and benefit from mobile learning'.*** This is the first large-scale project in the UK to undertake research projects to evaluate the use of mobile technologies in the FE sector. Among the project research questions are:

- How do colleges/consortia use mobile technologies to improve teaching and learning?
- What is the impact of mobile learning on learners, teachers and institutions?
- Can mobile learning help to improve attendance, achievement, retention or progression?

Specific practitoner-led action research focussed on specific issues such as:

- Learning and teaching – How can mobile technology improve a students' educational learning experience?
- Learner focus – Does listening to, watching and creating podcasts impact on learner motivation?
- Technology focus – Does the use of mobile devices improve the students ability to gather evidence for their portfolios?

- Institutional focus – What are the time, training and resource development costs when introducing mobile learning?
- Specific curriculum focus – Have mobile technologies enhanced independent learning experience for Health/Social Care and Geology students?
- Retention and Achievement focus – How does the use of mobile technologies affect the performance, retention and achievement of students aged 14-19?

Whilst the full report of Phase 1 evaluation is awaited, the recent MoleNET conference (33) gave some early indications of findings. These are summarised in Section 8 of this report.

6. Work Based Learning

In the Work based learning (WBL) sector one of the main drivers to the use of mobile technologies has been the NVQ assessment regime in which recording evidence of competence in workplace setting has traditionally been paper-based and very time-consuming for candidates, assessors and mentors. There is now widespread good practice in the use of mobile technologies to capture digital evidence of learner competence through digital cameras, dictaphones and even mobile phones.

The 'Assess - Train - Assess' model is a requirement in major LSC funded projects such as Train to Gain. This approach to recording evidence of competence is actively encouraged by QIA, for example on the website for the development programme for Train to Gain where Guidelines are provided on the use of MP3 players such as the DX Digital Player to record NVQ evidence in care and Child care training.

Much of this practice has also been stimulated and supported through the annual Learning Innovation Grant (LIG) from the LSC administered by the Association of Learning Providers (ALP). See the ALP E-learning website (7) for more information and case studies. 2 LIG beneficiaries from widely differing sectors can be cited as examples – EAGIT Training in manufacturing, engineering and construction, and Lifetime Health and Fitness. Both are private sector providers and as expected, are able to contribute evidence of the cost savings and efficiency benefits from the use of mobile technologies.

7. Personal and Community Development Learning

Much of the work in the area of using handheld technologies in Personal and Community Development Learning (PCDL) has developed originally from a 3 year pan-European research and development programme titled 'M-learning'. Funded by the EU with UK partners Tribal CTAD, Ultralab and the LSDA, the Foyer project targeted learners aged 16-24 mainly disaffected, homeless or hard to reach. This project showed that diagnostic testing using handheld devices can provide a valuable route into further learning for those who are divorced from or disadvantaged by the formal education system

Many of the lessons learned and tools developed, have transferred into wider m-learning projects in PCDL, FE and WBL. Among these are:

- Text message skills checks across 20 different industries
- Online skills checks and adaptive skills assessment (McDonalds)
- Mobile ESOL Screening (Newnham College)

- Mobile initial Skills for Life assessment (Foyer project)
- Drill and practice assessment (driving theory test revision).

The good practice and tools developed by Tribal CTAD for these projects and others are featured on their m-learning website (25). Much of the initial assessment practice is concentrated around the area of key and basic skills, probably due to the availability of funding to support these areas over the past few years. Tribal CTAD and LSN have subsequently used SMS Quizzes and games on mobile phones and PDAs with ESOL and Skills for Life learners with some success as shown in the pilots of a mobile learning teacher's toolkit in 5 FE colleges in 2006 (28).

Building on the focus on Skills for Life in the original Foyer project, Geoff Stead (34) describes how mobile technologies can be more than a motivating force, and summarise some of the lessons learned as follows:

- ***Technology balance****:* m-learning covers a wide range of technologies. New phones and PDAs come out every few weeks and each has more power than its predecessor. Finding a balance between focusing on a minority (but powerful) phone or a generic (but very outdated) technology standard is essential. That balance will differ depending on the project, but being clear about it from the start will help avoid problems later.

- ***Not a PC****:* It is easy to assume that the learning process will be similar to that using a PC, only at a smaller size. This is not true. In fact both the limits of the technology and the lack of control which practitioners have over how and when the learning happens mean that a different learning model is needed.

- ***Bite sized:*** If learners learn on the move, they do it in short sharp bursts and are often surrounded by distractions (some are on your phone, like the web or other games) so learning must be engaging.

- ***Keep a spread:*** Developing materials that can be used in different forms across different technologies will give the best mileage and stop them getting out of date when new phones are released. The best learning materials are short. They work best when part of a bigger solution – like with the student practicing her driving theory test while waiting for the bus: the phone didn't teach her all the theory, it just supported her as she tried to remember it.

- ***Collaboration****:* In every single trial, the learners engaged most with learning that they could do together, either by sharing phones or by passing things between phones. Try to build learning around this.

Such methods are not uncommon now in PCDL. The NIACE website for mobile technologies (31) gives many examples and links. This site is supported by one of the E-Guides series (16) by Di Dawson that contains an accessible overview of the potential for each application on handheld devices in adult education.

The point is well made that *'**the pedagogy should drive the technology and not the other way round'*.** On the same NIACE website examples are given for example, of how

multiple choice activities on handheld devices can test knowledge about processes, or health and safety issues. How in an art studio or dance class learners can record a gallery of images using video clips or still images to record progress and achievement at each stage. These images can be shared between learners' devices for peer evaluation and critique as well as forming part of a portfolio.

8. Impact on student learning/support

a) In schools

The St Hilds secondary school pilot using PDAs in maths and geography found that:

- Pupils used PDAs to organise their time more effectively, with easy access to a daily diary, school timetable and homework notes
- Bluetooth and wi-fi connectivity enabled transfer of teacher-led research activities both in class and out of school personalised projects
- Presentation of project work and reports improved in geography with the use of MS mobile office software
- Attainment levels in maths improved with the use of Sums Online software
- Pupils with behaviour difficulties found the use of PDAs encouraged a more active learning style

Pupil voice – **'it's great to have PDAs/mobile devices in the classroom as I can do many things using this as well I never lose my homework or am missing a timetable'.**

Teacher voice **–'the traditional way of teaching is not the best way forward for pupils' learning outcomes. Teachers are able to improve their ICT capabilities and planning of lessons using PDAs/mobile technology to engage pupils more effectively and creatively to make them more independent learners for their adult life'.**

Evaluation of the Learnosity project similarly found that 'students regarded the integrated technologies as a positive move from the more traditional methods of learning Irish. Students experienced less pressure in communicating in Irish than in face-to-face classroom settings and their abilities to learn autonomously were enhanced. Teachers also commented positively on the shift from more teacher-led to student-led learning that m-learning allowed, noticing increased motivation and student interest for using Irish during the pilot project. Topics were learned faster and the impact on their own teaching styles was largely positive.

Evaluation of impact in Learning2Go is available through the project website (20) or from David Perry associates (18) (19). More recent findings will be available through detailed follow-up research.

b) In FE

Early MoleNET findings (33) indicate benefits for both staff and learners. Teachers and assessors in Phase 1 projects report improved learner progress, better quality of coursework, learners more engaged, focussed and better behaved, and improved learner confidence and self-esteem. Learners perceive that their progress improved and say that mobile devices helped them to achieve learning goals (both in college and in the

workplace) as well as feeling more valued and better supported. It is of course, unknown to what extent the 'Hawthorne Effect' might have been in operation in some of these instances.

Quantitative data supports these findings however, with attendance and retention data being around 10% higher in 'MoleNET cohorts' than the national average and both achievement and predicted progression also being significantly higher. In an SMS quiz with over 900 learners (28% of whom had used mobile technologies for learning for over 3 months) the following results were obtained:

- 70% thought that using mobile technology had helped them to learn
- 60% said that using mobile technologies had made learning more interesting
- 78% said it had helped them to learn in different places
- 75% said it had helped them to learn at different times
- 84% said that they would like to use mobile technologies for learning in the future.

9. A note on disability

TechDis (40) is a JISC funded service which is actively involved in working across the FE, PDSL and HE sectors with the different provider organisations to provide a coherent and integrated service in the fields of accessibility and inclusion using technology. Across the sectors, practitioners are dealing with increasingly diverse learner needs, but there are limits to how effectively traditional teaching and learning methods can engage, support and stretch learners who have markedly different starting points and accessibility needs. Mobile learning offers some innovative and effective ways of tackling this challenge, but is still perceived by many as a niche area reserved for those with advanced technical skills. When mobile technologies have made their way into learning and teaching, it is often assumed that their benefits do not extend to learners with disabilities.

The paper from TechDis on m-learning and accessibility (40) begins:

"It is appropriate to ask the question "How accessible is m-Learning?", but the answer is not necessarily simple; it needs to be understood in the context of the alternatives. For an ESOL class in a rural community centre, m-learning may involve adult learners peering at small screens, and grappling with cramped keypads; but it may be the only way of engaging the learners with video and audio clips. The accessibility issues of the kit may be more than counterbalanced by the value added to the learning experience - compared to a traditional didactic lesson."

Their model of accessible m-learning provides a clear starting point for thinking about accessibility. The TechDis paper (40) continues:

"The model of accessible m-learning illustrates four accessibility criteria; the interface, the cultural capital (is this way of learning culturally appropriate), the accessibility of the task and the accessibility of the content. In the model, low values are in the middle and high values on the edges. Any learner who experiences high values for all four aspects has an "accessible learning experience". Learners with low values will have less accessible experiences but may still have a net benefit compared to other types of learning2".

From the projects in this report, mobiles and handheld devices are more often perceived to be a positive step towards accessibility. The key reasons are:

- They are personal, and private, removing some of the awkwardness around learning in certain situations (for example the Foyer study working with people in hostels).
- They are more able to reflect the learner's lifestyle. This covers both young(er) learner familiarity with what are primarily social networking tools in common currency, and the benefits of mobility to busy people on the move or unable to access a suitable learning location.
- They are (relatively) cheap and (relatively) ubiquitous (although care needs to be taken with assumptions here, particularly in sectors dealing with older generations). They can provide access to learning where none was previously available.
- They can work with visual and auditory input and output as well as text.

However:

- Wireless access is not uniform, or reliable across even the UK
- The text size can be hard to read. Older learners and those with sight problems can struggle. Text to voice technology is improving, albeit slowly, and needs to be considered where the learner constituency demands it, (and borne in mind where there is currently no demand).
- For the purposes of assessment, the use of mobile and handheld devices can lead to the simplification of assessment, with over-use simple multiple choice questions over text entry answering. Several projects have demonstrated that this does not have to be the case.

One recent publication (13) draws on the experiences of those working in the vanguard of mobile learning and inclusivity in independent specialist colleges and further and higher education institutions, 'GoMobile! Maximising the potential of mobile technologies for learners with disabilities' passes on some of the lessons learnt to make mobile learning a more achievable aim for those working with learners with disabilities.

Drawing on outcomes emerging from initiatives such as the Learning and Skills Council's MoLeNET and Learning for Living and Work (L4LW) programmes, and the Higher Education Assistive Technologies (HEAT) scheme administered by TechDis, 'GoMobile!' explores how mobile technologies can make day-to-day living and learning more manageable, enjoyable and achievable for learners who face a range of challenges when learning.

A more accessible resource can be found on the JISC Regional Support Centre website for Yorkshire and Humberside (10). The Excellence in inclusivity portal has been developed to help promote best practice and share knowledge to support enhanced inclusivity. This portal provides a simple route to accessing a range of case studies which show how inclusivity has been enhanced through the use of appropriate technology – including using mobile phones for podcasts at Yorkshire Coast College (52) which has established the use of SMS and podcasting as a means of communicating with students and dissemination of learning materials. The college has pioneered access to learning materials suitable for all learners through mobile phones.

Another college which used its MoleNET project to focus specifically on the evaluation of different types of mobile devices for learners with disability is Aylesbury College. A summary of their findings was presented to the recent MoleNET conference (2).

Short Case studies

1) Learnosity - Using mobile phones for language learning

Scale: 69 learners aged 14 and 15 in 2007
Timescale: Started in 2007 and continuing
Sector/learner group: Students working towards the Leaving Certificate in Irish as a second language
Funding: National Council for Curriculum and Assessment (NCCA) and National Centre for Technology in Education (NCTE)
Partners: Learnosity
Type of technology: Mobile phones and laptops linked to a website
Type of assessment: formative, adaptive and summative
Evaluation/project /website: See http://www.learnosity.com/
Continuation: Plans for further trials in 6 Irish schools, with task-based and role-play conference calls

This Eire based pilot project uses mobile phones and laptops linked to a website to support learning and teaching in Gaeilge. From 2009/10 in Eire for the optional Irish language component of the Junior Certificate and from 2011/12, 40% of the compulsory Leaving Certificate, will be based on oral examination There will be significant resources issues and logistical challenges in supplying teachers to be physically present in each school. The Learnosity solution is innovative, practical and timely.

Key points

There are several components to the Learnosity system that, taken together make it unique. These are:

- The use of mobile phones with the Interactive Voice Response (IVR) system
- Questions are selected at random from a question bank
- Students can re-record and repeat the process as required
- Answers are recorded as WAV files and saved to a server from which they can either be marked online through a website or saved and marked as a podcast
- Students can hear not only their own, but exemplary answers as well
- Feedback is given in the form of a printout or email – which can be saved to an e-portfolio if available
- New vocabulary can be delivered by SMS text each day for use in class or written work.
- Text chat with peers through Google Talk. In the pilot this was done with PCs but it could be via PDAs. Teachers can mediate in real time and assess later with the scripts also recorded and saved for self-assessment. Access to an online dictionary supports further language development.

Outcomes:

- 67% students reported that they had made significant progress with oral Irish language in the 6 weeks of the pilot. There are plans for further trials in 6 schools, task-based and role-play conference calls and potentially, biometric voice recognition. However, wireless access in schools can be a barrier in remote areas.

'It's nice to hear students you wouldn't hear too much in class talking on the recordings'

Class teacher

See: http://www.learnosity.com/go/client-ncca-ireland (44)

2) Barking and Dagenham Art initiatives - Using handheld devices to stimulate Critical Studies in A-level Art at Warren Comprehensive

Scale: initially one A level Art year group from Warren Comprehensive school
Timescale: 2006 onwards
Sector/learner group: A level students, then extended to other school children
Funding: ICT Test bed
Partners: Test Bed Team, Dulwich Picture Gallery, Street Access Software
Type of technology: PDAs and Street Access Software
Type of assessment: formative assessment for learning

Evaluation/project /website: http://www.barking-dagenham.gov.uk/9-cias/ict-team/pdf/pda-project-sept-dec05.pdf and http://www.dulwichpicturegallery.org.uk/uploads/Digit.pdf and http://www.barking-dagenham.gov.uk/9-cias/ict-team/ict-team-pda.html.and http://www.camot.net/files/Report%20on%20Dulwich%20Picture%20Gallery%20for%20CaMOT.pdf See also Test Bed evaluations: http://www.evaluation.icttestbed.org.uk/files/s2_handheld_art.pdf

Continuation: rolled out cross-phase to include Key Stage 3 and science students with plans for further expansion including GPS integration. Dulwich Gallery have expanded the project across age ranges. Barking and Dagenham have built on this experience to provide other opportunities throughout the borough, including collaboration with Valence House Museum.

"We wanted to try and develop children's critical awareness in art…Children aren't great users of art galleries. We wanted to find a way in for them." Ellie Burkett, project leader and Head of Art at Warren Secondary School.

"The hand-held made me think more about the painting and the questions made me think." Learner from DiGIT project.

Key points:

- Impact on student learning and motivation; improved understanding of critical analysis in Art
- Out of school learning activity
- Needs preparation and collaboration on behalf of teachers and museum or gallery staff
- Prompts learners to reflect and answer questions the project and provides an excellent opportunity for assessment for learning.

Aims

- This project aimed to enhance the experience and learning potential of visits to Museums and Art Galleries. It started as a collaborative project with the Dulwich gallery in South London by creating interactive lessons and study materials that visiting students could access via PDAs. This gallery has a wealth of Old Masters who are not usually popular with school-aged children.

Solutions

- Software developers StreetAccess created 'i-Guide, an interactive education package, and the application 'Trailmaker' to write interactive trails that can be accessed on personal computers and handhelds. Children are each assigned a personal ID number which, in conjunction with a school ID, allows them to access the Gallery's trails through the StreetAccess website. Once in the Gallery, students are given a hand-held device and they embark on the DiGIT tour. Brief contextual information and a thumbnail of each featured artefact are held in the PDA program with sets of in-depth questions which prompt reflection and greater understanding.

See
http://www.futurelab.org.uk/resources/documents/handbooks/handhelds_handbook.pdf
(15)

3) MyArt Space

Scale: 3000 school students with a final study involving 23 11-14 year old learners
Timescale: 2006 onwards
Sector/learner group: A level students, then extended to other school children
Funding: N/A
Partners: 3 museums
Type of technology: desktop or mobile phone (Nokia 6680), pre-programmed
Type of assessment: none specified, but enables formative commentary on exhibits collected and hones enquiry and analysis skills
Evaluation project/website:
http://www.projectsetc.org/technology/case_study_my_art_space.html and
http://www.myartspace.org.uk/web/index.php and
http://www.mlearn2007.org/files/mLearn_2007_Conference_Proceedings.pdf (page 238)
Continuation – used in wider fields. See
http://edit.archimuse.com/mw2007/papers/walker/walker.html

Key points

- evidence collection which supports both learning and assessment activity
- learner exhibits professional skills of gallery curator and of interpretation
- used at Kew Gardens, supported the development of journalistic enquiry and interpretation

Description of MyArtSpace

MyArtSpace connects a web-based client that can be accessed on a desktop computer in classrooms or homes with software running on mobile phones in the museums and gallery. Typically, the teacher will set one or more questions or goals to guide the visit. Small groups of learners are given a pre-programmed phone on arrival at the museum and enter a unique identifier.

As they tour the museum, each group can 'collect' an object by typing the exhibit code, which accesses an image and brief presentation on the artefact. Learners are prompted to type in their reasons for collecting the object, and shown a list of who else has collected it. They are able to add their own audio or text interpretation to support the learning outcomes and goals. The collected content is automatically transmitted over the GSM phone connection to the MyArtSpace website, which builds a personal record of their visit. Back in the classroom, or at home, the children can log into the MyArtSpace website for further discussion and exploration of outcomes and the production of a completed gallery.

Extension and explanation of the learning behind MyArtSpace

The background research to the project has explored the use of mobile technology to *"create personalized learning trails through the capture, editing and sharing of audio, photos and text during visits to museums, botanic gardens and cultural heritage sites"*. The aim of MyArtSpace was to find the appropriate levels of structure, support and focus for school visits as well as for casual visitors.

"Findings so far indicate that a narrow subject focus and a manageable amount of data capture are appropriate in most cases. Audio has proven the most important mode for communication and interpretation. Voice recording not only is easier and faster than entering text, but also enables visitors who may have writing difficulties. Audio is particularly effective when used collaboratively – for example, when two people have a conversation or share their impressions while in front of the artifact or exhibit of interest…. Some users (especially girls) interviewed each other. This form of journalistic inquiry appears particularly effective in constructing trails for others to follow".

MyArtSpace Project manager

See http://www.myartspace.org.uk/web/index.php (35)

4) Lifetime Health and Fitness - Recording evidence in disparate workplaces

Scale: 2000 learners in 2007/08
Timescale: Started in June 2007

Sector/learner group: Health and Fitness employees working towards Apprentiships, NVQs or Key Skills qualifications
Funding: Employer investment plus small Round 1 Learning Innovation Grant funding from LSC
Partners: None
Type of technology: Smartphones, digital cameras, HP swivel-screen tablet PCs, portable printers and scanners
Type of assessment: formative and summative
Evaluation/project /website: None but see http://www.lifetimehf.co.uk/
Continuation: Plans for integration of Moodle forums, podcast video clips and more use of digital learning resources.

Key points

- Learners are scattered throughout the UK and need to be assessed in workplace settings. Lifetime Health and Fitness is seeking both greater efficiency in the assessment process and provision of learning resources in a range of media to suit a range of learning styles.
- Assessors are equipped with tablet PCs and digital pens supported by handheld smartphones, digital cameras and portable scanners and printers for collecting performance evidence in the workplace. Evidence is then uploaded online to an internally developed e-portfolio on a central server
- Plans are in place to use the handheld smartphones as modems connected to the tablet PCs to enable online assessment of L1 literacy and numeracy with City and Guilds – providing instant feedback on results and enabling same day re-sits if necessary.

Key drivers

- Financial impact. The company already has evidence of substantial cost savings from data collection by assessors at 'point of entry' – saving administrator time previously spent in data entry and minimising data keying errors.
- Efficiency benefits. There are also benefits in electronic processing of registrations and certification with awarding bodies. Improved financial reporting capability informs management decision-making and also enables detailed progress reporting to corporate clients.
- Performance impact. Improved reporting capability enables tracking and analysis of trainers/assessors activity and regional contracts. This enables timely and targeted management interventions and results in improved retention and success rates of learners. Success rates doubled in 2007 and are now significantly above average for the sector.
- Speed of completion. Enabling learners and assessors to clearly see progress made and next steps builds confidence and provides focus. Lifetime now proudly boast of an average 7 to 8 months for completion of an Apprenticeship for example.

Key blockers

- The biggest challenge has proved to be cultural rather than technological. Learners, assessors and Internal Verifiers have taken time to become familiar with the new

kit and confident in its use. A well –structured and ongoing training programme is clearly required.
- Attitudes and experience of the use of ICT are now also built into the recruitment process so that training needs can be identified.
- LSC audit requirements remain problematic. At present Individual Learning Plans and Review plans have to be printed out and shared with learners to provide an acceptable audit trail. Also LSC have not approved the use of digital signatures so that paper signatures are still required before evidence is submitted

Continuation: Plans for integration of Moodle forums, podcast video clips and more use of digital learning resources.

See http://www.thefitmap.co.uk/new/services/training/lifetime.htm

5) Foyer project

Scale: 1000 initial Skills for Life assessments in 2 months in 45 different locations
Timescale: 2005
Sector/learner group: residents of Foyer hostels cross London
Funding: European Union
Partners: Tribal CTAD, Ultralab, LSDA and European partners
Type of technology: Pocket PCs linked to online tracking system
Type of assessment: screening and initial diagnostic assessment
Evaluation/project /website: http://www.m-learning.org/archive/index.shtml and http://www.m-learning.org/index.htm
Continuation: products such as authoring software (MyLearning author) and MediaBoard now available under licence.

Key points

- Used Pocket PCs linked to an online tracking system
- Portability across residences
- Privacy to take skills checks in own room
- Cheaper than purchasing/using laptops
- Higher level of engagement with no other software distractions (compared to laptops)
- Central uploading enabled diagnostic overview of skills, action planning and progress tracking.

Findings

'When working with young people, we expected them to be skilled users of IT, but we were surprised to find that the majority of our socially disadvantaged groups had no confidence in IT at all. In fact, many learners actively avoided it. After our trials, several learners initiated steps back into learning, so they could learn about email, the internet, word processing and other IT related skills. For these learners this represents a massive shift in autonomy and motivation. This 'bridge into IT' is a result we saw in several other trials with different age groups as well'.

Geoff Stead ‘ Moving M-learning into the mainstream (57)

See http://www.m-learning.org/archive/index.shtml (25)

Edited from a report commissioned for this project from Merritt Associates, November 2008

Appendix A

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Appendix B

Key websites on handheld technologies for m-learning

a) Some of the top sites referred to in the Report

http://www.m-learning.org.
The tribal CTAD m-learning site with a good overview of key projects and useful tools

http://www.niace.org.uk/mobiletechnology
The NIACE site with ACL case studies and summaries of technology applications

http://www.elearningproviders.org/HTML/pages/
The ALP site with links to WBL learning providers that have received LIG funding

http://www.handheldlearning2007.com/pages/suggested-reading.php
Suggested reading from the Handheld Learning conference 2007

http://www.mlearnopedia.com/
An international portal with some interesting m-learning links

http://mlearning.noe-kaleidoscope.org/links/websites.html
A European m-learning site with links to most of the key projects past and present

b) Some of the best blog sites on m-learning

http://andysblackhole.blogspot.com/
Andy Black at Becta

http://moblearn.blogspot.com/
Geoff Stead at Tribal CTAD

http://elearningstuff.wordpress.com/

James Clay from Gloucestershire College

http://davefoord.wordpress.com/2008/11/
Dave Foord

http://www.xlearn.co.uk/blogger.html
Lilian Soon a MoleNet mentor

c) Some of the most-used discussion forums

http://handheldlearning.co.uk
Forum moderated by Graham Brown-Martin

http://lists.becta.org.uk/mailman/listinfo/research
The research network managed by Becta

Appendix 4:

Detailed Site Visit Reports

4.1 Learning2Go Wolverhampton

http://www.learning2go.org/

January 2009

1. Introduction

Learning2Go is now the largest mobile learning project for young people in the UK. It is led by Dave Whyley, Head Teacher Consultant, of the Learning Technologies team Wolverhampton Local Authority.

Wolverhampton has been established for more than 1000 years and was at one time a major town in the industrial heartland of Britain. During the 19th century it was famous for producing eight million tons of coal a year and being an important centre for steel production http://www.wolverhamptoncity.co.uk/. Now however, it is 28th in the UK deprivation index. In this context it is interesting that mobile technologies have been particularly welcomed by the schools in poorer areas of the city and have helped reduce the "digital divide" by providing all children with the same technology.

Learning2Go has now involved at least 3,500 schoolchildren in using mobile technologies to enhance their learning. It is the first project in the country that has put 3G devices (among others) into the hands of large numbers of children with very little damage or loss. One of the successes of the project has been to educate children about responsible use of the device and this has also had an impact on their parents.

While the sophistication and functionality of the devices may not be immediately transferable to other locations, the initiative is demonstrating at scale and over time a range of outcomes which could be of great significance to others in the future. Among these are:

- Negotiation of corporate contracts with O2 (a major UK network provider) and influencing the development of hardware and software for educational use;
- The development of new pedagogies which will make the most of teaching and learning through mobile devices
- The development of "blocking" devices to ensure safe access for children and their focus on a learning environment
- The integration of school, home and the child's learning environment

The visit to this initiative was undertaken by Anne Gaskell on Thursday 29 January 2009. Discussions involved:

1. Dave Whyley (Initiative leader)
2. Faye Booth (Teacher, Wood End Primary School)
3. Six primary school children, years 4 and 5 (ages 8-10).

The Learning2Go website provides a great deal of information and downloadable reports. This report therefore concentrates on discussions held during the visit and the resources supplied by Dave Whyley afterwards.

2. Description of Learning2Go

Learning2Go's vision is "placing Children, Young People and their Families at the heart of an e-enabled system" and it has gained national and international acclaim. A BBC clip from 2007 is included in the references and can be accessed through the web link provided there (BBC, 2007).

The initiative has been established for five years:
"Phase 1 of the initiative began in 2003 with 120 devices in four schools. During phase 2 of the project, launched in the second half of the autumn term 2005, more than 1000 pupils and their teachers in 18 schools were involved. Phase Three began in October 2006 with an additional 1000 devices across all Key Stages. Phase Four 2008 sees a further rollout of over 1500 devices. This last phase includes devices rolled out within the "Computers for Pupils" initiative and the national Mobile Learning Network (MoLeNet) scheme" http://www.learning2go.org/.

Children have their own mobile device which they "rent" (see costs) and use in the classroom to undertake projects and seek information, to record their learning and to consider further questions. Some specific examples are included below. In most cases, they are also allowed to take the devices home and use them for homework and to take them out on school trips to record insects or plants they have seen etc. Both parents and children have to agree to this arrangement and there is evidence from the project that parents too learn from the process – both about their child's work and about the ways in which computers work. Faye Booth, the teacher at Wood End, noted that parents' ICT skills had been developed through the project. Very few parents have objected to children bringing the mobile devices home; in the few cases where this has happened, the children use the device at school only.

The initial primary school project was so successful that the concept was extended to 14-19 year olds in *Learning2Go Further* with the City of Wolverhampton College. This has included building a high level of rapport and understanding with O2 and influencing the design of a package to support mobile learning in education (Wolverhampton Learning Partnership, 2008a).

3. Technology

The initiative has used a range of mobile devices, all of which are essentially mobile handheld computers, but which provide different levels of functionality – from relatively basic devices to those with GPS 3G. Specific devices include: HP Ipaq 114; HP Ipaq 214; Pideon; MWG AtomLif; O2; HTC Advantage

In some instances the initiative has used multiple devices but the same operating system (OS - Windows) which, as Dave Whyley noted, "parks the problem of multiple operating systems".

One of the major successes of Learning2Go throughout has been in developing relationships with major suppliers. The 2005 evaluation notes that successful collaboration with supplier companies was key both to the provision of mainstream content, so that PDAs were core to the students' education, and to the quality of learning materials provided (Perry 2005).

Since then, Learning2Go has established a high level partnership with O2, one of the leading UK providers http://www.o2.co.uk/ which has resulted in the creation of specifically educational hardware and software packages. This has included:
"A redesigned business model which appreciates the unique nature of the education sector. This has developed from the standard telecom approach of selling as much airtime, bandwidth and texts as possible, to a structured affordable option of no voice, no texts and unlimited connectivity within an agreed, fixed price" (Wolverhampton Learning Partnership, 2008a).

The arrangement has also included an emphasis on e-Safety and online security and safety – known as 'Project Shield'.
"Initially a 'Whitelist' approach is being adopted whereby only permitted sites are accessible, whilst a comprehensive filtering system is developed. In the near future educational establishments will benefit from this ground breaking work by being given a flexible choice of an appropriate level of protection either through the 'Whitelist' or a filtered system" (Wolverhampton Learning Partnership, July 2008). This is of course very different from other systems which seek to develop black lists which have to expand indefinitely.

Dave Whyley commented that most educational IT was set up for formal learning and amongst the benefits of working with O2 was that learning could be made more informal – so that it really could engage the learner anytime, anyplace. He noted that the development of links with O2 had taken time but that through this process, O2's thinking had changed. This demonstrates the real potential for making an impact on corporate contracts. It was fortunate that O2's mission was entirely consistent with the aims of Learning2Go; the company has a strong social conscience. But through their links with O2 they had been provided with the opportunity to influence the marketplace.

Developing partnerships at this level takes time – in this case 18 months – but Dave Whyley is keen to demonstrate the benefits of the collaboration and also happy to share his experience with other countries/authorities so that they can avoid some of the pitfalls and delays that he and his team have experienced. Further information can be obtained from David.Whyley@wolverhamptoncyp.org.uk

4. Sustainability and costs

Learning2Go has developed a sustainable method of costing through joint funding. Parents are asked to contribute the equivalent of "a packet of cigarettes a fortnight" over two years and then the students are allowed to keep the device.

In summary, their website notes that it rests on:

- Device - Joint funded by Parents / school over 2 years or 100 payments
- Content/ Memory card - Funded via e - learning credits

- Wireless infrastructure - School funded
- Insurance - included in device price and joint funded as above.

The UK's eLearning Foundation has been a key partner in this model – see http://www.e-learningfoundation.com/

Learning2Go Further, the extension of the project to secondary schools and colleges, has developed the significant partnership with O2, one of the world's largest telecom providers, which is summarised above. This has included a redesigned business model which appreciates the education sector and has moved to a structured affordable model with an emphasis on e-Safety.

In the UK context, government and external funding for mobile usage has focussed on schools and is now extended to further education colleges. This has largely determined the locations in which mobile devices are being used. Learning2Go, however, provides some excellent examples of how those with vision can negotiate with providers to develop packages for specific purposes. In other countries this might be in the context of Open Schooling.

5. Challenges and successes

5.1 Successes

E-books are one of the ways in which children use the devices and software has been developed to ensure the interaction which promotes learning. Some e-books are divided into episodes so that after the first one, children have to answer a question on their mobile before receiving the next episode. This continues until the fourth episode which the children have to write themselves.

The reading levels of boys in particular have improved immensely since e-books have been introduced. Dave Whyley notes "We've seen a great improvement in the children's confidence. They are enthusiastic; they want to come to school. Attendance figures have gone up. We're also seeing boys switched on to reading. They like e-books. One boy read his e-book until his battery went flat on his PDA at night" (Whyley, 2007a). The 2005 evaluation also noted that: "Listening to boys who profess a dislike of reading recounting their enthusiasm for and knowledge of eBooks they have read is highly convincing" (Perry, 2005).

Faye Booth noted of her experience with Wood End children that their ICT confidence had grown and their parents' ICT skills had also increased. The devices had also promoted self-esteem particularly among reluctant learners; some boys were happy to write using PDAs because they did not have to expose their handwriting. There was also increased motivation and a reduction in behavioural issues: "Children love them – especially the programmes which collect ideas – there is a hush in the classroom when PDAs come out". Competition arose to develop expertise in the next skill; and while there was still something of a gender divide with boys being generally more confident, the allocation of the same device to all children in the cohort did help with the digital divide. Some families may well provide much more ICT access and experience at home than others but the allocation of identical devices was a great leveller.

There is also substantial evidence of improved performance by the children involved in Learning2Go projects. As with all educational evaluations, it is impossible to determine whether improved performance depends solely on a particular educational initiative, but all the evidence so far is overwhelmingly positive.

Comparing the performance of children in seven schools involved in the project in year 6 (Y6)(10-11 year olds) with the national average during 2005-6, Dave Whyley notes significant improvements:

"Science – Average percentage point increase for all seven Y6 schools was 5%
Average percentage point increase nationally was 0%

Maths – Average percentage point increase for all seven Y6 schools was 3.5%
Average percentage point increase nationally was 0%

Attendance
In a year when the Local Authority average for attendance went down by 0.5% - 32% improved their attendance last year, with 22% showing a remarkable improvement of over 3%."
(Whyley, 2008)

Independent consultants have also confirmed the significant impact the programme is having on children's performance. While cautious about overstating the case, Perry (2005) notes:
"an extremely wide range of indicators consistently suggest significant gains for the children involved…negative responses to the project have proved almost impossible to find."

5.2. Challenges

The introduction of a substantial and long-standing programme such as Learning2Go inevitably produces challenges – and these change over time.

Faye Booth noted that her school was among the first cohort to introduce mobile devices in 2003, but that at that time there had been a range of issues which prevented immediate embedding and large scale application of the systems involved. These included that devices were not entirely ready for useful application; the school's broadband system was not sufficiently established; the battery life of the PDAs being used was too limited and there were major school timetabling issues. She was however, very enthusiastic that these had all now been overcome although at this point they were still using the devices for cross-curricular subjects.

Currently, Dave Whyley has noted some the key difficulties as:

- Device market volatility
- Connectivity costs (school Wi-Fi, 3G outside)
- Teachers' reluctance to change
- Top-down pressures on teachers & schools
- No models of effective integrated use available

- Current National accountability pressure
- No Companies currently offering “Complete packages”

(Whyley, 2008b)

Among the most significant of these, he said during the visit, were the challenges facing teachers. Traditional school teaching has involved everyone doing the same thing at the same time – which is undermined by the freedom allowed by mobile technologies. Teachers have also found it difficult to work without familiar theoretical models and also to be faced with a range of practical/technical issues such as children arriving for lessons who have not charged mobiles, or who have altered their settings so that it makes it difficult to make relevant connections.

There are also different challenges with the use of mobile devices among older age groups: “the introduction of 1:1 mobile devices has been more problematic and complex in secondary schools than in primary” (McFarlane et al, 2008)
“”Ways should be found of encouraging teachers starting with mobile devices to take ownership of the initiative. Positive strategies include consultation beforehand; involvement in decision making; realistic expectations” (McFarlane et al, 2008).

6. Learning and Teaching

Discussions during the visit demonstrated several ways in which pedagogies for the use of mobile devices were being enhanced and/or developed. In addition, evaluations and feedback have identified further benefits in personalised and collaborative learning with the use of mobile devices.

6.1. A new e-Learner Framework:

Dave Whyley and colleagues are developing a new e-Learner Framework for e-learning and teaching (e-Learning being considered in its broadest terms in this instance). The framework consists of four learner stages (Whyley, 2008a):

- Exploratory Learner – who becomes aware of the potential of ICTs
- Developing Collaborative Learner – which includes the learner significantly enhancing their learning with “scaffolded” ICT tasks
- Confident collaborative Learner – who can collaborate with a partner in the creation of tasks
- Independent learner – who can fully explore and develop the creative possibilities of ICT.

A presentation which incorporates these stages is available as a download from the Leaning2Go website.

6.2. Go Know

The stages of this theoretical framework can be supported by particular tools on the mobile devices. Demonstrations were provided both by Dave Whyley and at the primary school.

Go Know provides:

- GoKwL – a screen divided into three areas in which children can articulate what they know; what they still wonder about and what they have learnt. One of the Wood End Primary School demonstrated how he had used this in a particular project about the Greeks; he wondered what schooling girls had at the time and listed what he had managed to find out.
- Pico map – enables children to draw a mind map of how concepts such as gravity and weight are related. Children at Wood End provided examples of this and their teacher said that children valued this possibility rather than having a standard text.
- Sketchy – a dynamic mindmap. A particularly good example was provided by a pupil's use of this to show dynamically how a plant grew and developed roots, leaves etc depending on input from water and sunshine.
- My Projects – which enables all information on the device to be wrapped together in an overview.

Another child demonstrated how she had identified and recorded particular musical instruments.

Faye Booth (teacher) noted that the children especially enjoyed the programmes which involved collecting ideas because they could group them the way they liked and evaluate them as they went along.

The younger age group at the school (year 4s – aged 8-9) were using less sophisticated devices from a previous project (2003-4) but were still extremely engaged in what they could do with them. Their teacher Faye Booth explained that they mostly use these devices for the repetition of key facts and more simple interactive activities such as multiplication tables and so on, although some educational games can be included. One that has proved very popular in teaching Maths is called "Radius of the lost Arc", which has attracted press coverage.

Faye Booth found it helpful to introduce the simpler devices to this age range because they still enabled children to develop skills with their PDA and stylus. The children from this age group who spoke to me were visibly enthused by the possibility of games in particular but also the fact that they had a mobile device of their own.

6.3 Personalised and collaborative learning

Providing learner choice has been one of the key driving motivators for Dave Whyley and his team. "The Learning2Go project has as its ethos the belief that learners should have the choice and self-confidence to learn when, how and where they want. The project promotes a personalised learning experience, in which the learner is responsible for managing their own device and helping to shape their own learning" (Whyley, 2007a). Personalised learning is increasingly being seen as key at all stages of learning, including Higher Education. The use of mobile devices within Learning2Go supports personal learning within school, but also extends outside:

"Evidence is building around the value of mobile devices in the personalised learning agenda. Autonomous use by pupils in and out of school has increased" (McFarlane et al, 2008).

Collaborative learning has also been enhanced by the use of the devices. The external evaluation of Learning2Go in 2005 noted: "the PDAs…facilitated collaborative learning between children to great effect. This has been through both teacher-structured activities requiring or encouraging collaboration and through the children choosing to work that way – as habitual collaborative workers" (Perry, 2005).

All these examples provide instances of student interaction with learning resources and peers within a social constructivist view of learning. They are thus making the most of mobile devices to encourage learning within current educational theories. As noted elsewhere in the report, this may involve some challenges to teachers or teaching contexts which utilise more didactic approaches, in particular with mobile and ICT systems.

All our investigations have supported the view that simply transferring educational content developed elsewhere to mobile devices does not enhance learning or make the most of the mobile potential.

7. Monitoring and Evaluation

Since its inception, Learning2Go has employed four main strategies for monitoring and evaluation. These are

- A critical friend in David Perry – who provides external evaluation and ongoing project consultancy (for example Perry, 2005).
- The Wolverhampton Local Authority – which has provided support for monitoring and the evaluation of impact (see for example Wolverhampton Learning Partnership, 2008a).
- External evaluation - project evaluation by external agencies such as BECTA http://www.becta.org.uk/, a UK government agency promoting the use of ICTs.(for example McFarlane et al, 2008)
- Partner and press reporting – the project has been substantially reviewed and investigated in local and national press and by attracted international interest (for example BBC, 2007).

Further information about these strategies can be found on the website http://www.learning2go.org/ and examples are included in the references.

Outcomes from these evaluations are incorporated throughout the report, in particular within section 5: Challenges and successes.

8. Relevance to Open Schooling

I asked Dave Whyley what advice he could give to countries in other parts of the world who might have very different technological infrastructures. He said:

- Think about what it is that you want children to be doing
- Think back from this to what you need to put in place to enable them to do it
- Trust the children
- Give teachers a vision - to enable them to link what they are doing to what overall needs to be done
- Map educational initiatives to their context: in developing countries a more didactic model than Learning2Go may be appropriate
- Recognise the importance of the learning platform, technological infrastructure and back-up.

Funding and infrastructure will clearly be critical in many developing countries but Learning2Go demonstrates that, as noted at the outset, some lessons may be transferrable; for example:

- Negotiation with lead suppliers
- Developing new pedagogies
- Involving pupils and parents

Further information on the initiative is available from the website http://learning2go.org.uk

or from Dave Whyley David.Whyley@Wolverhamptoncyp.org.uk

Acknowledgements

I would particularly like to thank Dave Whyley for his very generous help with this site visit. This extends to thanks for the amounts of time he made available, his arrangement of the school visit, and the follow-up delivery of resources.

I would also like to thank Faye Booth and the children of Wood End Primary School Wolverhampton for their time and enthusiasm in demonstrating in a very concrete way the benefits of the initiative and embodying the vision which drives it.

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4.2 The Open University, UK

www.open.ac.uk

Anne Gaskell had conversations with key people at the OU and access to unpublished reports to complete this case study.

1. Introduction

The Open University UK (OU) has been a leader in developing the use of new technologies for distance learning for 40 years. Within the OU, mobile technologies have provided impetus to a substantial range of projects, for example:

- internal projects, for example as part of the development of the OU's Virtual Learning Environment – see http://www.open.ac.uk/blogs/mLearn/index.php
- UK and international collaborative work, for example investigating science teachers' use of mobile devices in workplace settings – see http://www.open.ac.uk/pbpl/activities/details/detail.php?itemId=4609406034d8c as a project of the OU's Centres for Excellence in Teaching and Learning (http://www.open..ac.uk/opencetl/)
- international development projects (for example TESSA).

The focus of this report is on activity in Europe and so this case study does not include information on TESSA and other such international development projects. Information on these can be accessed at: http://www.tessafrica.net/

Perhaps surprisingly, however, there has been little or no attempt to embed mobile technologies at scale within learner support or within teaching strategies, a point noted in an interview with Professor Kukulska-Hulme, the OU's leading expert in the field. This is undoubtedly related to the reliability of the UK's landline telephone system, and relatively high broadband connectivity and computer ownership.

The OU UK can generally afford now to regard computer access as the default position and to make special arrangements for those who do not have access. This is obviously not the case for many countries with which COL is working. The OU has, however, substantial evidence for the impact of telephone contact by landline in terms of student achievement and retention and this is readily transferable to mobile devices.

This case study is therefore focuses on the large scale projects associated with proactive contact with students and the significant impact they have made in terms of student retention and success.

2. Telephone contact for student support and retention

Over a number of years, the Open University has investigated importance of proactive personal contact of students by some part of the institution and has compared their retention and performance with control groups who were not contacted. Graham Gibbs showed that contact from their tutor before the first assignment in a course both increased the likelihood of students submitting the assignment and improved their grade (Gibbs,

2002). Contact by telephone seems to be particularly effective in this area (Gaskell and Mills, 2004).

Proactive telephone contact by some OU regional centres from 2002—04 resulted in a 5% increase in student retention and a more substantial University-wide project in 2005 led to a 7.6% increase in retention over the control group (Simpson, 2006a, 2006b). Evidence from this work has informed a new 10 point learner support framework which has now been mainstreamed and implemented across the OU UK. The aim is for proactive contact of students at key points of the year to be undertaken before the course starts, mid-course, and post-course.

Contact is undertaken by the Learner Support teams in regional and national centres and has so far concentrated on those students deemed to be potentially vulnerable in some way (for instance they have low previous educational qualifications) because of resource implications.

In addition, a pilot study asked tutors on two of the OU's largest first level courses/modules (DD100 *An introduction to the social sciences* and S103 *An introduction to science*) to make proactive contact with their students after exam results were released to discuss the student's study plans and refer them on for additional support if required. The tutors on February start courses were also asked to contact their students over the summer. In total 12,180 students were involved, 7246 of whom received proactive contact and a control group of 4,934 students who did not receive this contact.

The main findings were:

"1. Students who had either a telephone conversation or an email conversation with their tutors after they received their exam results were 15-25% more likely to re-register with the OU than those who did not have contact.

2. Students on the February presentation who had either a telephone conversation or an email conversation with their tutor during the summer were about 30% more likely to pass the course" (Atkins, 2007).

The results from these and similar surveys are now feeding into current discussions and negotiations for a new contract and role for the Open University's 7,500 tutors.

To summarise: large scale research has proved that proactive contact (undertaken by telephone in most cases):

- before course start can improve end of course retention by 5-7%
- mid-course can improve end of course pass rates by 30%
- after course end can improve student re-registration by c 20%

Evidence from the surveys cited indicates that it is not necessarily the specific content of the contact, or even the person who is making it that is important (though generally tutors

are seen to be the best where this is possible); what matters is the fact that the institution by whatever means recognises a student's individual circumstances and is concerned to help them to make progress in their chosen study.

It is therefore the contact that is important; and this could easily be transferred to mobile devices, instead of taking place through landlines and emails.

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4.3. Tribal-CTAD

www.tribalgroup.co.uk

A case study of a provider of ICT-based educational materials

Anne Gaskell and Roger Mills visited this organisation, which is based in Cambridge on Wednesday 10th February 2009. We spoke with Geoff Stead, Technology Director, Publishing and Jessica Wakelin, Production Coordinator.

CTAD (formerly Cambridge Training and Development) is the educational software specialist of Tribal (see www.m-learning.org) and (www.tribalgroup.co.uk). It is a world leader in the design and implementation of m-learning technologies. It does not teach directly, but offers software and other materials, training and development and consultancy services to schools and colleges in the UK and overseas.

The reason for including this as a case study is that its products and consultancy can be purchased for use anywhere in the world and can be adapted to suit local needs.

The products most relevant to this report are its training services and its existing software resources.

MyLearning author is a PDA based system enabling teachers and others to access media rich resources which include animation, sound and photography making them ideal for mobile learning. It comprises a set of easy-to-use software tools that let teachers create vibrant learning activities for learners to run on their Pocket PCs.

MyLearning resources give access to a growing on-line library of ready-made content for use with Pocket PCs. The library includes generic materials and themed exercises covering "Skills for Life" and literacy and numeracy modules mapped to the UK adult core curriculum.

MediaBoard enables teachers to host events with learners who are widespread and truly mobile.

SMS quiz author helps teachers set up an automated SMS response for paper-based multiple-choice quizzes. Participants text in the answers to questions from their own mobile.

Key issues arising from the discussions

1. Teaching materials for use on handheld devices need to be designed specially. Evidence suggests that simply providing access to PC based learning systems via mobile phones is not particularly helpful in terms of access to teaching materials or the learning that takes place.
2. The more that animation and sound can be used in software designed for handheld learning, the more effective the learning becomes.
3. Mobile technology can be most effective when used with other teaching media e.g. radio, loudspeakers, whiteboards, print and face-to-face teaching where possible.

4. Most of the handheld devices provide software which is intuitive to use and where there is no need for any form of technical support. A small research programme indicated that there was no difference detected between groups who were trained to use a PDA before an activity and those who were not.
5. In the spectrum of functionality it is more apparent how the more elaborate and expensive devices, incorporating web access, photography, both still and video, as well as sound and sophisticated graphics can add value, than how this can occur using the simplest of 'phones.
6. However SMS texting, and SMS quizzes as described above, linked with paper or radio based content can be very helpful. The quizzes supplied by TRIBAL had been used in some of the MoLeNET projects.
7. And of course simple phones are much cheaper, usually can be shared or rented by the hour.
8. It is likely, however, that, as mentioned already in this report , that the simplest phones will be phased out in the next 5 years and costs of internet access and texting will be dramatically reduced.

Some examples of software materials available from Tribal CTAD

See www.ctad.co.uk for further examples and information

Work-related

* At work: Cleaning
* Cleaning skills check
* At work: Health and safety
* Basic number skills
* Becoming a parent
* Clocks and time
* Driving
* Literacy skills pack
* ESOL skills packs
* Measure it out
* Skills checks
* ESOL

Personal

* Health and fitness

* Money and shopping
* Cooking and eating
* Holiday travel
* Everyday numeracy

A detailed example

Cleaning: learn some of the communication and numeracy skills that are needed for a cleaning job. In this activity, a set of cleaning procedures such as brushing, mopping and wiping surfaces are illustrated with animations. Learners watch these animations and learn the correct vocabulary before proceeding to the practice activities:

e.g Practice 1

In this practice activity, learners hear an instruction from a supervisor, then choose the correct illustration. They can then check if their selection is correct, or proceed to the next question and get a final score at the end of the activity. The activity helps them to practise both vocabulary and listening to instructions.

Costs

Tribal CTAD has a clear pricing policy which can be seen by accessing the M-Learning Suite though the web site www.m-learning.org and clicking on 'How to Buy'. But to give an idea the cost of the full Suite is around £2800 including VAT for a licence to support 50 Tutors/authors and 1000 learners for a year.

Clearly this will seem expensive for a limited open schooling provision but for the major institutions it might be an option worth considering, even though this does not include the cost of mobile devices which are significant at the higher end of the scale.

Appendix 5

Accumulated Descriptive Bibliography

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   Mlearn 2003 conference on Learning with mobile devices

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   Analysis of the evidence collected during the research suggests that the use of mobile learning may have a positive contribution to make in the following areas:
   - m-learning helps learners to improve their literacy and numeracy skills and to recognise their existing abilities
   - m-learning can be used to encourage both independent and collaborative learning experiences
   - m-learning helps learners to identify areas where they need assistance and support
   - m-learning helps to combat resistance to the use of ICT and can help bridge the gap between mobile phone literacy and ICT literacy
   - m-learning helps to remove some of the formality from the learning experience and engages reluctant learners
   - m-learning helps learners to remain more focused for longer periods
   - m-learning helps to raise self-esteem
   - m-learning helps to raise self-confidence

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A 3 year pan European project aimed at helping young adults aged 16—24 most at risk of social exclusion.
Plenty of examples of projects here including CTAD projects in the East of England
http://www.m-learning.org/index.htm
http://www.m-learning.org/archive/background.shtml
http://www.m-learning.org/archive/which.shtml
http://www.m-learning.org/archive/projects.shtml

Two comprehensive factual electronic books on the web about mobile learning in Europe and the World
Achievements of mobile learning today
http://www.exact.ie/ebook/achievements/
The role of Mobile learning in Europe
http://www.exact.ie/ebook/mobilelearning/

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