

Challenges and Opportunities: Making Mobile Learning a Reality in Schools.

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Abstract

This paper explores ways in which the provision of ubiquitous computing impacts on teaching and learning, through a case study of a major initiative run by a local education authority in the UK. Students and staff across 8 schools (including primary, secondary special and mainstream secondary) have been provided with handheld computers for use at home and school. Previous research suggests that mobile technologies can make a significant impact in supporting teaching and learning (Perry, 2003; Zurita & Nussbaum, 2004); this paper will examine the practical realities of achieving these objectives in diverse educational settings.

The paper considers key technical, managerial and organisational issues arising from this initiative. In particular, we explore factors contributing to or mitigating against the Initiative's aims of achieving innovative models of teaching and learning; a positive engagement with formal education; widening access to technology and changing literacy and numeracy practices. Data for the paper is drawn from interviews, questionnaires, focus groups, observation and students acting as researchers, in a spirit of collaborative enquiry.

This paper will discuss key issues arising to date, exploring ways in which handheld computers facilitate ambient teaching and learning, where teaching agendas must be set against the notion of appropriateness of tool. Initial findings reveal technical difficulties hinder the ubiquitous use of handheld computers, though enthusiasm for the Initiative remains high. Consequently, we will be asking: at what point is it reasonable for both learners and educators to make use of the technology, and at what point does use of the technology become unreasonable?

Introduction

The U.K. Government has invested heavily in developing information and communication technology (ICT) in schools; future plans include a broadening of access to diverse forms of both ICT and learning, with the Government's e-learning strategy emphasising personalised and ubiquitous learning (DfES, 2005). This has acted as an encouragement for schools to start exploring the use of 'mobile technologies' in the classroom, but it is not yet known how these devices might be best used within education. Further, there is a current paucity of literature reviewing the use of handheld computers in education and, although several initiatives are being implemented throughout the U.K., an underlying rationale for the use of these devices in education has yet to be articulated.

Because the handheld device is so easily portable, it offers itself as an ideal conduit between school and home; this shift in sites of education means that the transfer of knowledge and skills is not limited to the school curriculum but extends into the daily lives both of those immediately involved, and their families, thus offering the potential for widening participation and allowing the actors to 'take control' of their own learning, though it seems likely that the *types* of learning with which students are engaged will differ between these sites. Yet whilst we might argue the Utopian ideal of students taking ownership of their learning, we must also be aware that teachers, who are used to taking leadership in the classroom, may insist on taking responsibility for ways in which students use these technologies. This changing locus of control is potentially problematic and requires consideration of the *nature* of control gained by students and relinquished by teachers. Indeed, Ito (2005) points out that students automatically use mobile devices in a naturalistic and selective way, yet schools are still concerned to 'teach' their use. In some senses, this teaching aims to inculcate the use of mobile technologies in a 'school way'. If this is because the hierarchical and social structuring of schools remains unchanged, then the technology is likely to prove ineffective as a teaching and learning tool.

Much is claimed for the motivational effects of ICT generally (Cox, Preston, & Cox, 1999), and if students have a personal device it might be expected that this would promote engagement with learning. In addition such ubiquitous access should support teacher innovation as the devices will be available as and when needed in the classroom. The study reported here offered an opportunity to investigate the notions of autonomy, engagement and innovation in the context of a project which aimed to increase the links between school and community based learning for school children and their families. At the same time the issues of device management, hardware and software functionality are reported, as they all played key roles in the implementation of the project and its outcomes.

Background

Community engagement and the motivation for learning were two of the aims of The Handhelds Initiative, which was initiated by a Local Education Authority (LEA) in February 2004, and was jointly funded by the LEA and a handheld supplier. The Initiative provided personal digital assistants to students in eight schools (6 x primary schools; 1 x secondary special school; 1 x mainstream secondary school), for use at both school and home. Different schools received different types of device and some schools had a mixture of devices. This difference in provision is important because of compatibility issues between different models; additionally, the functionality of the devices varied.

Data reported here is drawn from interviews with Head Teachers of six of the participating eight schools and the Acting Deputy Head of the seventh of these schools – the eighth school declined to take part in the research. Eight teaching staff, teaching students across year groups 5, 6, (age 9-11) and 8 and 11 (age 12 and 16 approximately), were interviewed. All interviews were electronically recorded, transcribed and returned to participants for approval.

The research and evaluation exercise reported here considers the notions of:

- (i) School and community
- (ii) Attitudes to learning
- (iii) Innovation and autonomy
- (iv) Management issues arising from the implementation of handheld computers within educational settings.

Key Findings

(i) School and Community

The majority of staff felt that use of the handhelds had extended community access to ICT and helped in forging stronger links with parents. Indeed, the impact of the devices on the community was generally perceived positively.

The fact that, you know, you're giving access to people who wouldn't ordinarily have it ...neighbours, people down the road. And so they do seem to be going the rounds and getting used. (Teacher, Primary School).

There was also some evidence of positive impact on engagement with learning in the community:

Also the fact that you've got children who as I say don't have computer access at home and they're taking something home that ... first of all appears alien to some of our parents, the technology ... and the fact that they are also encouraged to have a go and learn new skills on as well. (Teacher, Primary School).

In some cases parents have helped to locate and share resources for the handhelds and parental feedback has been positive. It is believed that some students have 'taught' parents how to use the devices and, overall, it was felt that use of the handhelds had increased access to ICT provision outside of school.

'It's involved certain parents who wouldn't ordinarily be involved. And that's one of the things, you know it's ... although you're giving access to a greater number of people, it's not just pupils you're giving this access to, it's going throughout their little community.'

One school hoped that future benefits might include the ability to replace paperwork (letters to parents; sending information home etc.) with electronic versions, where parents could use the voice record function to acknowledge receipt, or respond as appropriate.

One teacher commented that a student who had visited India to meet family, used his handheld device to store digital photos and record some thoughts and feelings while he was away, which were then shared with the rest of the class on his return.

(ii) Attitudes to learning

Teachers reported a high level of engagement by students initially, although this waned as the devices began to malfunction. Some students did report a negative impact on learning, and there were a very small number of reports of lessons that used the handhelds being contrived and making little contribution to learning. These negative comments were largely associated with frustration due to poor reliability or ease of use of the devices.

One school claimed that whilst the Project initially generated a feeling of 'a shared ethos in the class', student enthusiasm was since believed to have diminished and this was attributed, in part, at least, to decreased use of the handhelds in school. Although students still used the handhelds to beam games to each other and had the freedom to choose for themselves when to use the handhelds, the ICT co-ordinator commented:

'... we have given up trying to format any use of them within the lessons. If a child has theirs and would like to use that in a particular lesson – great, they can go ahead. However, there are one or two children who will still use them, that are still using them considerably for playing games and things, but they're not using them for any educational purpose independently, of their own volition. English and Science have been the two main focuses of our work and they'd still use them by choice if they could in that lesson. However general instructions from me as a teacher are "We're going to

do this in this way on the board and we're going to record it into our books." So they don't get that opportunity. (Teacher, Primary School).

(iii) Innovation and autonomy

Although there were some expressions of desire and even intent to use the devices to innovate in the classroom there was no evidence of this actually happening. A general lack of confidence in teaching with the handhelds was apparent; this ranged from insecurity in technical know-how, to doubts as to how the devices could be used to advantage within teaching and learning. A primary school teacher felt that the handhelds needed to be embedded within the curriculum but her lack of confidence and hesitation as to how to use the devices in teaching and learning, highlighted a need for training; she felt that these issues had limited her uptake of the Project and, also, may have impacted negatively on the Project generally. Whilst training sessions were highlighted as important, they were not provided.

'We could do with something, because we could do with seeing what everybody else is doing.'

One teacher, who believed that the handhelds should ideally function as a research tool, was unable to proceed in this regard as it was not possible to connect them to either the intranet or Internet. Consequently, whilst this activity was seen as centrally important, it was also unattainable.

Concern was expressed as to whether using the devices complicated, rather than simplified, the teaching process:

Example 1: *'... by the time I've connected it up, I can find something else to use.'*

Example 2: *'It should be making it easier shouldn't it? Not sort of harder ...'*

The software provided on the devices was seen as inadequate by most teachers, but the reasons for this varied. Some clearly felt frustration at the inability to move practice on beyond that available with current resources: *'It's not just got to be a replacement for a book or something like that. It's got to take it further.'*

The freely available e-books were found to be inappropriate and one school wanted to be able to access reading schemes via the handhelds and to have the ability to create their own e-books. Overall, it was felt that the handhelds should provide comparable provision to that which can be found on a desktop PC, which does not suggest a vision of innovation linked to the use of the handhelds. Few expressed any desire to use the software tools available, such as the word processor, animation software etc. but, rather, wanted curriculum specific software, although one teacher commented:

There's masses of freeware that can be loaded down for all sorts of uses. The diary uses, the notepads, the word processing. I think those are sufficient. The maths I think is a problem. And I'd like to see, like to have seen something that was more Science friendly.

Some wanted an increase in the availability of curriculum-specific programs, together with the provision of activity and worksheet-type material. In part, this is because of the perceived advantages of moving from a paper-based approach to an electronic mode. However, a certain hesitation was noted in regard to exactly how the devices could be used to aid teaching and learning. Although students at another primary school used the devices for note taking, and the School used a mathematics application, mind mapping software and several games, lack of appropriate software was still perceived as problematic. The School would have liked the provision of revision software for core subjects, and age/interest appropriate e-books for reading. The ICT co-ordinator believed that, given a choice, because of the limited available material, students preferred to use laptops, rather than handhelds.

There was little evidence of autonomous use of the devices in class by students. In one of the schools, class teachers decided whether students should use the devices when deemed to be appropriate. However, because of the limited number available, organisation of lessons utilising handhelds was considered to be

problematic, thus restricting their usage within a class situation. Additionally, student use was always directed, and teacher-led, rather than student-initiated and driven. In order to ensure that all students had access to a handheld, the School had a rolling programme so that devices could be utilised all week and taken home over the weekend, before being returned to school for another student to take ownership. However, this did somewhat limit the possibilities for personalisation of the device and the School would have preferred to use a different model, allowing for student ownership, with a focus, for example, on individualised and personalised learning. However, even where schools stopped using the handhelds in a structured way, some of the students still used them for diarising and self-organisation. In the primary sector this was seen in a positive light but in the secondary sector the staff did not see this as particularly useful. MARGI links, which allow a handheld to be connected to a data projector, were used for presentations and this was felt to be very powerful as a teaching and learning tool.

(iv) Management issues arising from the implementation of handheld computers within educational settings.

Issues such as lack of teacher confidence, lack of training, and technical difficulties with the devices used, impacted negatively on their uptake and use in innovative teaching. Technical issues such as synchronising the device with a PC, or laptop, navigation and file storage, short battery life and device breakages were problematic. Similarly, paucity of appropriate software, together with uncertainty as to how the devices might best be used to enhance teaching and learning, inhibited the development of innovative models of teaching and learning, highlighting a need for the provision of training, with a particular focus on ‘teaching ideas’.

Also, concern was expressed about their design:

But in a way they haven't been designed with school children in mind.

Similarly, there was uncertainty as to whether the students were sufficiently careful with them:

And the fact that you know they lose pens and covers and things. And perhaps they don't take as much care of them, as they should do in an ideal world.

At a primary school where the handhelds were kept by the Head Teacher, the School did not suffer with breakage of the devices, but their robustness was still felt to be problematic, as was a lack of stability, sometimes resulting in data loss. Additionally, it was felt that doubling the screen size and making it generally more ‘chunky’ might improve the actual design. It was also suggested that a bigger stylus (pen sized) would more easily allow for handwriting practice.

Staff at the Mainstream Secondary School had difficulty in finding appropriate software, feeling that much of the available software was better suited to primary, rather than to secondary education, and therefore failed to provide sufficient challenge for their students. Staff would have liked dynamic geometry and mathematics software packages and simulation software for science.

Example 1: *‘... there is nothing there that would make the use of (device name) purposeful – it would be contrived. And I'm not going to do that.’*

Example 2: *‘... there's not enough that's challenging enough. And there's nothing that stretches them so they are contrived situations rather than something else we'd do.’*

The School would also have liked to access reading schemes via the handhelds and to have the ability to create their own e-books. Overall, it was felt that the handhelds should provide comparable provision to that which can be found on desktop PCs.

Whilst one of the primary schools felt that the handhelds needed to be embedded within the curriculum, the teacher also expressed a lack of confidence in her own ICT abilities and an uncertainty as to how the

devices could be used in teaching and learning, highlighting a need for training; she felt that these issues had limited her uptake of the Project and, also, may have impacted negatively on the Project generally.

'I feel a bit sort of in the dark as to what actually we could do with it anyway you know.'

One primary school used the handhelds for student presentations and this was felt to be helpful for developing presentation skills, though the small number of available devices complicated lesson planning. However, this school also expressed some uncertainty as to how the handhelds could be used for teaching and learning, believing that the devices were primarily used because the School had them, rather than because they met a particular teaching/learning need. Training sessions were highlighted as important, but these were not provided.

'We could do with something, because we could do with seeing what everybody else is doing.'

The ease of portability was seen as a positive attribute of the devices and staff of the secondary school also felt that the distribution of the handhelds had increased home access to ICT. Primary schools also perceived portability of the devices as a positive feature, which was particularly helpful when collecting, and entering data, especially on field trips. Many of the teaching staff utilised the multimedia – voice recorder, digital camera, video camera – for activities such as recording role-play, taking photographs around the school and school trips, where students take written and voice recorded notes as well as pictures. However, despite the importance of the devices' portability, activities undertaken with them were limited in some schools because not all devices had multimedia functions. This also presented problems for the secondary school, which had a range of different devices, distributed at different times, resulting in differing degrees of training. The students who had the devices the longest, and therefore received most training, had devices which were capable of less than their newer counterparts. Conversely, those students with the newest and most multimedia capable devices received less training.

However, some teaching staff expressed a concern that use of the devices was somewhat contrived, resulting in a reticence to use them as tools for teaching and learning.

'I've enjoyed using them, the children have enjoyed using them, but we still don't think it's quite right and there's limitations with them.' (Teacher, Primary School 5).

Conclusion

Whilst the project shows some evidence of increasing access to digital technology in the wider community, and engaging students and families with formal education, there is little evidence that teachers are adopting innovative approaches to teaching and learning with the devices. This seems to be due to a lack of vision and skill with the devices or, where the teachers have a vision, lack of appropriate levels of access and software. In addition, the requests for additional software illustrate clearly that most models of practice are predicated on a mapping of the use of the devices onto the existing curriculum format and structure. The scope of the project was severely limited by the lack of technical reliability of the devices, and the long turn around time on repairs. The small number of devices available exacerbated this so that it quickly became impossible to use the devices with a whole class. The small size made sharing impractical, and it seems small group work was never seriously considered as an option. Lack of access to the Internet (either directly or through the school network) was seen as a significant drawback, and limited the options for research-based learning. Where it was available, multimedia capability was welcome and aided resource based learning.

Whilst many in education have great hopes for the use of mobile technologies in school, this project suggests that issues such as lack of teacher confidence, lack of training, and technical difficulties with the devices used, impact negatively on their uptake and use in innovative teaching. Further, there is currently no tried and tested model which schools can follow – each school embarking on the use of these devices does so largely without any map to follow, as it has yet to be drawn.

For example, whilst some teachers involved in these projects expressed both a desire and intent to use the devices to innovate in the classroom, there was sparse evidence of this actually happening. There was little evidence of autonomous use of the devices in class by students and there were examples of class teachers deciding whether students should use the devices and when this was deemed to be appropriate. Indeed, in some cases, student use of the devices was always directed, and teacher-led, rather than student-initiated and driven. This should cause no surprise in view of the continued emphasis on ‘results’ – teachers have little time, and less scope, for undertaking the ‘creative’ teaching now being espoused by government, when their main concern must remain the implementation and evaluation of state directed targets by which students, teachers and schools themselves are measured. Further, at the present time there are limited opportunities for accrediting students for that which they have achieved when using mobile technologies, but which does not form a part of the standard curriculum. This explains why, when mobile technologies are available to schools, teachers may afford them a low priority compared to the time and effort put into, for example, work on student attainment targets, and envisage their use for activities such as electronic worksheets, rather than for teaching and learning innovation.

However, for both technophobes and technophiles, teaching agendas must be set against the notion of appropriateness of tool and ‘reasonability’; that is, at what point is it reasonable for educators to make use of the technology and at what point does use of the technology become unreasonable? This question is closely linked to ways in which technical difficulties might hinder classroom appropriation of the technology. Therefore, we need to establish which contexts are relevant for the use of mobile technologies, given that the technology itself is flowing and shifting (Ito, 2005). We might also ask why mobile technologies should be used in schools at all, considering what they offer over and above other forms of technology, and reflecting upon where there may be congruence and dissimilarity with the existing curriculum and pedagogy, because if implementation of these devices within education is to succeed, cultural change is inevitable.

I believe that if we are to have new forms of learning, we need a very different kind of theory of learning. The theories that have been developed by educational psychologists and by academic psychologists in general, are matched to a specific kind of learning. School’s kind. As long as these ways of thinking about learning remain dominant, it will be very hard to make a serious shift from the traditional form of School. (Papert, 1994, p.21)

Given this background, there is a need to move towards a theory of Mobile Learning and, to some extent, this is linked to the policy context within which this learning takes place. The e-learning strategy, together with the Government’s Building schools for the Future Initiative (Directgov, 2005), would seem to indicate that a cohesive strategy for the overall development of education is in place, with an emphasis on the growth of ICT. However, this is somewhat in contrast to the curriculum, which, despite the rhetoric of individualized and collaborative learning, continues to demand a focus on didactic teaching and quantifiable results. As can be seen, the tension which arises from these opposing value systems and pedagogical frameworks has already been experienced by some of the schools undertaking pioneering work attempting to use mobile technologies in education.

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