How mobile phones help learning in secondary schools

A report to Becta March 2008

Authors: Elizabeth Hartnell-Young and Nadja Heym
Learning Sciences Research Institute
University of Nottingham

www.lsri.nottingham.ac.uk

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Introduction

This research took place in 2007-8, at a time when mobile phones had become small, personal computers, providing clock, calendar, games, music player, Bluetooth connection, Internet access, and high-quality camera functions in addition to voice calls and short messaging. The Mobile Life Youth Report (2006) found that by the time they reach secondary school, 91% of 12 year olds in the UK have a mobile phone. Even though recent phone models, sometimes called 'smart phones', allow users to read pdf formats, spreadsheets and word-processed files, they have been more usually seen as disruptive, rather than useful, in school education.

In fact in December 2007 England's Children's Minister, Kevin Brennan, urged parents not to allow their children to take their Christmas toys, such as mobile phones, to school. He was backed up by the general secretary of a teaching union, who said 'Teachers would be grateful if pupils just brought a pen'. (BBC News http://news.bbc.co.uk/1/hi/education/7156326.stm)

Most schools follow policies that fall in line with these statements, so this research was devised to find out whether there is a positive side to mobile phones in schools, and if so, to suggest how they might be used to support learning. The project built on previous work (Hartnell-Young, 2005) and took into account projects that indicated concerns among teachers about introducing mobile devices into secondary schools (McFarlane, Roche, & Triggs, 2007). As a result we have identified some important ways in which mobile phones support learning, and eight key messages for schools.

Key Messages for schools

The major recommendation of this project is the need to shift the focus of policy away from the devices themselves to consider the frequently-reported reasons that mobile phones are banned: fear of distraction in class, cheating, inappropriate recording of students and teachers, and publication on sites like YouTube. Solutions must be found to each of these, in policies that address:

- ownership of computing equipment and access to network connections,
- tools to support curriculum and its personalisation,
- appropriate behaviour in school and other contexts,
- privacy and security of data, including photographs and video clips.

While the eventual aim could be to replace policies that involve blanket bans on devices, we do not recommend whole-school change at the outset, rather a gradual adoption as attitudes and behaviours align with purposeful learning, until the school (and the community) reaches the tipping point, and mobile phone use is as natural as using any other technology in school.

How schools can introduce mobile phones for learning

1 Identify and support champions: volunteer teachers who are prepared to take some risks

2 Involve those who have responsibility for curriculum, student management, and technical support to plan and work through responses to the issues raised in this report.

3 Initiate discussions about using mobile phones for learning (perhaps using student voice work) and survey current ownership, device capability and the ways mobile phones are already being used in the school.

4 Provide hands-on, small-scale opportunities for teachers to try out appropriate uses for mobile phones.

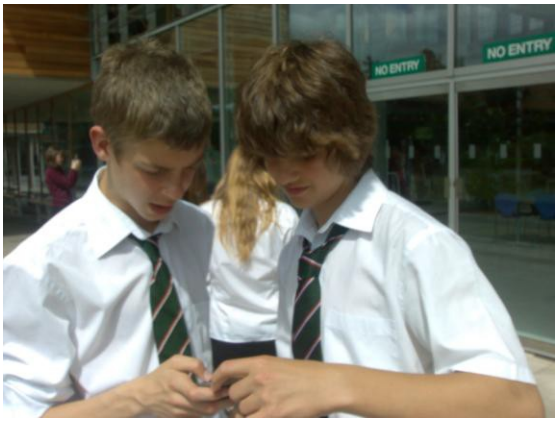
5 Encourage teachers to design activities that make the learning purpose clear and to anticipate management issues at the classroom level (such as rules, etiquette)

6 Inform parents of the learning purposes for mobile phones, and involve them in establishing appropriate ownership, management and ethical arrangements.

7 Anticipate and address technical issues ranging from battery charging to network access and security, data protection, etc.

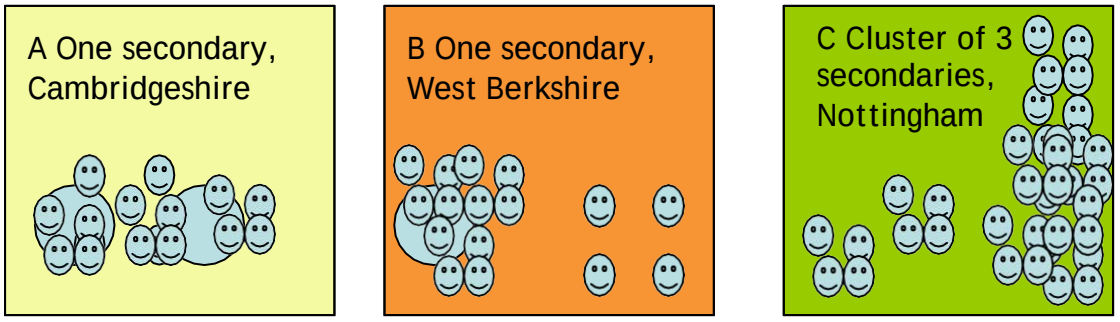
8 Develop new school policies that shift the focus of policy attention away from the device to the uses, security and behavioural issues that are the real concern.

NB These all need to be considered, and are not in any particular order of implementation



Participating schools

Three sets of secondary school teachers volunteered to be involved from the outset, from two single schools and one cluster, which are labelled A, B and C. They chose individuals and class groups to participate, with the result that the cohort comprised 331 students made up of one group of A level students, plus a class of Year 10 science students who moved up to Year 11 in School A, four individual students, a Year 9 group and one Year 11 Design Technology class in School B, and in Cluster C, 12 Year 9 students from three schools in 2006, and 147 Year 9 students in School C in 2007.



Distribution of participants in the project

The teachers, rather than the research team, chose the activities and the extent of participation for each group. By the end of the project two teachers from School A, four Teachers and the ICT coordinator from School B, and four teachers and the ICT manager from School C were involved.

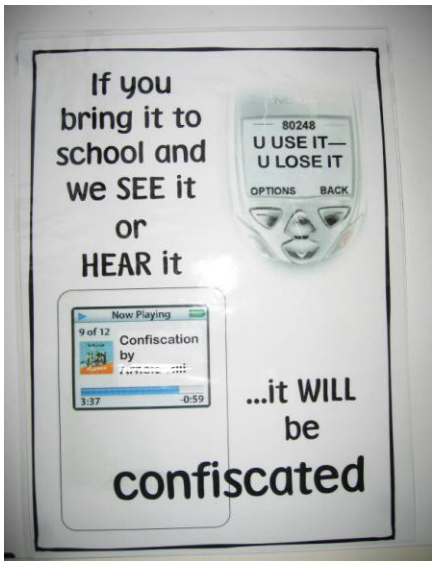
Importantly, three different approaches developed. School A students used their own phones 24/7 for approximately nine months. School B students used their own sim cards in 'unlocked' smart phones 24/7 for nine months, meaning that they could use any phone company. This meant that in schools A and B students' regular phone numbers could be used at all times. In C all students used a set of unlocked smart phones (with one device shared between every two students). These were lent by the university, with sim cards included, and used for periods of less than a day, so there was no opportunity to personalise the device.

School A: used own phones 24/7
School B: students used their own sim cards in unlocked smart phones 24/7
Cluster C: used a set of unlocked smart phones with sim cards included, for less than a day.

School policies

Each school had a clear written policy banning mobile phones in class.

- Students must keep phones switched off and out of sight in lessons and in the College building. (School A)



- For students in Years 7 to 11, we do not allow mobile phones in school. This is an extension of our policy regarding Walkmans, laser pens, Cyberpets and other devices which could interfere with the quality of teaching. (School B)

- Any use of a mobile phone, whether it is for calls, messaging, photographs or games during the school day is strictly prohibited. The school has adopted these rules because the use of mobile phones in school can be highly disruptive. (School, Cluster C)

This poster was displayed in the corridor of a cluster C school. It underlines the policy in a good-humoured way.

We asked students what the policy of their school was, and their replies, shown in Table 1, generally reflected the written policy.

Not allowed	92%
Allowed outside lessons	6.6%
Used occasionally for personal reasons	1.5%
Used for learning purposes	1.8%

n = 331

Table 1: Students' knowledge of school policy

However in practice, particularly in School A, students were already allowed reasonable use. For example, the ethos of the school meant that students were able to make or receive important calls in some cases, such as if there was an illness in the family, and some teachers were prepared to turn a blind eye when students were listening to music, if the students were obviously working. Further, one teacher said:

- There's a general policy, but within that policy there may be pockets of innovation where people try to use mobile phones as an educational tool within the classroom. School A

Another explained his rationale for using students' mobile phones in class:

- As a society we need to generate a continuous source of good engineers and scientists and to do that obviously we have to engage with them within secondary school to ensure that numbers are

retained at A-level and beyond… I think anything that helps enthuse students with science in the classroom has to be a positive. School A

In School B a teacher said:

- They're not meant to have their mobiles out, but they always have them out in here for some reason. Actually, I have my mobile in my pocket, and I have it switched on, like the kids. I know you're not allowed it out and when it does go off I do apologise to the kids.

A group of School A students told us they left their phones on silent mode:

- Because teachers can't hear it and you don't look at it in your lesson, so it's OK.

Technically, then, all teachers participated in the project in spite of the policy of their school (with the support of the school heads). In School A a teacher told us the Principal was 'quite excited' about the project, 'he's pro the idea', and the Principal confirmed this. Champions of the project varied: a relatively junior Science teacher in School A, an experienced ICT coordinator and several teachers in School B, and a young Geography teacher in School C. Each school's culture had an effect on the project, and in each case, other teachers became involved.

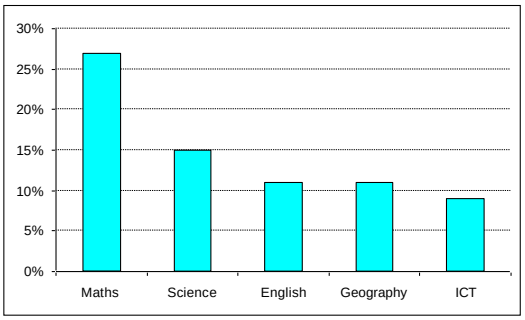
Uses in specific subjects

Even at the beginning of the project, students reported using their phones in classes, mainly in Maths (27%), Science (15%) English and Geography (both 11%), as shown in Table 2. However students reported quite low use in ICT classes.

Maths	27%
Science	15%
English	11%
Geography	11%
ICT	9%

n = 331

Table 2: Baseline use in school subjects across schools



Camera phones were already being used to capture evidence of activities in class, while the stopwatch was used in science. We think that the reports of SMS and MP3 use during lessons were actually not for learning purposes at this stage. Students in School A reported that they sent surreptitious text messages, while the ICT Manager in School C said

- As I'm walking round school, I find that most of the kids are playing music on them. And of course, when they're out, they will take photos of each other. And making phone calls and sending texts as well, they do a lot of texting with them.

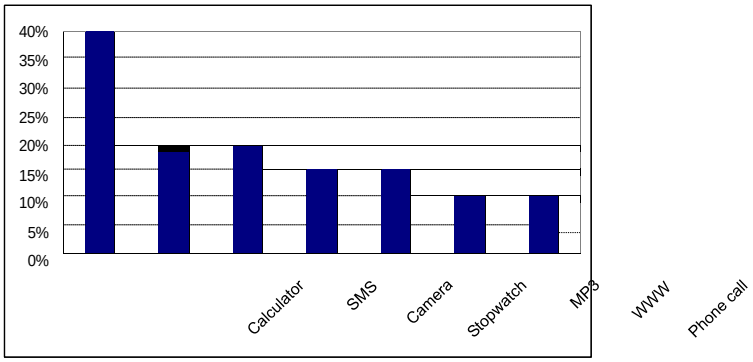
The functions that students had ever used in lessons are shown in Table 3. The high proportion of calculator use reflects the proportion of use in Maths

classes. As one student said ‘I just use it for a calculator because I never bring mine’. School A

Calculator	37%
SMS	19%
Camera	18%
Stopwatch	16%
MP3	14%
WWW	11%
Phone call	9%

n = 331

Table 3: Phone functions reported as used in lessons



These data indicate that already in the participating schools, there was, to a small extent, a pragmatic approach to using mobile phones in class. The teachers involved in the project were keen to develop learning activities, and gave various reasons for using the mobile phones. In the baseline survey, students were asked to suggest potential learning uses for mobile phones, and they came up particularly with the calculator function and Internet access. However almost half of the students in School A and 30% of those in School B did not offer any suggestions. Once the project began, one of the participating students told us:

- The other students didn’t take it as well as the teachers did, because the teachers were obviously told before this was happening that it was a scheme through the University, but it took a lot more convincing for the other students. They kept saying ‘Well, it’s not a learning device, it’s a mobile phone.’ School B

Why teachers in this project decided to use mobile phones

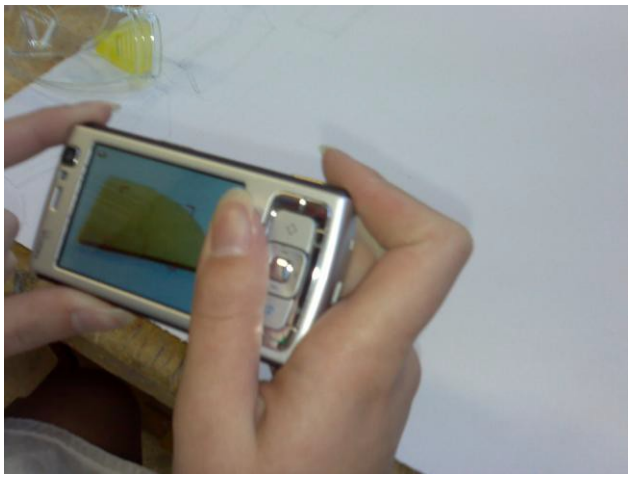
I was very keen to promote the idea that they have ownership and they use the phones both in their social and their normal school life
ICT Coordinator, School B

A fundamental difference between mobile phones and the handheld computers that have been introduced into schools through other projects is that most students already own mobile phones. This raises a new set of issues to do with ownership of computing devices, security of school networks, and societal perceptions of device use. The teachers in this project explained their reasoning:

- I think it was a natural progression from some of the work I’d already been doing, so I was very keen to look at how new technologies could be incorporated and assist within science teaching. School A
- I chose the smart phone above and beyond most of the other units because I didn’t want a PDA [Personal Digital Assistant]. I wanted a truly mobile unit with all the other features that it had. I was very keen to promote the idea that students have ownership and then they use them both in their social and their normal school life. School B

- Students like mobiles and they know how to use them. Using this technology gives them more freedom to express themselves and their thoughts without having to be constantly supervised. School C

Students who responded to the survey highlighted instant access, ease of use and convenience–such as the device being lightweight–as important.



Student using mobile phone

What happened when teachers and students used mobile phones in class

This project focused on actual use in class, and the survey results indicated that the majority (96%) of the respondents used the still camera, 22% also used the video application, 10% used a data transfer function between their own equipment and 7% used Bluetooth to transfer data to others. However, only 2 students reported used the MP3 function for learning, while one respondent used the light. Through the observations and interviews we also found the following uses.

Fifteen useful things students did with mobile phones

1	Timing experiments with stopwatch
2	Photographing apparatus and results of experiments for reports
3	Photographing development of design models for eportfolios
4	Photographing texts/whiteboards for future review
5	Bluetoothing project material between group members
6	Receiving SMS & email reminders from teachers
7	Synchronising calendar/timetable and setting reminders
8	Connecting remotely to school learning platform
9	Recording a teacher reading a poem for revision
10	Accessing revision sites on the Internet
11	Creating short narrative movies
12	Downloading and listening to foreign language podcasts
13	Logging into the school email system
14	Using GPS to identify locations
15	Transferring files between school and home

These fifteen activities were developed by both students and teachers, and encouraged by the teachers because they were serving useful purposes. They helped the students to develop 'new literacies' (Lankshear & Knobel, 2006), a term that goes further than the literacies of reading and writing to include communication in multiple modes, including visual, oral and audio modes.

- **Visual**

The visual aspects of learning were a focus for many. In School A, the teacher encouraged his students to use the phones for the first 20 minutes of each science class, mainly collaborating to capture evidence of experiments into plant growth. The Applied Science course requires students to make and record accurate observations and measurements to ensure 'scientific validity' of data. These observations go into a report in their paper-based portfolio. The teacher said:

- Clearly the technology enables them to have that physical record. It is a very accurate observation, because it's real, then they obviously have to talk about what it is, or describe it in a bit more detail.

Both the students and the teacher valued the chance to review material. A student said:

- The portfolio we're doing is monitoring plant growth, so it's good to take pictures so you can look back at your past results. Most people have phones with cameras and you can connect them to the computer and put on our portfolios. School A
-

The teacher also pointed out the value of reflecting on the evidence over time:

- The photos themselves are something that are useful, but what's very useful for the students is that historical record in science. So where there was very clear value is in taking a set of images over a period of time for a particular science experiment and then being able to look at that and seeing what's happened and the gradual biological change. Otherwise you can't remember what it looked like.

Biology experiment captured for eportfolio

School C used the camera function in a Geography project on social exclusion. Prior to the activity, teachers and students tried out the phones and the software on the University campus, where they captured these images.

Another productive use of the camera function was to record visual notes. In School B, a teacher put pictures of circle theorems on the board with explanations, and a student zoomed in and photographed the picture so he could use the explanations for revision.

- **Audio**

Many phones can function as audio recorders and MP3 players. One student in School B downloaded German language podcasts to his phone from www.Tagesshau.de. He also recorded some of his teachers (with their permission), in activities such as reading out a poem in an accent, and told us that when he was in the exam he could remember the person speaking. As well, he said:

- It's been fantastically useful to get onto the BBC Revisewize, to hear the audio bites.

- **Communication and Collaboration**

New literacies involve participation, collaboration, distributed expertise, and citizen journalism. When students create, as well as read, material, they are able to practise critical literacy, discovering deep meaning in the curriculum. Students have a lot of experience in collaborating socially, so they are quite used to sharing information and can do this for learning purposes. Developing critical literacy includes an understanding of audience and also has implications for personal safety and security in the online and connected world.

In all the schools, students collaborated in achieving their goals. This was essential in School C where students shared handsets, and to a certain extent in School A as not all students owned a good-quality camera.

Students share photographs via Bluetooth

- It's easy to send pictures, because you've got Bluetooth, so you can just send them around so everyone's got the same pictures and the same results on their phone. School A

Students also displayed critical literacy when they told us:

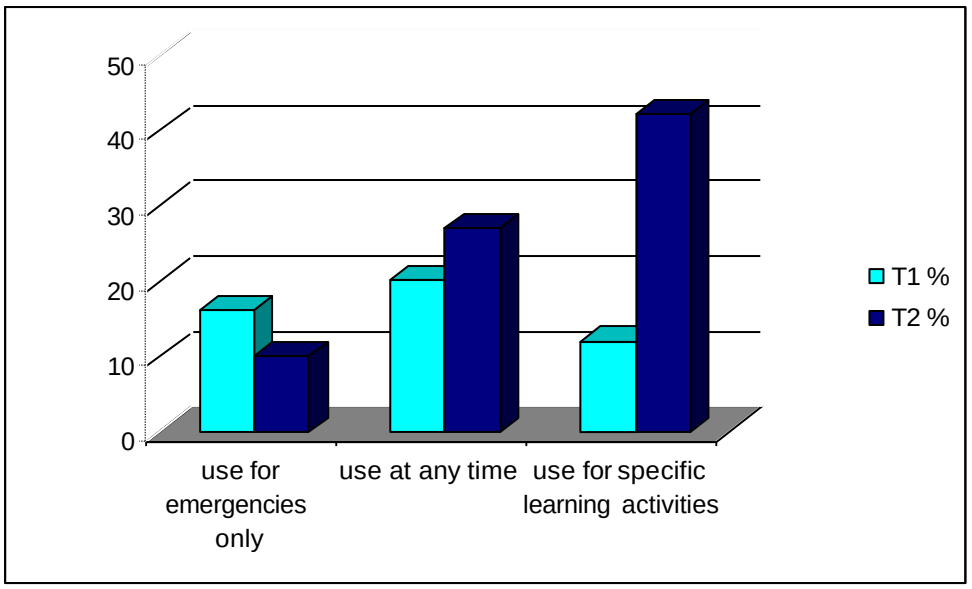
- I'd never put any pictures of myself, or any contact with personal information on it.
- You can put a security thing on it so only people of your age can look at it, or people you want to look at it. School A

How the experience affected attitudes and behaviour

In this project we took the view that there is a strong link between attitudes and behaviour, so that positive or negative attitudes towards using mobile phones for learning predict subsequent behaviour. At the outset, students were often surprised at the thought that mobile phones could be used for learning. They saw their phones as mainly for social uses, normally only using the camera to take pictures of parents or friends when socialising.

However almost all reported that they enjoyed the project and felt more motivated. It was something they would do 'in real life': to experience new technology in a different way. According to teachers in School B, the most important thing learned was that some students who were lacking in confidence were using the phones so successfully that they had 'blossomed' both in their social and learning environments and as a direct result, their work ethic had increased exponentially.

In order to assess any shift in attitudes, at the end of the project the students involved were asked the same questions as in the baseline survey, and the results are shown below.



These figures can only be taken as a rough guide, as they refer to the whole cohort of participants, which was made up of 319 students for Time 1 (prior to use in this project), and 101 students who participated in class activities during the project (Time 2):

It is clear that whilst prior to the project only 12% of all students thought the phones could be used for specific learning activities, after some involvement, this proportion increased to over 42%.

The take away message here is that even short use projects in schools can show students some of the advantages and usefulness of mobile phones in learning contexts. Similarly, adults they dealt with also showed shifts in attitudes:

- I thought it was a useful project for the students to do. It showed them another use for mobile phones apart from playing music on them. ICT Manager School C
- Before I had this phone, I used to think that text messages were just a waste of time. And I was wrong. It's a very subtly different type of communication. ICT Coordinator School B

Benefits of using mobile phones

Using students' phones reduces both set up time and the need for training on the devices. Teacher School A

Teachers reported the advantages of spontaneity and efficiency:

- Suddenly there's a calculation, for example, and we've got a full set of calculators that are there and able to use. If we think we're going to go outside and do an experiment and we need to record it, use a stopwatch, we've got a full set of stopwatches and they're there, they're easy to use. School A

- In the past students always had to draw diagrams to show their scientific method, but now they've got access to a camera, so they can take a picture on that. It gives them something that they can put straight into a report, which they've done for their GCSEs. Their time is better spent doing the experiment and interpreting the results afterwards. School A

Students without Internet access at home used school access via the mobile phone to retrieve information. School B

Being able to read files (as with e-books, spreadsheets etc) on the move was very useful as well:

- Quick Office software enables you to edit things on the move. If you see a mistake you can edit it before you print it out on the computer. And also I've found that you can store documents on there and then print it out on the computers at school with the cable supplied with the phone. School B

A teacher in School A sent regular reminders to his students by text message (SMS).

- The idea of using them for the homework side worked OK with the 6th form group as a reminder of revision sessions because of the immediacy that this technology offers, even more so than email.

It seemed that some students could communicate with the teacher better by texting, creating space between them rather than face-to-face contact. School A reported that students initiated discussions and questions in this medium.

A student in School B found the small screen size helped his revision:

- The fact that I had to scroll down meant that the other parts of the text were hidden so that I'd have to remember them.

In Schools A and B, where they used the phones on a 24/7 basis over a period of months, teachers and students reported a sense of autonomy, and generally an atmosphere of trust.

- The thing that surprised me was there was no need for me to say 'You need to go and do this and this': it just happened. School A

However there was little evidence of students creating products other than images and videoclips, of using the MP3 function to listen to curriculum material such as podcasts, or of assessment using mobile phones.

Integration with other technologies

It is clear that mobile phones are not suitable for all aspects of computing, and they therefore need to be able to link up with the other technology tools that students use, such as PCs, printers and wireless networks.

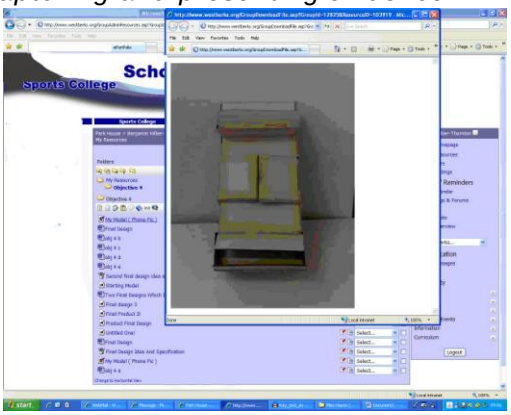
The strongest example of integration occurred in School B, where students could interact with the learning platform through their mobile phones, by using their school email logon.

- There are different homework resources that you can download from the school's website. I was able to get photographs of the geography field trip using the phone, from the school portal.

A Year 13 art student personalised her space on the learning platform, storing resources for inspiration, capturing images and interacting via her phone. Her teacher could also load material specifically to each student's space, thus assisting personalisation.

Design Technology students regularly captured evidence of the development of their models, and uploaded this to the learning platform, as shown.

Capturing and presenting evidence



One Year 11 student created his timetable as recurring appointments on the handset, thus setting alerts for each class, and used the To Do list as a homework organiser.

- I've synchronised this also with Microsoft Outlook, which keeps me organised, so if I have a meeting it appears on the front screen. School B

In schools A and C, students used compatible software to download their photos from the phones to the computers.

Crossing the educational-social boundary

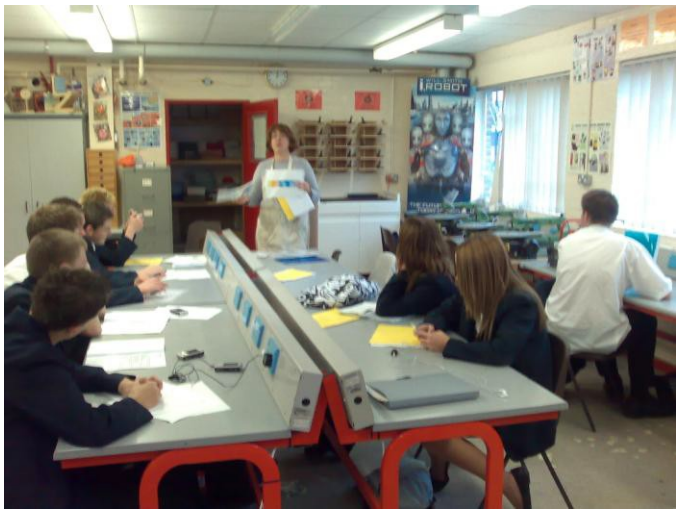
Many students we spoke to early in the project made a clear distinction between school life and social life, and while boundaries are sometimes appropriate, we suggest from previous experience (eg. Hartnell-Young and Vetere, 2006) that there could be benefit in greater interaction between the two aspects of a learner's life. In this project there were instances of students using their own phones (School A), as well as others using borrowed phones with their own sim cards. In these cases, personal life became mixed with school life.

Students said:

- It's nice to be able to access the things at home that I can access at school as well. School B
- I've used mine in Art to take pictures of some of my work to show my Mum. School A
- Not only was I able to use it at school, I could use it when I was out, because I had to have a mobile phone with me when I was out to contact people. School B
- You can access it at home. You can take it home and put it on the computer and use it whenever you need it. And you can have as many pictures as you need on there, whereas sometimes on the school camera you're limited. School A
- Over summer the teacher took our phone numbers and our email addresses to remind us about homework and the exams we had to do over the holiday. School A

A teacher said:

- I've been trying to encourage students as well, because I think a lot of them didn't know that they could find something at home, save it on their little area and then access it in school and vice versa. School B



What parents thought about the project

Given the current school policies and the publicity against mobile phones, we anticipated that some parents might not approve of the project. However most parents of students invited to join the project signed the consent forms without any concerns, and only a few asked for more information about privacy and security of the data. Teachers reported that parents were keen on the project and of the 300 students involved in School C, only 1 parent objected.

The students acknowledged that using mobile phones in class is different to their parents' curriculum experience. They said:

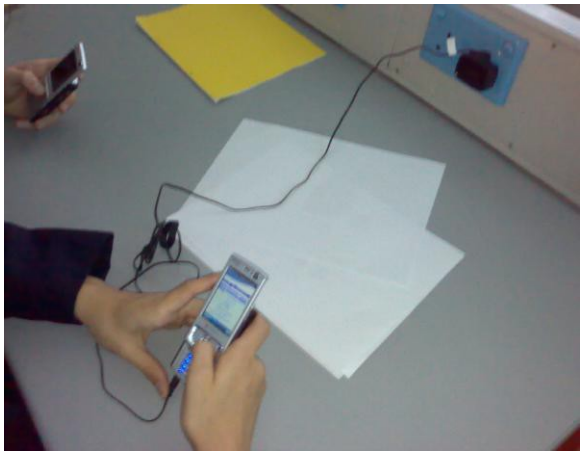
- Mum doesn't really know much about technology, but she thought it sounded really fun and that people would pay more attention because it's more interesting. School C
- My parents just say well, it's your phone, if you lose it it's your problem. School A
- My Mum thought it was a good idea, because it's easier than carrying cameras and it's cheaper as well. School A
- Well, at first I think my parents were a bit resistant, but when I explained to them that it was mostly for learning, and the things that I could use it for, they were actually quite happy for me to use it. School B

In fact School B received complaints from a few parents of the groups not using mobile phones, that their children were being disadvantaged. The responses suggest that it is teachers, rather than parents, who influence school policies banning phones.

> ***Mum doesn't really know much about technology, but she thought it sounded really fun and that people would pay more attention because it's more interesting.*** Student School C

The down side

Some of the factors raised during the project were usability and software issues, costs, school policies and culture, and student behaviour.



School B reported that students in the initial stages had been very motivated by using their devices, but after the first six weeks, they needed to be encouraged in their use. It seemed that this was due to in particular to battery life. After as little as two hours use, with students enthusiastically using Bluetooth and video functions, batteries were beginning to run down.

Charging a phone during a lesson

- Sometimes the pictures weren't very clear because they weren't like digital pictures School A

- Editing of Office documents was limited because students needed to pay extra for the appropriate software. Students aren't going to pay to edit a Word document on their device, so I think that's something that needs to be overcome. School B

- I could not use any of the flash-based parts of the website. School B (Flash is a common format for games, animations, and interfaces embedded into web pages).

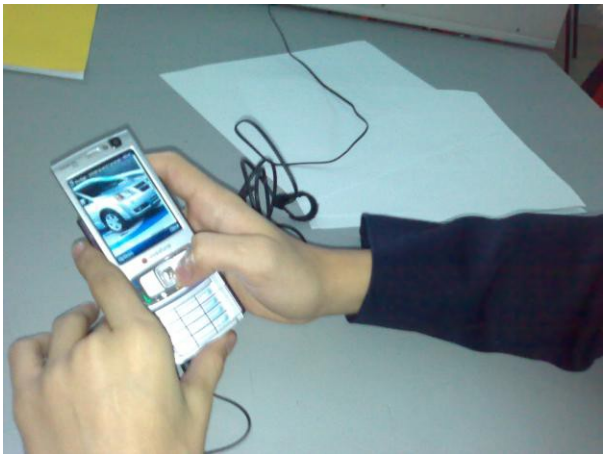
- One lad was on the playing field at break time, surfing the Internet, doing a bit of research. He was approached by a member of staff saying 'You've got a mobile phone', so we had to smooth the waters on that. School B

Two single Year 9/10 students were involved in this project, but as they were the only students in the class, they were 'left to their own devices'. Under the current policies in place, both felt intimidated during lessons, as their use would single them out. They didn't feel confident enough to speak directly with staff on their use. Generally, if they were prompted to use the devices they would, otherwise they stuck with the rest of the class and used either a provided laptop or paper. School B

A project phone lent to a teacher was stolen from a classroom bench, and a student's phone was stolen in a changing room in School A. No other thefts were reported.

During the period of the project, School B had a 'YouTube experience' where material of an unruly class recorded on a video camera (not a mobile phone) was posted on the web. The school dealt with the issue quickly, and their major concern was that YouTube refused to take the clip down, arguing that while it portrayed the school in a bad light, it was not illegal.

- And then you can hack into other people's phones, if they leave their Bluetooth on, you can hack in and nick stuff off their phone. School A



How schools can introduce mobile phones into curriculum activities

According to a local authority consultant, at the moment teachers don't have the confidence and the policies are not in place within the education sector to allow students to use their devices in the school environment. This project allowed schools to try various models of ownership, from students' own phones to phones supplied by the University with pre-paid sim cards.

If mobile are to be used in schools, certain issues must be addressed, including leadership and school culture; attitudes of teachers, students and others with influence; appropriate curriculum activities; professional development; technical integration and support; and a new approach to policies.

- **Leadership and school culture**

What are the cultural factors influencing the use of mobile phones into everyday practice in secondary schools? A teacher in School A, where students used their own phones, suggested:

- A lot of it will depend on the particular school and the ethos within the school. There are very strong relationships here between staff and students. And they're very supportive of their own learning, their parents are supportive of the learning, the school are supportive and so when you've got that in place the other things are clearly enablers.

While all teachers in the project were supported to work outside their school policy, for more widespread implementation there would need to be strong leadership, good management and professional development of other teachers to promote cultural change.

Starting small with champions and spreading out is a good strategy for this type of change. School B started with four students, and then a whole class group. The school lent the students the latest phones (provided by a phone company) but encouraged students to use their own sim cards. Because of the nature of secondary schooling, these students interacted with many other teachers, thus raising the possibility for discussion and use in class. The ICT coordinator said:

- I'd already started the small project early in the year, that started to filter out from the subjects that I'd identified. So geography was very successful, and then I approached the other members of staff that taught these students, and they were 100% supportive.

and

- Because this 14-student cohort obviously has an impact on a wider number of members of staff, and I think it probably involves virtually every member of staff across the site, I have had a couple of queries. I've had a couple of emails from staff saying 'I'm not particularly happy for this to go ahead' and I've spoken to them and reassured them and they have been happy.

- **Attitudes**

A teacher in the project suggested:

- I think teachers need to be put in the shoes of the kids that haven't got a laptop at home, or that can't get on because somebody else keeps using it. So I think they have to blinker themselves for a day and actually experience what the benefit is and think positive about it rather than negative. School B

The use of the learning platform and e-portfolios will happen. ICT Coordinator, School B

Another suggested pragmatically:

- You always want to do something that you're not allowed to do and when you're allowed to do it then the novelty disappears. School A

Teachers in this project discussed the appropriate use of the phones with their students, who expressed very reasonable responses:

- If you're allowed to take your phone in school I think that they should say you're allowed to use it if your teacher says, for an experiment or something like that. But you shouldn't be allowed to just have them out to text your friends, but just have it out for educational reasons. School A

- Yes, not using them in class unless you're recording something or the teacher will let you. School A

- They shouldn't be seen unless like a teacher says you can use them for a certain project or something. School C

- My geography teacher said that I'd used it brilliantly and I was always getting things for her as well. When she didn't know a fact I was able to go on the Internet and quickly look it up. I could help her teaching, to quickly look it up. And it also helped the rest of the class as well, that I was able to connect so quickly to the school's network. So I think I have influenced some of my teachers' views. School B

It is good to use new technologies. It prepares for the future as we will be using mobile phones more and more. *Student School C*

Of course it is also important to consider the attitudes of others who are needed to support change, such as technical staff, parents, governors and so on.

- **Appropriate curriculum activities**

The Demos report (Green and Hannon, 2007) and the Futurelab report (Green et al, 2005) identified numerous areas where students already have the technology skills that teachers could capitalise on in order to make their curriculum more personal. This project showed that older students in particular were able to devise their own uses for learning, while younger students seemed to need more teacher encouragement.

Using mobile phones in Geography

Teachers can design meaningful activities that take advantage of the ability of mobile phones to cross boundaries (Hartnell-Young and Vetere, 2006), as one teacher noted:

- If we actually showed them they could connect to our Internet and access stuff, I think that then they'd go home and they'd start picking up wireless networks and they'd start using the stuff at home. And then they'd be able to put essays and things on to actually use their phones. School B

With the increasing use of learning platforms, teachers and students can develop two-way interaction, so that it is not just teachers who populate the platforms with resources for learning, but students who submit useful items for class use, or for their personal learning spaces and eportfolios. Keeping students' phones busy with meaningful curriculum activities has the benefit of reducing time and inclination for the misuses that schools fear.

This project showed that mobile phones have different uses in different subjects. These help to build up the range of new literacies that students are already developing, knowledge and skills that can be valued and assessed.

As well, schools will be wise to develop critical literacies within the other work they are doing. These include awareness of trust, privacy and security of personal information, 'grooming' of young people and identity theft. Here schools can build on, and learn from, the experience that their students bring through their activities on social networking, blogging and photo sharing sites.

- **Professional development**

If mobile phones are to be used profitably, teachers, assistants and other staff need to be aware of the benefits as well as the disadvantages which are widely publicised at present, as one student commented:

- Teachers need to be trained in order to be able to see these phones as learning devices instead of a distraction. School B

Professional development will be essential, both to address prevailing attitudes and to develop knowledge of the potential for curriculum uses. This project was itself a form of professional development, and a teacher suggested:

- In every single department there is a couple of people that could bring the others up to speed. Even if they just started using it and they were making their life a bit easier or they were giving their students that something bit extra, I think the others would seriously look at it. School B

Teacher and ICT Coordinator working together

Hands on activities are recommended. Teachers need time for tinkering and classroom experimentation, allowing them to be active and creative, and time to reflect on their experience. In similar projects using PDAs, McFarlane, Roche and Triggs (2007) found that teachers appreciated having time to play with the devices and explore their potential before using them in teaching, and that the presence of mentors appeared to increase the use of the devices. They suggest that it is teachers' confidence, relationship with their classes and attitude to taking risks that have the greatest effect on implementation of such technologies.

A student suggested one way to avoid teachers feeling a loss of control:

- If a teacher was to record herself and then to send it to students…giving the teacher more control, so that she can send out the resources, either from the laptop to the mobile phone, or from a mobile phone to the computer, then to laptops and things. School B

And a teacher said:

- I think if teachers were shown actually, on your mobile, you could do this, and encouraged to do it, or even lent a phone and 'Right, have a play around'…If you actually sat down and physically showed them how easy it was with a worksheet that said 'Now click on this, now click on that', they'd do it. School B

- **Ownership**

We acknowledge that you have a personal computer to hand and it can be used for learning. We believe that you can learn anytime, anywhere.

This is a fundamental issue. Using students' own phones sends a message: we acknowledge that you have a personal computer to hand and it can be used for learning. We believe that you can learn anytime, anywhere. On the other hand, it means that students in any one group will have different devices, which can complicate management. This is often a financial issue, although this is likely to change in future as mobile phones become even cheaper.

- The cost of wireless Internet smart phones means that they are not ubiquitous among secondary school students. However 24/7 use is the desirable option. Therefore cost and ownership go hand in hand as issues to consider. School B

- It's cheaper to have a phone because everyone has a phone, you don't have to buy a camera. School A

This project showed that there are a number of possibly entry points for using mobile phones in class. School C started with a collaborative short-term activity to address the shortage of handsets, School B gained the support of a phone company to increase the number of devices, and in School A students

willingly shared data from their own phones to reach individual curriculum goals.
Where School A used the phones to send reminders of revision classes, there was no need for pupils to reply, so no cost to the owner of the phone.

One student suggested:

- If the Government funded the school to give students a set amount of credit for that month so that they could access things from home if they needed, or to make the students go onto a low cost network. Because at the moment the networks are charging quite a lot for walk-around WAP access. School B

While schools should not expect their main computer provision to be built on student-owned devices, they should acknowledge that they provide instant access to augment the basic infrastructure. But supporting the use of personal devices means enabling access to school networks, which leads to technical issues.

- **Technical integration and support**

Teachers in this project wanted devices that offer photography and video recording, audio recording, storage capacity, and communication between devices and people, such as Bluetooth and wireless. However while mobile phones provide these requirements, they also use different versions of software, some of which schools are not familiar with, or do not wish to use.

To facilitate learning, schools need to enable all the computers in use, including mobile phones, to connect to their learning platforms. School B's vision of a learning journey that 'can begin and continue well beyond the traditional school day' was supported by its learning platform:

- Students' first point of contact on any device is the portal. And through that portal is delivered everything that a student or a member of staff needs for any given time. So when a student opens up her mobile device, she'll log on to the school website, because that will be her homepage, and if there are any changes: PING! That's what I want them to look at. ICT Coordinator School B

The school addressed security issues in conjunction with the learning platform provider.

- We've set up a guest area so that people can come on and access a secure internet connection. We're trying to facilitate the students' learning by encouraging the use of the learning platform and the security measures that we need to put in place for that are much simpler than network security. ICT Coordinator School B

It is clear that schools have a greater responsibility for data security than external providers, and policies and procedures regarding data access and control need to be addressed. The ICT Manager in School C suggested that similar technology controls to those used for classroom PCs would need to be developed.

Access to networks when outside the school WIFI area is also an issue of cost and security, unless, as one School B student mentioned, there is town-wide broadband access. This is a good reason for schools and their geographical communities to work together on providing networks to support learning.

A new approach to policies

Of the 101 students surveyed after the project, 29% indicated intend to use a phone in future for learning purposes and 41% could see a possible use in future. 64% of students thought mobile phones should be used in class for learning, 18% saw a possibility and only 2 students did not.

- I think it would be better if more schools did it because then it's not as strict and, because everyone likes their phones if they know that you can slowly just use it, as long as you're not pushing the boundaries, then it'll make lessons more fun. School A

We'll be allowed to use our phones. We should be allowed to use them for educational purposes in lessons. If your teacher says to take it out, you should be able to use them.
Students School A

Teachers too, found the experience positive, and in every case, plan to continue using mobile phones in class where appropriate. In each school the experience of being involved in the project has identified particular issues that they want to address, thus building up a useful store of knowledge in implementing new technologies.

We do not recommend that schools rush into wholesale policy change at the outset, but rather a gradual adoption as attitudes and behaviours align with purposeful learning, until the school reaches the tipping point, and using mobile phones is as natural as using any other technology.

Eventually, change will occur in policies to reflect this practice. The new policies will address the key issues, which are:

- ownership of computing equipment and access to network connections,
- tools to support curriculum and its personalisation,
- appropriate behaviour in school and other contexts,
- privacy and security of data, including photographs and video clips.

A note on our methods

The research model was intended to involve teachers as researchers, as well as ensuring professional learning for teachers by being involved. Prior to the submission, teachers were identified from those who had previously responded to an online call for those interested in researching the use of mobile phones in schools. The university had a set of smart phones available for loan. After discussion, teachers in three locations were involved in submitting the proposal.

The integration of the project in the curriculum was decided by the teachers and their students, while the university team provided consent forms, planning and data collection frameworks, and wrote to the head of each school. The schools were allocated several teacher release days to allow time for project activity, and the university team visited each school for briefing, sharing plans and additional data collection, demonstration, and drafting documents.

The university team used broad ethnographic approaches. Data collection included documents, observations (with video), conversations and samples of digital products created by students and teachers. A baseline student survey of use and attitudes was constructed with one of the teachers and shared across all sites. A second survey, building on the first, was developed by the university team during the project in light of the data coming in from each site.

All images are used with the permission of the teachers and students involved.

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