



# Implementing broadband Internet in the classroom: key issues for research and practice

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## **Introduction**

This paper reports the outcome of a study into classroom uses of broadband-connected Internet in the UK. The study focuses on how some teachers and pupils made use of this new teaching and learning resource during the period of its initial introduction in one local education authority. The settings investigated consisted of a range of classrooms, from Reception through to Year 10 (i.e. pupils aged 5 to 15+ years).

In line with Woolgar's (2002: 6) observation that 'attention at the macro-level gives rather little clue as to how these technologies are actually used and experienced in every day practice', this small-scale case study focuses on the micro level of implementation, seeking to understand whether and how the positive and encouraging claims made at the levels of policy and curriculum development on behalf of broadband Internet in schools are realised when that technology is implemented in individual classrooms.

Given the newness to all involved of this technology within schools, we approached our research in an extremely exploratory and open-minded way: we wished both to learn about the developing broadband-related practices of individual teachers and learners in classrooms, and we also hoped to sharpen and refine our understandings of how research should look at these issues and what questions it should be asking.

We believe that the opportunity to carry out this research has opened up a number of important lines for further enquiry that should be pursued seriously and with some urgency if the full potential of this new resource is to be achieved.

### **Policy and research context**

By 2002, according to the NCES (2003: 3–4), 99% of public schools in the United States had access to the Internet, 94% of which used broadband connections of some kind. Comparably impressive progress has already been achieved in countries as diverse as South Korea, Japan and Sweden (Cisco Systems 2002: 11–13). The European Union is rapidly making up ground, in pursuit of becoming 'the world's most competitive and dynamic knowledge-based economy by 2010' (Cisco Systems 2002: 14). For example, the eEurope 2002 Benchmarking Report (European Commission 2002) showed that the initial eEurope target of connecting all schools to the Internet had been all but achieved by 2002, at which time attention was directed to achieving better connections and wider educational use in order that 'all schools and universities, as well as other institutions that play a key role in e-learning (museums, libraries, archives ...), should have broadband Internet access for educational and research purposes by end 2005'.

The UK is currently more or less in line with these aspirations, aiming to ensure broadband connectivity for all its schools by 2006, thanks to sustained government commitment. In particular, the Department for Education and Skills (DfES) provided £37 million of matching funding to create eight Regional Broadband Consortia (RBCs), established in 1999 to develop the provision of broadband Internet connections to schools through the purchase of an appropriate infrastructure. Additionally, RBCs were able to develop their own learning materials, provide third-party materials and in-service training. Oxfordshire, the focus of the present study, was one of a very small minority of local education authorities that opted out of the RBC route.

The case for comprehensive, high-speed connectivity in schools tends to be made in broad generic terms, often regardless of the realities of considerable local variation (such as geography, technological infrastructure, etc.). The following definition from the EU summarizes, in typical terms, the kinds of beneficial outcome claimed for the current massive global investment into these technologies: 'e-Learning: the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration' (European Commission 2001: 2).

A more recent report from Cisco Systems (2002: 7) specifies in slightly more detail what it is about broadband technology that actually enables such outcomes:

... broadband allows teachers to incorporate Internet content into their lesson plans. Without broadband Internet access, teachers and students end up waiting for content to download. Students get restless and lose interest. By delivering content quickly, however, broadband allows teachers to capitalize on the Web as an educational resource. Broadband also enables teachers to bring real-time audio and video into their classrooms. Rather than point to a static picture of an African elephant, teachers can show these majestic animals marching across the savannah—a far more inspiring option, particularly to a generation weaned on video games.

Within the EU and beyond, such specifically educational aspirations are also typically placed in the contexts of lifelong learning, access to the knowledge economy and the need to ensure that, by the end of 2003, 'all school-leavers have had the chance to become digitally literate' (European Commission 2001: 3). Furthermore, educational policy and rhetoric in the UK promotes the notion that broadband Internet specifically encourages active and independent learning. A recent Becta (2003) report claimed that 'anecdotal evidence demonstrates the effectiveness of broadband in removing barriers to access to ICT [information and communication technology]', and specified high speed audio and video, avoidance of time wasting, and encouragement to pupils to 'explore independently and to achieve their own goals' as key benefits. A draft report from the Yorkshire and Humberside Grid for Learning (YHGfL 2002) emphasizes the values of speed, lesson pace, letting 'individuals take off on their own course' and the recognition that, by contrast, earlier uses of ICT had become increasingly seen as an impediment to learning that teachers tended to avoid.

The government's July 2003 Consultation Document, 'Towards a Unified e-Learning Strategy' (DfES 2003a: 5), most directly expresses the policy vision of what might emerge from such investment in technology, in proposing 'what our education system could do, fuelled by e-learning'. At the heart of this vision is the aim to 'empower learners—with more active learning, people of all ages could take responsibility for what and how they learn, achieving their personal goals as self-directed learners'.

Such claims have some foundation in earlier forms of ICT-supported practice and have been demonstrated to some extent in previous research, especially: NCET (1994), Cox (1997), Denning (1997), Grabe and Grabe (2001), Loveless and Ellis (2001), Harris and Kington (2002), Holloway and Valentine (2002), Furlong et al. (2003), Loveless (2003), and Scrimshaw (2003). Despite such studies, however, relatively

little evidence exists in support of such claims in relation to broadband specifically. What there is consists largely of short-term classroom-level inspections of regional broadband consortia, conducted internally (for example, YHGfL 2002), by Ofsted (see, for example, Ofsted 2001) or small case studies relayed at occasional conferences, such as 'Contagious Creativity' organized by NESTA Futurelab in 2002.

In January 2003, Secretary of State for Education Charles Clarke, citing ImpaCT2 (DfES 2002), claimed that 'the independent research shows us that ICT in schools, when well used by teachers, is raising standards', and emphasized the potential of broadband technology in this whole process (DfES 2003b: 1–2). Whilst ImpaCT2 provided some qualitative case study evidence, its central case was founded on the statistical significance of correlations between computer usage and test outcomes in different subjects at different stages. Although powerful in arguing for continued investment in ICT generally, ImpaCT2 did not actually manage either to answer the question of what it is about how teachers use technology that raises standards, or to tell us exactly where to focus the attention of research in order to find out. As indicated at the start of this paper, these are the issues that our own modest investigations aimed to explore with specific respect to broadband.

### **Oxfordshire schools broadband study**

During the first two terms of universal broadband connectivity in Oxfordshire schools, between October 2003 and March 2004, we studied sequences of lessons involving the use of broadband taught in six classrooms from across the full school age range. We were able to record the lessons as a whole, to focus on specific pupils or pairs of pupils as they worked with broadband, and to discuss the lessons afterwards with the teachers. At the heart of these investigations was the video-recording of pupils working with broadband technology. We were subsequently able to analyse these recordings in considerable detail.

Proponents of video analysis in workplace studies and sociology point to the capacity of video to enable the analyst to examine materials extensively, repeatedly and in fine detail, as well as to present data in close to their original form in order to augment descriptions, document conclusions or allow alternative interpretations. For this particular research project, with a digital camcorder and external directional microphone we were able to capture, preserve and retrieve exactly what pupils said and did as they worked with broadband-supported ICTs. We recorded pupils' interactions with their teachers as well as their conversations with each other, their gestures and their use of the keyboard, mouse and additional paper-based resources and materials. We took measures advocated in the video-analysis research literature (e.g. Goodwin, 1981, 1994; Heath and Luff, 1993) to minimize the obtrusiveness of video in research settings. We then prepared detailed transcripts of conversations and other visually available aspects of classroom interaction. The transcription system we used is one which we modified ourselves from Gail Jefferson's foundational transcription system for Conversation Analysis (Schenkein 1978: xi–xvi).

In addition, the post-lesson interviews enabled us to explore with certain of the teachers the rationales for their lessons, the extent and ways in which their initial plans aimed for certain approaches to learning or learning outcomes, and any ways in which these intentions turned out differently in practice. In some cases we were also able

to supplement the data with documentary evidence such as pupil worksheets and examples of pupils' work.

### **The case studies**

We first of all present a brief descriptive account of each individual case study in turn, as the basis for a subsequent evidence-based discussion of key issues and themes that have emerged from the six case studies as a whole.

#### *Case Study 1: Reception/Year 1 literacy class*

This study involved a Reception/Year 1 class focusing on learning consonant–vowel–consonant (CVC) words, as part of the National Literacy Strategy. The teacher's introduction to the lesson conveys something of the wide range of activities undertaken by pupils in this class, sometimes working together as a whole class, sometimes moving into smaller groups (e.g. 'Fireman', 'Doctors', etc.) and sometimes working on their own; at all times orchestrated by the class teacher:

Teacher: We're going to watch the video and then after the video Mrs Smith is going to come at some point to take the Firemen for hand-writing (.) but I will give you some work to do as well so when you come back from working with Mrs Smith you can get on with that work okay (.) and that work will be to do with what we're going to watch on Words and Pictures (.) the Doctors and the Police when we've watched the video we're going to do some work on the carpet and each group's got work to do and then some of you are going to work on Jim's Crankophone okay (.) do what we did yesterday afternoon and see if we can print it off (.) if you get stuck just find me okay?

Within this particular working context, the two-pupil computer workstations constitute just one among many different kinds of resource used by these children. It was only when the teacher used the interactive whiteboard, typically with the whole class sitting on the floor around it, that technology took centre stage in this classroom.

The ultimate focus for this literacy lesson was CVC words, an area of phonic knowledge introduced in the Year 1 Term 1 objectives of the National Literacy Strategy Framework, but this focus emerged only gradually out of a number of topics and activities. The class as a whole first watched an episode of the BBC programme 'Words and Pictures'. Then they divided into three smaller groups, some practising their handwriting, the others using either cubes and a 'board' or a worksheet to practise assembling CVC words.

During this time, four pupils took turns to sit at the single Internet-connected workstation to play 'Jim's Crankophone' on the BBC Learning website.<sup>1</sup> This is a Flash-animated game in which players listen to words emitted from the 'Crankophone' and select which of two vowels offered to them they can hear in the middle of the word. Correct answers are added to a list which can then be personalized and printed out: according to the BBC website, the game is 'an exercise in auditory discrimination of medial vowels, often the most difficult to hear and identify when learning phonics'. Each pupil worked

on their own, unsupervised, for around 4 minutes, finishing up by being instructed to print out their finished work.

Printing proved troublesome both because the pupils experienced difficulties accessing the printing facility and instructing the computer to print, and because of the considerable time it took to print out work—about the same length of time pupils had taken to play the game. Because of the delay, only half the number of pupils the teacher had originally selected to use the resource actually did so.

#### *Case Study 2: Year 4 history class*

The topic of the lesson studied, the mummification process in Ancient Egypt, relates to the focus in Key Stage 2 of the National Curriculum for history on study of a past society (item 13 of Knowledge, Skills and Understanding). The lesson took place in the school's ICT suite, beginning with the teacher discussing with the class as a whole its recent visit to a museum. Then, on an interactive whiteboard at the head of the classroom, the teacher displayed an online 'interactive game', 'Prepare a Mummy for Burial!', on the website for the 'Kids' Corner' of the education section of the Oriental Institute of the University of Chicago (USA).<sup>2</sup> This site had been recommended to her by ICT staff in the local education advisory service. The game was a fairly light-hearted Flash animation, in the style of 'Horrible Histories', in which players prepare a fictitious ancient Egyptian, Seneb, for the afterlife by removing his brain and internal organs, drying out his body with salt and wrapping it in linen.

The teacher focused most of her instructional guidance on process rather than content throughout the lesson, both in terms of using the technology (such as explaining how the 'Favorites' capability works on a computer), and in terms of the importance in this lesson of clearly recording the information about mummification that they discover from the website activity:

Teacher: there are some very important bits of information up here (.) and there is some live words which you can actually read as well as doing what you're supposed to be doing (.) so you can read the information (.) you *could* try the live words and see what information it comes up with otherwise you're doing as it's asking you to do (.) you're actually following the instructions. It's important that you do look here though because next week we're going to be making a little sheet of instructions so that you can give that to somebody and say this is how to make a mummy...

Technical problems with the computers meant the game could only be accessed on four of the 15 machines. The teacher reassembled all pupils, except those seated at the four working computers around the whiteboard, and worked through the game with them by inviting individual pupils in turn to attempt the various tasks on the interactive whiteboard itself in front of the rest of the class. This was only partially successful because the pupils experienced difficulty with dragging icons around the whiteboard, so that the teacher frequently stepped in to help. This was an arduous process and towards the end one pupil, with no prompting, used the whiteboard-connected computer rather than the whiteboard itself, thus eliminating the problem.

### *Case Study 3: Combined Years 4/5/6 science class*

This science lesson on magnetism related directly to the National Curriculum (Sc4/2 Physical Processes in Key Stage 2 science) and was run by two teachers: the Science Coordinator and a newly qualified teacher. It took place in a classroom which contained a network of four PCs. For the Year 6 pupils, the lesson was a one-off revision session in advance of their Standard Assessment Tests (SATs); for the Year 5s, it was an opportunity to revise and extend upon lessons they had had one year earlier; and for the Year 4s it was an introduction to magnetism. This was a complex and busy lesson in which several resources were used in support of a variety of discrete activities: props and apparatus, minerals, 'concept cartoons', worksheets, an experiment and a quiz:

Teacher 1: (displays concept cartoon on interactive whiteboard) right you've all got the concept cartoon in front of you (.) some of you have written a lot on it and that's great (.) what we're going to do now is a practical activity (.) really we want to find out whether this chap at the top here is on the right track (.) he's saying I think magnetic fields work through anything and that's what you're going to test out this afternoon.

Teacher 2: these are very very weak magnets (.) I had to take everything off my fridge this morning (.) so you've got all my fridge magnets [...] right all you've got is a piece of paper (.) a piece of plastic (.) a piece of wood (.) a magnet (.) and a paperclip

The classroom's interactive whiteboard was used extensively, in order to display to the whole class animations about magnetism and a comprehension quiz; both from an American website.<sup>3</sup> Pupils took turns to use the four PCs to consult the magnetism section of Heinemann Explore. As they did so, the teachers asked them to pay particular attention to the specialist vocabulary associated with magnetism. Each pupil spent an average of 4 minutes alone at the PC, during which time they were free to explore the Heinemann site without restriction.

### *Case Study 4: Year 7 ICT class*

This class was studying elements of the Key Stage 3 ICT strategy. The lessons were part of a longer sequence in the ICT subject area, in which the teacher was covering the Key Stage 3 National Strategy for ICT with his Year 7 class. The Framework Objectives for Unit 7.2 focus on searching, selecting and using online information sources, and this teacher's aim was that his pupils should be able to explain how to search for information for a particular task, refine their search and evaluate information from the Internet, while understanding that missing or inaccurate information can mislead.

Teacher: if we're doing a web search and here's our key words up on here (pointing to whiteboard) for this lesson (.) we've got to make sure that we've got a very clear image in our head of what information we're getting off the Internet (.) and is that information true (.) so what we're going to have a look at today are these words

(.) we're going to have a look at information (.) and [...] we're going to ask ourselves is it reliable

The teacher encouraged the pupils to think about different sources of information, such as libraries, computers, encyclopaedias, teachers and others. The example of school library books was used for an exercise in searching for information by consulting contents pages and indexes, looking for 'one piece of knowledge that you didn't know before'. The majority of both lessons was spent away from the computers, working individually or as a whole class on the Unit's worksheets. Pupils' first and only use of the Internet in the second lesson came 40 minutes into the lesson and lasted just 10 minutes. They were asked to work individually using the Pupil Resource 8 worksheet to evaluate the quality of particular websites relating to the wreck of the Mary Rose, a sixteenth century warship.

The first occasion on which the teacher asked pupils to work individually at their own machine, in order to find out about the local weather from the BBC website, proved problematic: the network had been switched off for testing without the teacher's knowledge, and access was sporadic and slow when it was switched on again. The teacher conducted the remainder of the first lesson on a whole-class basis around the suite's whiteboard.

#### *Case Study 5: two Year 9 religious education classes*

This case study comprises one lesson, studying the building of Durham Cathedral, with each of two Year 9 religious education (RE) classes, as part of the school's specialist focus on engineering. Both lessons took place in an English classroom with a bank of 10 PCs, rather than in the much larger but fully booked ICT suite as the teacher had originally intended. This meant that some pupils had to work in groups of four, taking turns with their joint task.

Each class was undertaking an engineering project about building cathedrals: the school had recently acquired engineering status and all teachers, irrespective of their specialism, had been asked to incorporate the topic of engineering into elements of their teaching. Prior to the case study lessons, both classes had watched a video about the history of Durham Cathedral and begun working in pairs on PowerPoint presentations about the cathedral, paying particular attention to engineering innovations such as vaulted roofs, pointed arches and flying buttresses. The teacher had prepared a list of websites in advance for pupils to visit in order to consult and collect textual and pictorial resources to incorporate into their presentations:

Teacher: what things can we include do you think in our PowerPoints  
(.) we talked about ribbed vaults (.) that was one of the three new  
methods (.) talk about the history (.) buttresses (.) can anyone  
remember what the third of those things were (.) pointed arches (.)  
[opens website document on whiteboard] right see if you can find  
something on those in those websites

### *Case Study 6: Year 10 English class for GCSE coursework*

This case study comprises two consecutive lessons with one Year 10 class studying the social and cultural context of the notorious Derek Bentley shooting incident in 1950s England. The aim was to help inform a Media Studies coursework essay that they were required to write for their English General Certificate of Secondary Education (GCSE) course. In preparation for the essay, the pupils had studied a report of the incident in the Daily Mail from 3 November 1952 and a representation of the incident in the film 'Let Him Have It!' Both lessons took place in an ICT suite with pupils working in pairs at a PC.

The teacher began the first lesson by handing out a worksheet she had written herself, headed 'British Society in the 1950s'. The worksheet explained that:

... in order to fully understand the Derek Bentley case, it is vital that you have a good working knowledge of the society that he lived in, and its values and traditions. As part of your research, you are being given the opportunity to use the Internet to investigate the context of the incident so that you can apply any relevant information to your essay.

The worksheet contained four questions on 1950s popular culture, the emergence of the teenager, crime and punishment in the 1950s and the history of capital punishment in the UK. Each question was accompanied by between one and three 'helpful websites' the teacher had provided to help pupils with their answers. The worksheet also contained a list of Google key words the teacher had selected to help pupils produce some 'background notes'. The teacher devoted the entirety of both lessons to getting the pupils to work through the worksheet, regularly monitoring, assisting and questioning her pupils as they worked in pairs around a computer.

## **Discussion**

Classroom broadband is worthy of study because it constitutes a significant moment of development and change in the usability of an existing educational technology: its introduction is intended to make possible the normal and regular use of the Internet in classrooms, resulting in a broad increase in use of ICTs generally. Although some teachers we contacted were not explicitly conscious of the implementation of broadband, there was a general awareness of the fact that Internet access had become more feasible and convenient and that 'broadband', whatever that was, had made that possible. All the case study teachers were quite clear about the fact that they were trying to take advantage of a powerful new resource, and were influenced both in their lesson-planning decisions and classroom practice by the fact of its availability and improved functionality as a means of accessing the Internet.

This investigation focused upon a period of learning and transition for teachers: each of these cases represents first-stage and experimental steps towards what is broadly promoted as a desirable future state of normalized and understood usability. The teachers in this study were, without exception, enterprising, adaptable and prepared to work through uncertainty and unfamiliarity in order to gain the benefits

of this technology. In analysing the case studies outlined above, we were looking for patterns and clues that told us something about the kinds of practice that seem to be taking shape around broadband Internet use in the classroom, and about any aspects of that practice which deserve to be fostered or avoided. The issues and comments which follow are solely intended to add to our understandings about moving forward through this period of transition, rather than to question whether or not classroom-based Internet is a good idea. It seems to us that it is already a fact of life, and effort should be directed now to making the most of that fact.

### **How the teachers worked with broadband**

With the exception of Case Study 1, technology featured heavily in all the case study lessons as a leading element in the lesson plan, with a considerable proportion of teacher talk in the actual lesson devoted to explaining to pupils how to use it, and with pupil use in turn constituting the climax or main event of the lesson. Our communications with a wider group of Oxfordshire teachers, prior to and during the study reported here, suggest that broadband Internet was also often being used in classrooms for brief forays onto the Internet, usually for the purpose of information gathering in the course of several other activities during a lesson, and in conjunction with a wide range of other resources. In such lessons, broadband Internet might be characterized as an embedded resource, used with minimal attention paid to issues about technology or to any attempt to develop digital literacy, as distinct from more technology-dominated lessons where it is a foregrounded resource, competing with the subject matter of the lesson for the attention of pupils and teacher alike.

In all the cases reported here, apart from the first, broadband was to some extent or another a foregrounded resource. Whilst this was partly the result of the fact that teachers were less inclined to offer up their brief (embedded) uses of Internet to outside observation than was the case with more substantial (foregrounded) uses, we suspect that it is still more generally the case that the Internet is used in this foregrounded way. Teachers usually need to go through complex processes of booking computer suites and relocating their classes to these, and therefore tend to try to make the most of such occasions: during this period of transition at least, using the Internet in class is likely to be experienced by pupils as a relatively 'big deal', perhaps disproportionately so. In some cases, such as Case Study 2, problems with the technology necessitated exaggerated attention to the workings of the technology throughout the lesson, but in every case we were impressed by the skill of teachers in either solving unexpected problems with the technology, or in adapting their lesson plan in order to minimize loss of momentum.

Activities utilizing the Internet divided fairly evenly between the online educational games playing in Case Studies 1, 2 and 3 (i.e. interactive and multimedia activities incorporating some element of fun or playfulness in order to encourage learning, rather than full-blown computer games-playing activities) and carrying out information searches on largely pre-selected sites, transferring or adapting what they found either to notes or presentations (Case Studies 4, 5 and 6). In all cases, the activities had been carefully pre-planned by the teachers, to the extent that websites were pre-selected, and guidance was provided to pupils about how to use these. In the cases of educational games-playing, the pupils were told clearly and precisely how long to

spend on an activity, and how to take notes on what was learnt from it. In the case of searches, keywords were provided to guide wider searches where appropriate, and detailed guidance (generally written in the form of a worksheet, or instructions projected on the class screen) was given to the pupils about the parameters of searches and the questions to be answered. There were no instances of remote exchanges and collaboration in these studies, although it is worth noting that prior to this research (and therefore not video-recorded) we had observed the Case Study 5 teacher run what appeared to be a successful e-mail project involving an asynchronous debate between her pupils and high school students in Kentucky (USA) on the topic of capital punishment.

In none of the recorded instances did the teachers simply let the pupils make use of Internet resources in unstructured ways, to the extent that they could be said to have been enabled to 'explore independently and to achieve their own goals' (Becta 2003, quoted above) or to 'take off on their own course' as individuals (YHGfL 2002, quoted above). The implication, in terms of how these broadband-supported activities were presented to the pupils, was that if they followed the teacher's instructions, and in some cases the program's instructions also (e.g. Case Study 2), then the necessary learning would follow straightforwardly:

Pupil 1: sawdust (.) sawdust (.) then what do they do?

Pupil 2: erm (.) I'm not sure

Pupil 1: (pointing to screen) they cover it in that stuff

Pupil 2: yeah we've done that

Pupil 2: (to Teacher) we can't press one of these

Teacher: (coming over to pupils) no you need (.) Oh (reading from screen) now it's time to remove the natron (.) use your hand to remove the pile of natron (.) from the body (.) so I think you've got to use your hands

Pupil 2: we've just put it on

Teacher: yeah (.) so now you've got to remove it (.) now remove the natron packets so (.) okay so you've got to follow the instructions (Teacher leaves)

Pupil 2: now we have to (.) now what?

Pupil 1: dunno (.) erm (.) put linen in (writes in exercise book) then (.) stuff (.) him (.) with (.) my turn to do two (.) linen (.) my turn to do two (takes control of mouse) (.) I have to do the next two things

(Case Study 2)

In all cases, the teacher's role with pupils involved such brief visits to pupils at their workstations to ensure that they were on-task, following instructions, and able to

cope. Apart from this, the teachers left the pupils to run these pre-designed activities for themselves, which seems to us to be a very important part of the process as conceived within the classroom: to this extent, it could indeed be said that the pupils were working independently. From the teachers' perspectives, the Internet used in this way constituted what could be described as independent learning:

... this just makes them more independent learners because they have to go and find most of the source material themselves. I know that I focus them, but then I give them topics rather than ... I never ever say to a group 'go and find out about this' because they can't, the Internet's too massive.

(Post-lesson interview, Case Study 6)

In similar terms, the teacher in Case Study 5 explained to us how she attempted to guide the pupils towards learning from the Internet by pre-selecting a suitable variety of websites:

... looking at the sites on Durham I was getting frustrated because it was all the same pictures and I'd go through ten and it was all the same pictures and information so I chose the best of them. You've got to structure it.

(Post-lesson interview, Case Study 5)

Within the context of this framed and managed entry into the limitlessness of the Web, she is happy for the pupils to move on to an expanded search for material for themselves in addition to the encounters she has structured for them:

Most of them did go off and do other bits, like research pictures and things and I don't mind that but at least that gives those that aren't that confident a basis and most of them can get the majority of what they want and then go off [...] I think if you have key words like we had at the beginning and try and include those in your PowerPoint, how you get to them as far as I'm concerned doesn't matter. As long as they're in there or at least they're seen to be trying to get them in there.

(Post-lesson interview, Case Study 5)

### **How the pupils worked with broadband**

The motivational benefits of using ICTs are well-documented (Becta 2003). Although sometimes used in ways that render pupils fairly passive (e.g. watching teacher-prepared PowerPoint presentations or Internet-sourced material on a whiteboard), interactive technologies potentially engage learners far more actively than previous technologies, such as watching slide shows, films or video.

The pupils in all the classes we observed engaged in Internet-based tasks willingly, and especially seemed to welcome the opportunities to work relatively independently of the teacher. Whether playing educational games or accessing information, pupils readily got on with using the Internet for themselves, even if topic and content

were not inherently interesting to them. The games-playing tasks (as it happened, occurring exclusively in the primary school age classes) were all carried out according to instruction and cheerfully, which is not remarkable, given that these games were designed to be enjoyable and were not difficult to use. The information-gathering tasks carried out by the older classes were less playfully engaging, and were potentially more demanding, but the pupils proved to be highly adept in carrying these out, moving rapidly and confidently through teacher-designed tasks, generally working skillfully and productively together in pairs at a single workstation:

Boy: is the information up to date?

Girl: well it says on this 1509 so I wouldn't say that (.) is it official or unofficial (.) it's official

Boy: is it official (.) yes it is official (.) is the vocabulary easy to understand (.) yes

Girl: oh yes (.)

[...]

46:06 (she selects and scrolls through 'the ship' page)

47:20 (.. selects 'visiting' page)

47:49 (.. leaves her seat to get a worksheet of her own)

48:15 (.. returns to her seat)

48:54 (.. selects 'archaeological services' page)

48:59 (.. selects 'the ship' page, then selects 'introduction', 'dimensions' and 'the hull' links within 12 seconds)

49:31 (.. selects 'deck construction' link and scrolls through) no one wants to know that (.) can't say I'm amazed by the thought of Portsmouth

50:32 (.. closes down and straightaway re-opens Internet Explorer) oh dear (.) I just went off the Internet

51:24 (.. types in 'http://www.stvincent.ac.uk/WfS/Tourism/Portsmouth/HistShips/' from worksheet; page appears at 52:44)

53:05 (.. selects 'the Mary Rose' link)

53:59 Teacher: (off-camera to class) okay folks (.) sorry to stop you there (.) can you log off (.)

(Case Study 4)

These pupils managed this designated task with considerable skill and pace. There was no great engagement with the material, but then in this instance it was the process rather than the content that was important, and they carried out the process as instructed. They had no problems with the technology and, indeed, seemed to enjoy being in charge of it.

In the opinion of the teacher in Case Study 6, 'If we hadn't had this facility [broadband] there's also an issue with learning. I don't think as many of them would have been on-task' (post-lesson interview). This is the overriding impression we took from studying the ways in which the pupils worked in all the cases: they were on-task virtually all the time. Without exception, the pupils could easily meet the technical demands of the broadband-based activities and, as far as we could tell, nearly always followed the teachers' instructions (including the pupils who were not particularly conscious of being observed by us). The impression of the pupils being on-task is hard to resist when surveying a room full of active, generally self-regulating pupils working in accordance with the teacher's guidance and instructions in front of busy computer screens, even when coping with the potential frustrations of working in pairs:

Pupil 1: (selects Google)

Pupil 2: (types 'pointed arches' into Google)

Teacher: (to class) right you've got ten minutes (.) start saving

Pupil 1: (selects a website: the site is solely text-based)

Pupil 2: don't just copy and paste it all (.) I need to read it (reads the text for a few seconds before Pupil 1 scrolls down, making it impossible for Pupil 2 to read)

Pupil 2: okay I've (.) I've got enough stuff

Pupil 1: can you read it when I do this

Pupil 2: no I just thought of more stuff to write (Pupil 1 maximizes PowerPoint slide and Pupil 2 types)

(Case Study 5)

The video evidence does indicate, however, that the pupils' readiness and capacity to act in these responsible and semi-autonomous ways in carrying out their teachers' instructions when using the Internet did not necessarily equate with active learning of the intended subject topic. When it came to finding material from the websites, pre-selected or otherwise, we saw little evidence of careful reading and absorption of information by pupils. Rather, the pupils were generally prone to fast and relatively indiscriminate scrolling through Web pages, pausing momentarily at pictures, diagrams or photographs, and deciding within seconds whether or not to move on to another site. Although it often took on the appearance of constructive collaboration, the talk of pupils working together in pairs at the computer consisted overwhelmingly of reading aloud from websites, with one pupil dictating to another or simply talking off-topic. In effect, such collaborations worked well enough if the aim was to get a particular

job done quickly and efficiently. However, we saw little evidence of truly productive learning collaborations in which the pupils worked in partnership to co-construct their understandings of a topic.

The following extracts, from Case Study 6, vividly illustrate both the pupils' fluid facility with the medium and the tendency to engage only lightly, at best, with actual content. The first extract provides a vivid instance of the capacity to paraphrase at speed, which appears to be one clear skill-outcome of working with Internet material:<sup>4</sup>

Girl 1: (maximizes Google homepage) right teddy boys

Boy 1: (types) (both look at the text of a web page headed 'The Story of the Teddy Boy Movement' for over 4 minutes without speaking)

Girl 1: (alternates between Word document and Web site and dictates, Boy 1 types with occasional intervention from Girl 1) in the 1950s (.) a gang emerged (.) in London (.) called the Cosh Boys (.) they terrorized tee ee double ar (.) people (.) by fighting (.) by fighting with other gangs (.) and the police (.) and also (.) also committing robberies (.) the press needed (.) a new name for them (.) they decided on (.) they decided on (.) they decided on teddy boy (.) which eventually evolved (.) into (.) the teddy boys

Constructing and dictating text in this way is a valuable practical skill, but there is no evidence here that it relates in any way to the intended learning about the historical and cultural context of the events portrayed in the film they were studying. By the second lesson in the sequence, the pupils were becoming increasingly adept at getting this particular job done, as demonstrated by the following exchanges between a second pair of pupils:

Girl 2: (looking at worksheet) next we've got to look at (.) fashion (both spend over 5 minutes scrolling randomly through site, stumbling upon 1950s furniture before giving up)

22:07 Girl 2: why don't we try that Fifties website again (points to 'www.fiftiesweb.com' on worksheet)

22:35 Boy 2: (opens URL)

Girl 2: and then (.) fashion (points to 'fads fashion slang' link)

Girl 2: (reading sub-links) we'll do it for women yeah? Oh men's quicker.

[...]

26:34 Girl 2: now we need to do women

Boy 2: (selects women's hairstyles link)

Girl 2: (reading text) the Fifties look was usually achieved by an arduous process of pin curling and rolling. Remember—no blow dryers in the 50s. [...]

27:44 Girl 2: (highlighting the text) we should just copy that

Boy 2: (copies and pastes text)

Girl 2: (re-formats text)

29:31 Teacher: (to the class) right we've got ten minutes left (.) and I'm worried that a lot of people—

30:12 Girl 2: right we need to do like (.) fashion (pointing to links) dresses (.) skirts (.) blouses (.) pants (.) shorts (.) dresses

Boy 2: (selects 'dresses' link)

Girl 2: (reading text) Women dressed 'smartly' in the Fifties. Good grooming and a tailored look were prized. Acting [...]

Boy 2: so women dressed smartly—

Girl 2: just copy that (.) copy it (.) copy it all (laughing)

Boy 2: (copies and pastes and re-formats text) yeah that'll do

(Case Study 6)

There is, arguably, quite a complex combination of learning behaviours going on here. The pupils are, once again, unquestionably on-task throughout. They know the job they have to do, and they get it done, demonstrating expertise in using technology to locate and process information: they can move from website to website at considerable speed; they know how to look for the kind of material that the teacher wants; and they know how to transform text into their own words rather than just to copy-and-paste it (and if they do copy-and-paste, they know to reformat the text). They seem to like the freedom to get on with this work, in ways that do not appear to be at odds with what the teacher requires. But it is also evident that task completion is the prime goal, and if the task as constituted fails to establish a link between the scope of the Internet activity and the specific subject focus, then the evidence of these lessons suggests that the pupils were not motivated to seek such a link for themselves.

## **Conclusions**

The aim of this research was to look closely at how a widely varied sample of classes worked with high-speed and reliable Internet in lessons, in order to detect any significant patterns or understandings that might help to chart the best path through this transitional stage of the technology's implementation in schools. The key issues that emerged concerned: practical and logistical factors; pupils' orientations and skills regarding the use of broadband Internet in classrooms; teachers' developing practices in enabling young people to interact with this and other ICTs; and teachers'

assumptions about how young people learn with technology, which appear to underlie these practices. These in turn point to some potentially important areas for future research and development in order to help build on early achievements in classroom teaching using broadband Internet.

### **Practical and logistical factors**

Logistical and technical demands of using technology in schools continue to impinge heavily upon pedagogical and educational considerations, despite the many years that have passed since schools first began to incorporate educational ICTs into their mainstream provision. The single most important attraction of broadband Internet is that it is supposed to be fast and reliable, to the extent that technological considerations do not intrude upon educational purposes. Whilst a considerable number of technical problems occurred in the lessons we observed, the fact remains that broadband Internet did indeed work as promised: problems tended to be with the management of school networks and systems, rather than with the larger Oxfordshire schools network. This is a significant achievement, and provides good reason to suppose that the present transitional period of the technology's implementation—with all its many but generally minor frustrations—has a real prospect of evolving into the kind of steady-state usability which will mark a step forward in how we view and use technology in schools.

### **Pupil orientation and skills**

Pupils generally welcomed the opportunity to work with the Internet, and carried out tasks confidently and inventively when asked to do so. They valued the relative freedom of managing this work for themselves, although perhaps more for the reason that they found it congenial than because they found it stimulating. The evidence of these studies does suggest, though, that we should not infer from the pupils' capacity to use the Internet for specified tasks in this way that they will necessarily become adept at using the Internet for the teacher-directed learning of content they have not themselves chosen to learn. This is a very different matter from the kind of informal self-directed learning using technology and the Internet that many young people are known to engage in away from school (Furlong et al. 2003).

### **Teachers' assumptions about how to help young people use technology for learning**

Without exception, the teachers we observed had approached the use of broadband Internet in their subject teaching with notable care and forethought. The approach, at this early stage of using the technology, was to leave little to chance: they invariably reviewed and selected educational online games or relevant websites in advance of lessons, and devised clearly structured activities and lesson plans within which these would be used. This occurs within a heavily prescribed and monitored educational climate in which learning activities and intended outcomes are generally planned in considerable detail.

The teachers had every right to be satisfied with the fact that their pupils managed, willingly and often skilfully, to carry out the specified learning tasks. Given the almost inevitable occurrence of practical and logistical problems, this was a major

achievement in itself, in that it provides evidence and experience of the technology's usability in classrooms. This must not, however, distract us from the possibility that the learning tasks were not actually leading to serious or committed pupil engagement with the intended learning, which generally appeared to be quite superficial.

The evidence of our observations suggests an underlying assumption by many of the teachers that willing interactions between pupils and the powerful resource of the Internet are in themselves somehow going to result in substantive learning of subject content. Bound up in such assumptions, we are likely to find the conceptions of young people as generally computer literate, and conceptions of technology as both powerful (which goes with being difficult to use) and inherently motivating to young people, so that some kind of synergy between learner and technology takes place when the two are brought together in classrooms. This is clearly not always the case in reality.

Teachers need to have the opportunity (especially by adopting the perspective of practitioner–researcher) to stand back from simply making sure that nothing goes wrong in ICT-based lessons, in order to study closely what kinds of sense their pupils are actually making of the learning activities and material that broadband connectivity affords them. This kind of closer study of what pupils are actually doing when they are apparently working in productive ways with technology is, we believe, essential if teachers are to make appropriate decisions about how to set up and guide learning experiences that utilize broadband Internet—as well as wider uses of technology.

In doing so, the question of deploying this technology towards the goal of enabling a greater degree of independent and active learning constantly comes into play. There are significant choices to be made which potentially have major implications for how we conceptualize learning in schools.

If the role of technology is to service existing configurations of classroom teaching and learning, then the evidence of this research shows that broadband has considerable potential. In order to realise this, however, teachers will need to plan their uses of it even more carefully than in the instances reported here, taking full responsibility for accessing suitable and relevant material, and working out with great clarity what pupils must do with that material in order to learn from it.

On the other hand, if we prefer to envisage a very different kind of schooling in which learners are empowered—particularly through their interactions with technology—to conceptualize and operationalize their own learning to a far higher degree than is currently considered either possible or desirable in the context of curriculum-driven classrooms, then increased teacher-direction of these processes is not the answer, or at least not the only answer.

The cases reported in this study suggest that either approach will benefit from a closer understanding—especially on the part of teachers themselves—of what is happening when pupils work with technology in classrooms. The evidence of this study suggests that its most effective uses must be discovered and refined through research-based exploration and experimentation in practical settings, in collaboration with or led by practitioners. Broadband Internet is a powerful and attractive resource, but its widespread availability does not in itself engender desirable practices in the classroom.

## Key research and development issues

We end with the following attempt to clarify what we believe to be the key issues for further research and development, in order to transform the impressive early achievements we have observed into forms of long-term practice that are both sustainable and worth sustaining.

First of all, we urgently need to develop and test effective models of Internet skills education, both for teachers and pupils. In particular, strict principles and guidelines for selecting, evaluating and making use of Internet-accessed material also need to be understood and enforced in order to ensure a high quality of learning.

We should question the assumption that this resource relates equally well to all kinds of knowledge—there is rich scope for empirical research into the relevance of this medium to the learning of different kinds of subject matter.

There is a particular and urgent need for teachers and researchers to focus on the empirical questions of how exactly pupils enact typical classroom Internet tasks, and the ways in which these do or do not result in the intended curriculum learning.

It is important also that the previous perspective is theorized in relation to competing conceptions of school-based learning, and the extent to which technology may or may not facilitate a more significant role for pupils' own informal and self-directed learning capacities in school work.

Finally, we must continue to seek out and disseminate instances of more creative uses of the Internet for learning than are represented in what we suspect are the fairly typical instances examined here.

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## Notes

<sup>1</sup> [www.bbc.co.uk/schools/wordsandpictures/cvc/crank/game.shtml](http://www.bbc.co.uk/schools/wordsandpictures/cvc/crank/game.shtml)

<sup>2</sup> [www-oi.uchicago.edu/OI/MUS/ED/kids.html](http://www-oi.uchicago.edu/OI/MUS/ED/kids.html)

<sup>3</sup> [www.brainpop.com](http://www.brainpop.com)

<sup>4</sup> The pupil is paraphrasing the following source text, which is presented here verbatim: 'All began in the early 1950s in England. Some teenagers gangs appeared in the East End of London; they were called the Cosh boys. It was very easy to recognise them. They wore a very special rig: long jacket with velvet collar and cuffs drain-pipe trousers like under the reign of Edward VII (1901–1910), bright ankle socks and slim Jim tie. Their hair were 'long' and greased. These Cosh boys terrified the English society: razor attacks, fights between gangs but also against the police, robberies ... After the Second World War England woke up with an headache! Press needed a new term to describe these gangs which number increased each day? The word chosen was Teddy Boy(s) and Teddy Girl(s), Ted(s)' Available at: [www.rockabilly.nl/cavan/teddyboys.htm](http://www.rockabilly.nl/cavan/teddyboys.htm)