

Are we there yet? Teachers, schools and electronic networks

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The ‘Learning How to Learn’ project of the ESRC Teaching and Learning Research Programme engaged teachers from primary and secondary schools in the UK in development and research of practice related to ‘assessment for learning’ between 2001 and 2005. As part of the project, we were concerned to discover what factors encouraged the development and sharing of practice within and between schools, including the use of electronic networking. A range of data about the use of electronic networks, tools and resources was collected through: a survey of over 250 teachers; an audit of participating schools’ IT infrastructures and available resources; semi-structured interviews; and a novel ‘network mapping’ task. We discovered that while use of IT is now a well-established element of classroom practice, teachers made less use of electronic networks to develop their professional practice, even when their schools were part of networks designed to support them in so doing. Despite a range of barriers to the development of IT in teachers’ practice, the overall impression presented by the data is one of optimism as to what new technologies can offer and a sense that while the journey may be onerous the benefits will make it all worth while.

Keywords: Educational technology; Information technology; Knowledge exchange; Networks; Teachers’ professional learning

Introduction

‘Learning How to Learn—in classrooms, schools and networks’¹ is a project of the ESRC Teaching and Learning Research Programme which ran from 2001 to 2004 and involved teachers and pupils from 40 schools across six local authorities (LAs) and a Virtual Education Action Zone (VEAZ). The focus of the project was the development and research of ‘assessment for learning’ practices (Black & Wiliam, 1998) in a range of educational contexts ranging from small primary schools to large secondary schools, some of which were parts of ‘Networked Learning Communities’ and six of which were members of a ‘Virtual Education Action Zone’. The project was concerned to explore the nature of ‘learning’ at three levels (James *et al.*, 2003;

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James *et al.*, 2006a); this learning concerned learning how to learn practices. The first level was the learning of individual pupils and teachers; second, the idea of the school as a 'learning organization'; and third, the emerging idea that 'networks' are the location of the collective, distributed knowledge of a broad community of practitioners. One of the key research questions at the 'network level' of this project was: 'How can the knowledge and skills of learning how to learn be effectively created, managed and transferred within educational networks?' Subsidiary questions were concerned with the nature of variations in network structures, technologies and operation in ICT-rich learning environments, and the combinations of organizational and technological factors which maximize the potential for generating and transferring teachers' knowledge and skills. We developed a series of research instruments to produce a picture of the infrastructural and organizational conditions in participating schools, and to explore the extent to which teachers were already participating in intra-school and inter-school networks. More broadly, we were concerned to discover how the provision of network structures might contribute to the development of a networking culture in which collaboration, sharing and innovation were facilitated—in this respect mirroring other project concerns with the organizational factors which supported innovation and cultural change (see Swaffield & MacBeath, 2006, for a discussion of this issue in a broader project context). At the same time, our interview data, in particular, were used to illustrate how varied the conceptions and perceptions of networks were among our participants, and how important informal and personal links were in developing inter-school networks and informing practice (Carmichael *et al.*, 2006).

What this article presents is a picture of a range of primary and secondary schools in a key period of transition in that staff had recently been trained in the use of new technologies, significant infrastructural improvements had taken place, and the policy context—particularly around teachers' professional development—was stressing the role of networks not only as an outcome of professional development but also as the means by which it might take place. At the same time, we did not explicitly set out to address issues of teacher competence and confidence in the use of new technologies, although we were conscious that many of our participants had recently completed New Opportunities Fund (NOF) training or had experienced the recently reformed Initial Teacher Training National Curriculum with its competence-based ICT element; some participants reflected on these issues in subsequent interviews.

Our research instruments included a *survey* of 269 teachers across 11 schools; an *audit* of ICT deployment within 15 schools (including the 11 surveyed); *semi-structured interviews* with head teachers and the individuals appointed within each school to coordinate the project; and a novel *mapping task* designed to explore participants' conceptions and perceptions of personal and institutional networks. This latter task is fully described in Fox *et al.* (2005) and the analytical framework used in Carmichael *et al.* (2006). This article presents some of the data collected using these instruments, and it utilizes the qualitative data to illuminate and expand upon that collected using the survey and audit instruments. The question of how teacher knowledge and 'best practice' can be transferred in general has been widely

discussed (see, for example, Hargreaves, 2003; Fielding *et al.*, 2005) and, while our primary concern was with the conditions that would contribute to the transfer of specific knowledge (about ‘assessment for learning’ and ‘learning how to learn’), the findings reported here are potentially significant for all aspects of teacher knowledge and its creation, sharing and transfer.

Survey data: ICT support for classroom learning and teacher development

Our survey sample comprised 127 secondary teachers from three schools, each in a different LA (but of which two were members of the same VEAZ) and 142 primary teachers from nine schools drawn from six LAs (of which four were members of the same VEAZ). One of the LAs involved was a National College for School Leadership ‘Networked Learning Community’, with all schools participating in at least one network supported by the LA (see Carmichael *et al.*, 2006, for a fuller account of some of the network activities in this LA). In both secondary and primary schools female staff made up the majority of our respondents (65% in secondary and 93% in primary). Respondents ranged from newly qualified teachers to those with over 20 years’ experience (24% in secondary schools and 23% in primary schools), and while the majority (58%) had no special responsibilities, the sample included teachers at all levels of management in their respective schools. The schools in the sample included some large and multi-site ones, one of the secondary schools having a roll of over 2000 and one primary school roll being nearly 900. We asked participants to report on their access to computers; the frequency with which they undertook a range of tasks and the confidence with which they did so; and the use they made of online resources in supporting their classroom practice and professional development.

Access to computers

Most teachers had access to computers both at home and at school (71% secondary and 78% primary) with the vast majority of these being connected to the Internet. There was a significant difference² between the 15% of secondary teachers and the 4% of primary teachers who reported having no access to computers at school. This is probably a reflection of the greater number of primary teachers who are based in a single classroom within which there is a computer to which they have access: 59% of primary teachers reported that the computers they ‘usually used’ were in their classroom compared to only 41% in secondary schools. In the secondary schools, as the IT audit will show later, there were certainly large numbers of computers available, but these may have been deployed in IT suites and other locations which made them less accessible to individual teachers. This was confirmed by responses when teachers were asked to rate their ‘ease of access’ to computers at school: 85% of primary teachers reported that this was ‘very easy’ compared with only 72% of secondary teachers.³ Fabry and Higgs (1997) suggested—even before recent increases in the numbers of computers in schools—that ‘access’ was more important

than actual numbers of computers and Cuban *et al.* (2001) go further and suggest that the current organization of schools with their ‘cellular’ structures actually precludes the integration of new technologies and innovative practice, a factor also pointed up in the recent Becta survey of barriers to uptake of ICT by teachers in England (Becta, 2004). Whatever the patterns of access at school, the majority of teachers in both primary and secondary schools (60%, with no significant difference across school sectors) reported that they carried out the bulk of their computer-based professional work at home, an important point given that several authors (Cox *et al.*, 1999; Ross *et al.*, 1999; Guha, 2003) have argued that personal access to computers is a major contributor to improved teacher confidence and use of ICT in school.

Activities using computers

We asked our participants to report on the frequency with which they used computer applications ranging from word processing to multimedia authoring environments, and Internet services and resources. Selected results are shown for secondary teachers (Figure 1) and primary teachers (Figure 2), and a number of issues emerge. The majority of teachers reported using word processing and email, and searching the World Wide Web for information, on a daily or weekly basis, with less frequent use of the web as a source of materials for download.

Much less common (the most common responses being ‘never’ or ‘termly’) were activities in which teachers were authoring their own presentations, web resources or multimedia content. Regular participation in online discussion was confined to a minority, 75% of secondary and 83% of primary teachers reporting that they ‘never’ took part in such activities. This pattern suggests that, rather than characterizing

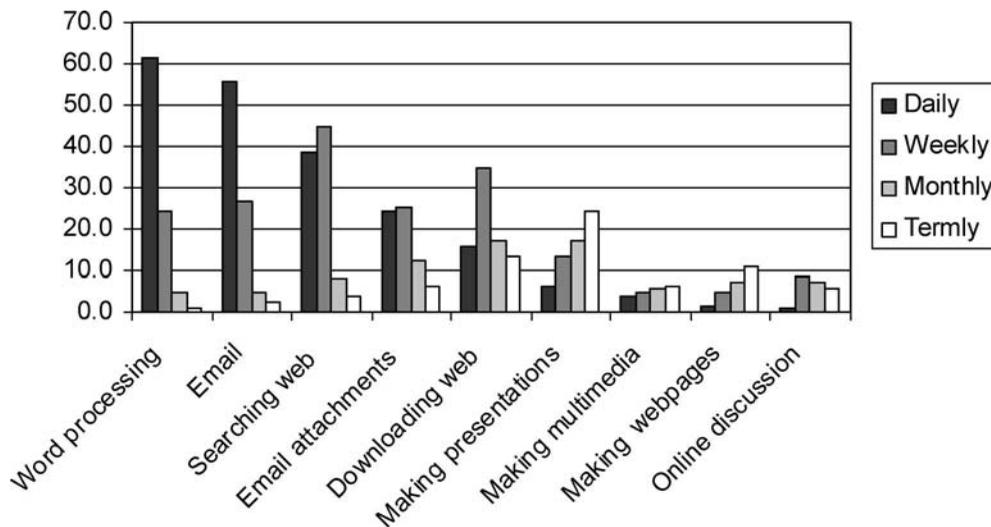


Figure 1. Activities using computers: percentage of secondary school participants reporting frequency of selected activities

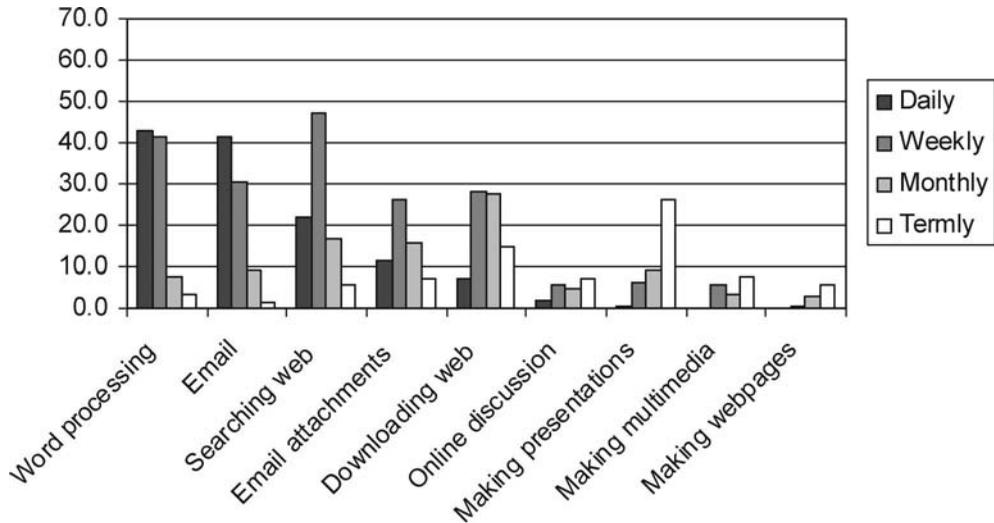


Figure 2. Activities using computers: percentage of primary school participants reporting frequency of selected activities

teachers collectively as, for example, network ‘users’ or ‘non-users’, they are using a set of technologies, some of which by definition (email, searching the web) involve using electronic networks, and others which are principally concerned with personal productivity and the development of classroom resources. With a low number of teachers reporting involvement in online discussions, it was becoming evident that teachers might be engaging online primarily with *resources* rather than other people.

Use and contribution of online resources

We asked our participants to what extent they used online resources in their classroom practice and professional development and what these were; the most common kind of online resources used were what we described as ‘lesson resources’ such as images and texts (see Figure 3). The impact of complete schemes of work being made available at the DFES Standards Site (<http://www.standards.dfes.gov.uk/>) and by local authorities was particularly evident, with primary teachers in particular visiting these sites ‘monthly’ or ‘termly’ to download such resources. Another pattern (more common among secondary teachers) was the identification of useful websites (not simply resources), suggesting that pupils are being directed by teachers to useful sources of information and learning resources. Most striking, however, was the smaller proportion of teachers in both secondary and primary schools who reported using online sources of information about teaching techniques, an issue to which we will return later.

The sources of these materials varied widely from the local (school and local authority) to the national (for example, Department for Education and Skills and TeacherNet (<http://www.teachernet.gov.uk/>)). With schools in receipt of E-Learning Credits (ELC), commercial providers (see <http://www.curriculumonline.gov.uk/>)

were also a major source of lesson plans, schemes of work and other resources. New and existing community resources were also cited, with subject associations and a number of teacher-run websites providing largely low-cost or free resources (see Figure 4).

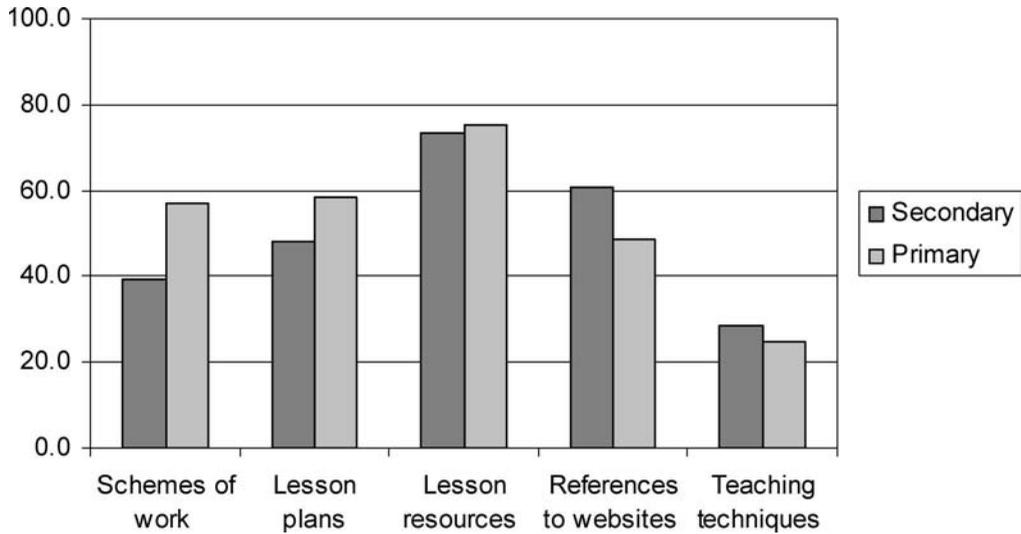


Figure 3. What electronic resources do teachers use? Percentage of participants who reported using different types of online resources

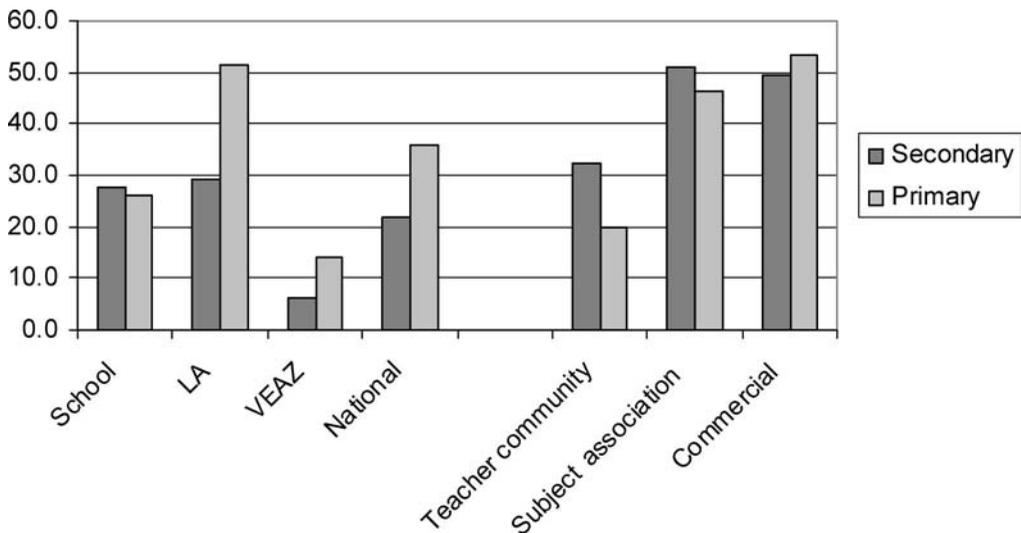


Figure 4. Online providers: percentage of participants reporting use of different online sources of information

Having established patterns of online resource use by participants, we were also interested to discover whether they also *contributed* to resource banks, websites or digital repositories, a key feature of the ‘epidemic’ suggested by Hargreaves (2003). The numbers of participants who had contributed resources (mainly lesson plans and schemes of work, with smaller numbers of other resources) were very small and the only sites to which more than 3% of teachers reported submitting materials were their own schools (9% in secondary and 3% in primary) and teacher-run community websites (4.7%, only in secondary schools). Responses indicated that this activity largely involved individual teachers, with little evidence of the ‘whole-school approach’ to sharing resources identified as important by Scrimshaw (2004, p. 5).

Communication with other schools

The one network technology that appeared to have become embedded in the daily lives of many of our participants was email, but once again we were interested to discover to what extent this and other technologies were used to communicate with teachers *in other schools*. While one-to-one means of communication (telephone, email and SMS text messaging) predominated (see Figure 5), this belies a wide variation across schools and between individuals; a small number of individuals reported regular use of online discussion groups or email lists (identified by Scrimshaw, 2004, as providing opportunities for dissemination of good practice, development of confidence and motivation, and better access to resources and research). For all of the media featured in Figure 5 the modal reported frequencies were ‘monthly’ or less frequent, suggesting minimal school-to-school contact for most staff, even where

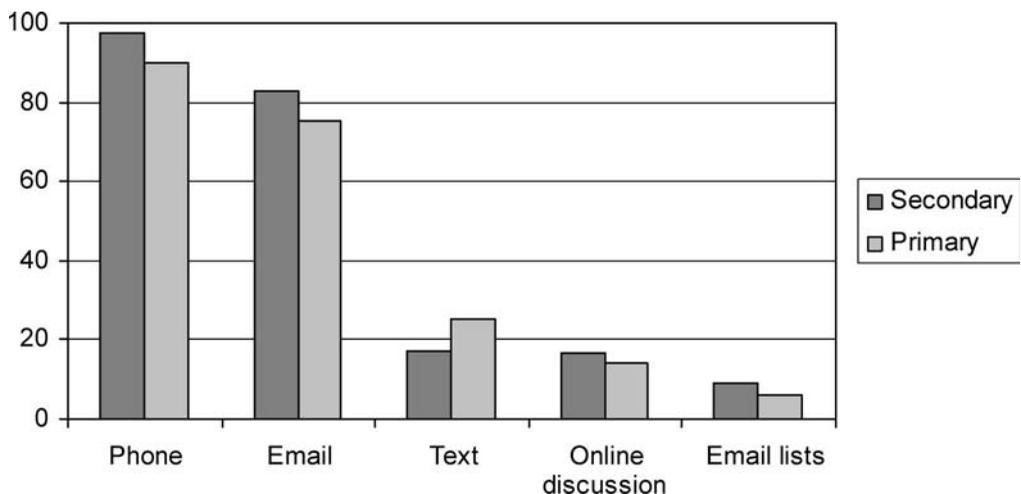


Figure 5. Percentage of participants using means of communication with teachers in other schools

their schools were members of a defined network such as a Networked Learning Community or Virtual Education Action Zone.

A final note on the survey data

One final set of responses is of note: we asked two very broad questions about ‘how positive’ participants felt about the use of ICT. While 47% of teachers described themselves as ‘very positive’, with a further 44% ‘quite positive’ about the role of ICT in the classroom, with no significant difference across sectors, their view of its role in supporting their professional practice was even more positive: 60% were ‘very positive’ with a further 29% ‘quite positive’ (once again without significant difference between primary and secondary school participants)—this despite the fact that only a minority had reported using networked resources in support of professional development. These largely positive attitudes were to provide an interesting backdrop for our subsequent, qualitative enquiries in schools, and encouraged further exploration of the perceived and realized benefits which might be contributing to this generally positive disposition.

The ICT audit: the institutional context

In order to supplement and triangulate the patterns we had observed in the survey, we also asked appropriate participants in each of the schools where the survey had been administered to complete an audit in which they reported numbers of computers, patterns of deployment and access, and the use made by teachers of electronic networks. We also received audits from another four schools (two primary schools and two secondary schools) from the participating LAs mentioned above. Our initial points of contact for this audit process were the project coordinators in the schools, with information being provided by ICT subject coordinators and in the larger schools by ICT managers or network managers.

Table 1 shows the numbers of computers in the sample primary schools compared to the DfES survey for England for the year in which the data was collected (DfES, 2003). In this respect the schools are broadly typical of the national picture, although the schools in the VEAZ had a smaller pupil–computer ratio than the other schools in the sample. National patterns were also reflected in that, while all schools reported

Table 1. Number of computers: primary schools

	<i>Mean computers per school (range)</i>	<i>Mean pupil/computer ratio (range)</i>
All project schools (n = 11)	43.0 (24–81)	8.9 (5.1–13.2)
VEAZ project schools (n = 4)	43.8 (27–75)	7.1 (5.1–9.3)
Non-VEAZ project schools (n = 7)	42.6 (24–81)	9.9 (5.8–13.2)
All England schools	29.8	7.9

having a computer suite, single computers or 'clusters' were also to be found around the school. School-wide networks were also reported in about half the sample schools—once again, with the VEAZ schools having more networked computers than others.

In secondary schools (Table 2), the small number of schools in the sample ($n = 4$, following the exclusion of one unreliable data-set) makes comparisons difficult. Three out of four schools had lower pupil-computer ratios than the national mean, and the secondary school in the VEAZ had a very low pupil-computer ratio: less than two pupils to a computer, with school networks connecting around 650 computers. Whole-school networks were reported in all schools, with computers being located in suites, libraries and resource areas, and in subject areas.

The drive to connect all schools to the Internet and to provide Internet access at classroom level in schools was reflected in the number of computers which were connected not only to a school network but also to LA and regional 'Grids for Learning' and to wider networks. Table 3 shows how the schools compare to the national mean; once again, the VEAZ schools were well equipped in this respect, the difference being particularly marked in relation to primary schools.

The presence of Internet connections in ICT suites, teaching areas, libraries and staff rooms clearly offered both teachers and pupils access to a range of resources (although it is worth recalling secondary teachers' less easy access). However, according to the audits, the majority of use by pupils was for accessing the schools'

Table 2. Number of computers: secondary schools

	<i>Mean computers per school (range)</i>	<i>Mean pupil/computer ratio (range)</i>
All project schools ($n = 4^*$)	479.5 (334–648)	3.0 (1.8–6.4)
VEAZ project schools ($n = 1$)	648	1.8
Non-VEAZ project schools ($n = 3$)	423.3 (334–639)	3.7 (2.1–6.4)
All England schools	192.7	5.4

Note: *One secondary school audit had unreliable data on this question.

Table 3. Internet-connected computers

<i>Sector</i>	<i>Sample/comparator</i>	<i>% Computers with Internet connection</i>
Primary	All project primary schools ($n = 11$)	81.6
	VEAZ project primary schools ($n = 4$)	96.6
	All England primary schools	70.9
Secondary	All project secondary schools ($n = 4$)	97.5
	VEAZ secondary schools ($n = 1$)	100.0
	All England secondary schools	86.4

own websites and intranets, with less use of external sources, including commercial providers. While some teachers made use of national organizations' web content, the local authorities remained the most common source of content from beyond the school itself. The VEAZ had yet to establish itself as a source of content for teachers or pupils, with all the audits from schools in the VEAZ stating that their respective LAs were more common sources of online content.

We also asked participants to rank the 'importance' of different modes of communication used *within* the school, in order to explore the comparative importance of electronic and other means of communication. Aggregation of these rankings provided the ranked lists in Table 4, with the top six modes presented in each case.

Differences between primary and secondary schools are probably attributable to size and dispersal, telephone and email being more reliable means of contacting staff than relying upon face-to-face contact across large multi-site schools. Primary schools, perhaps because they characteristically have a single staff room, were reported as using notice boards more than secondary counterparts. It is worth reiterating that all of the primary schools were large ones, with rolls of 300 or more, and one having a roll of nearly 900; different patterns might be evident in the case of smaller schools.⁴ Some schools had specific patterns and procedures—for example, senior staff and premises managers being equipped with pagers or mobile phones so they could be reached in emergencies.

Even though the prompts in the audit item included 'email', 'group email' and 'web-based discussions', these were, in the majority of cases, not highly ranked. In one case, however (the secondary school in the VEAZ, which had nearly 650 computers and all staff equipped with wireless laptop computers), email was ranked above all other modes of communication. However, despite the potential for much communication to take place over the school wireless network, the school continued to hold daily staff meetings prior to the beginning of the school day.

The picture which emerges from both the audit and the survey is one of communications within and between schools remaining dominated by face-to-face interactions, paper-based means of communication such as memos, newsletters and notices, and telephone conversations. This accords with data gathered through the mapping task and its associated interviews (Fox *et al.*, 2005) in which email and other electronic tools were reported as playing a comparatively minor role overall, or were

Table 4. Rankings of modes of communication (highest ranked items at top)

<i>Secondary schools</i>	<i>Primary schools</i>
Meetings	Meetings
Telephone	Informal face to face
Memos	Notice boards
Individual email	Memos
Newsletters	Newsletters
Informal face to face	Individual email

used in support of other modes of communication. As one respondent from a primary school reported, while in her school other modes of communication were important, it was ‘word of mouth [that] links it all together’.

Interview and mapping task data: realities, possibilities and barriers

The realities of access to, and use of, networks that the survey and audit identified raised some important issues for the research agenda of the ‘Learning How to Learn’ project, and challenged some of our early assumptions as to how easy it would be to identify and describe instances of innovation, collaboration and transfer of practice. We approached the collection and analysis of qualitative data with a concern to explore the patterns revealed in the survey; to discover whether barriers to wider adoption (of ICT for professional development purposes, for example) were technological, organizational or social; and to illuminate the differences between the largely positive attitudes towards the use of ICT and the apparently low levels of use for school-to-school networking and professional development. What emerges from these data, as we will show, is a picture of teachers and school leaders responding to a rapidly changing environment in which concerns about infra-structural development and staff training in ICT that had dominated the previous four years were now compounded by a drive to engage schools and staff in organizational change and network building.

The data we present here are drawn from interviews with LA coordinators responsible for clusters or schools or with authority-wide responsibilities, head teachers and school coordinators, most of which were focused on the network mapping task described in Fox *et al.* (2005) in which participants were encouraged to represent and describe their personal and organizational networks. They are presented here under three headings: *realities*, *possibilities* and *barriers*. While some of the discussion was concerned with classroom practice and the role of ICT in children’s learning, we have concentrated on those that are concerned with practice and professional development.

Electronic networking within and between schools: realities

Our participants confirmed that electronic communication largely supplemented and in some cases replaced ‘traditional’ approaches, rather than transforming working practices or relationships. Email, in particular, provided an alternative to the telephone, with the added benefit of providing an ‘audit trail’ or record of interactions:

We use e-mails in particular to communicate with our schools, although, if it’s a quick answer to be gained, obviously the telephone is used but we often use e-mail. (MH)

Email is a great way of recording informal conversations and actually ensures they elicit a response sometimes, because I find that with telephone systems you can have barriers put in your way and you can also forget what was said in the conversation. As you [interviewer] arrived now I was engaged in emailing a service contract that we have here.

I have had no joy through the traditional ringing of them so I am informing them by email and I want a response from it. (TH)

LA respondents were particularly enthusiastic about the use of email as a means of disseminating information to schools, but recognized that some schools were still more likely to respond to paper communication:

We are tending now to make more and more of our communication to schools electronic, although that at the moment has its own problems because of its differential axis. We are finding some things we think schools have received have not necessarily been received so we are tending to do some duplication so this would also have links to paper copies, hard copy, but not anywhere near as much as we used to. . . . I would also follow through with paper copy, letters, simply because I know that is the way that they tend to access things. (TG)

School-to-school email links were less well established, the above LA advisor stating that of a group of seven schools, 'three or four' would 'send email backwards and forwards' (TG). Of those links that had been established between schools, many had come about through initiatives such as National College for School Leadership courses for head teachers and the Learning How to Learn project itself, and on the whole reflected person-to-person links between individuals, rather than more formal, institutional connections.

This limited engagement was paralleled in other areas where network technologies had potential application, such as contact with school governors, community groups and parents. Some head teachers described how email had become a valuable resource in supporting the work of the governing body, 'sending out reports, minutes, things requested, and so on' (AW). However, despite some of the schools providing information via websites and email addresses to parents, there were few accounts of protracted home-school liaison using electronic modes of communication:

I would say out of the 260 kids in the course of an academic year we may get emails from round about 20 parents maximum. They tend to be seeking clarification on dates or giving a reason why a kid won't be in school etc. We still have a fair percentage of parents who are not actually email clued up basically. (TH)

Many of the schools involved in the project had websites, with the majority of these being mainly concerned to provide information about the school (including excerpts from recent inspection reports) and, in some cases, curriculum support to pupils and parents. There were some examples of schools where the development of school intranets with curriculum content and the installation of electronic whiteboards were accompanied by increased use of external networks giving access to the LA and commercial providers:

I've just put interactive whiteboards in every classroom so we're going very high tech, which sort of leads onto an outside network because we're going to be an e-learning school. (MD)

NCSL-funded Networked Learning Communities and the VEAZ also had websites and the LA 'Grids for Learning' were also described as 'a fabulous resource' to which 'teachers should go' (MD). Where schools had developed high quality web content—particularly for primary school 'topic work'—these tended to be visited both by teachers and children, either directly or via the local Grid for Learning.

Some network coordinators encouraged the use of electronic means of communication by offering no alternatives, and argued that this was effective in identifying key individuals on an 'opt-in' basis:

the biggest response was by putting the basic information onto the Zone's [VEAZ] website and then emailing all of the schools, heads and coordinators, and saying to them, 'If there is anybody in your school whom you know of who is interested in this, can you get them to look at the information that's on the website? If they are still interested in taking something forward, can you email me back with names?' (PL)

We do not email agendas, we don't post reports, what we do is make them available as a download from the website and say, send...an email saying it's available on the website. (PL)

Electronic networking in and between schools: possibilities

Our respondents identified a number of areas where new technologies offered potential for development. Of these, some were couched in broad terms while others were related to what Norman (1999) would describe as very specific perceived 'affordances'. In some cases, the introduction of new technologies was an integral part of a broader strategy to change practice and approaches to teaching and learning. This was particularly the case within the Networked Learning Community schools in which, while new technology was seen as important, the focus was improved classroom practice.

One area of potential development was *effective dissemination* (subject, as in this case, to infrastructural development):

it's not connected with anything yet, but it's in place, if not being used. But, of course within that email link would be a link to the partnership [between primary and secondary schools], and a link internally to things like staff rooms and notice boards. So I suppose it would be possible for me as [network] co-leader to put an email message into every staff notice board. (AH)

Technologies which allowed dissemination from the top down were also identified as having the potential to *establish and enhance school-to-school links*, with potential impact on classroom practice:

What we want to try and do is actually get those schools talking to each other more electronically. . . . What I would like to do at that meeting is to set up . . . that would begin email communication, so that they keep in closer contact with each other. (TG)

This comment is of interest because the LA coordinator involved saw her main role as ‘brokering’ links between schools, facilitating initial meetings and then encouraging staff in schools to maintain contact with each other.

Such links (once again subject to technological issues, of which more shortly) were seen as having the potential to impact directly on classroom experience by involving pupils, or by encouraging teacher innovation in teaching and learning:

[I am] just starting up a web-streaming teacher innovation [that] allows the school to create its own virtual television station via the web, which then allows communication between schools. (AW)

We’ve got various strategic plans to develop that in terms of making more use of email conference groups and other things on that side of it and in relation to the children, video-conferencing as well for linking up . . . particularly in some of the smaller and larger schools so that there can be a sharing of professional expertise and opportunities to access areas of teaching and learning that may not be available within their own schools. (JH)

There was also a view that the parallel development of new technologies across schools and other agencies offered the potential for *convergence*, of both systems and technologies:

once we start getting into video conferencing, I think that . . . I mean these sort of things coming together, these are Open College Network, Network [Learning] Community and being a partnership and so forth, I think there’s some kind of happy coincidence with all these things merging . . . we can have phone traffic, voice-mail traffic and video traffic and email traffic going down the tube. (MS)

Electronic networking in and between schools: barriers

Respondents identified a range of barriers to the wider use of ICT, or its having wider and lasting impact on practice. One set of barriers and obstacles related to the experience, competence and new ways of working demanded of teachers and LA staff as they integrated new technologies into their practice. Despite New Opportunities Fund training (of which respondents appeared to have had mixed experiences), provision of laptop computers for staff in many schools and increased ICT use generally, some respondents reported problems related to their level of experience or that of their colleagues:

The website domain name ran out, the registration ran up to the beginning of July and the website was taken offline by the host. And it was only phoned up, I started in September, but I was working over the summer on it, I phoned towards the end of August and said, ‘Well, do you know why I can’t get on the website this afternoon?’ It was only at that point that anybody working within the project knew that the website wasn’t online. And yet it was supposed to be the most active period of the whole thing. (PL)

Using email and web-based discussions were seen as valuable but additional responsibilities, and respondents described how they had to devote extra time to using

electronic communications, confirming the picture of tools such as email supplementing rather than replacing other modes of communication. One respondent, who had a network coordination role in addition to her school post, reported a range of communication methods used which highlighted the extra demands on their time of maintaining electronic links, including those with higher education institutions and the 'Learning How to Learn' project itself:

So there's phone contact, email contact with schools, [and] participation in conferences . . . there's critical friend and network leader support and that's been done mainly by email and meetings . . . I've got a Grid for Learning website which I've just got. I use email at home because I don't have time at school. (JH)

The model of an 'epidemic', in which resources and examples of practice would be exchanged via 'electronic hubs' (Hargreaves, 2003), was seen as unrealistic and overly demanding of teacher time. One participant explained the disparity between the numbers of teachers reporting downloading resources in the survey and those contributing them:

they're launching the . . . website and if everybody puts something on 'Won't it all be wonderful?' So we were all sitting there saying, 'Yeah, it's all very well, but when are we meant to have a life?' You know you can't spend all your time feeding into websites and accessing information off websites; you'd never do anything else but you would sit in a dark room with a computer all the time. (MD)

Despite the potential role of websites as sources of information and of 'best practice', these concerns, together with technical and time demands of maintenance, meant that in some cases their promise was unfulfilled:

the website hadn't changed for over two years, and there wasn't a single example of a report or case-study of good practice that was on there anyway. (PL)

In some cases specific issues related to the quality of ICT infrastructure—sometimes at school level, but more commonly at LA or network level. Several LAs had established extranets and local 'Grids' providing access to shared resources, but the email services intended for use by all staff were widely perceived as inadequate and frustrating:

We've got an intranet system for communicating between schools, and well everybody else really, that has to go up to County Hall by the intranet to be filtered and then come down. So it can take four or five days for an email to come sometimes. (TG)

Email probably takes up to three days, but you can come back with something on the telephone quicker. (AW)

Problems were attributed to poor management, poor choices of platform and poor standards of interoperability between Management Information Systems, school and LA networks, and other systems and resources:

Apparently when it first went out to tender, when it was first set up, according to the people now it wasn't very well handled. So they had lots and lots of different technologies all going on at the same time and we're in a situation where they don't talk to each other. (TG)

A relatively simple thing such as a video conferencing, where you have got incompatible systems so it doesn't work. (TH)

They don't track through the students at the FE college from secondary school level, that's not on their database, we cannot... get any view about the extent of what we're doing having an impact on widening participation into higher education. (PL)

It is very important to recognize that many of the above barriers were not seen as insurmountable or inevitable: teachers used their own 'webmail' accounts to circumvent slow LEA-provided email; new funding opportunities were used to employ web developers; and training was provided for teachers and other staff. More difficult to address, however, were matters broadly concerned with school and organizational cultures, and the issue of whether ICT was, in fact, a poor substitute for more established approaches. Those who already had access to person-to-person networks tended to view email, for example, as slower and less effective than telephone or face-to-face contact, one head teacher commenting:

I could have got the information I needed quicker off the phone, and the contacts I've got as a head, than going through the Internet. (MD)

The chair of governors I telephone fairly often, you know, if I'm not sure he's going to answer my email quickly or if I know he's just round the corner I say, 'Hey, get in here fast'... other professionals, likewise, if it's to fix up a meeting or something and we want to compare diaries straight away, you know, emails probably take up to three days but you can come back with something on the telephone quicker. ... If I've got a complaint I'll tend to want to phone them up because an email doesn't necessarily carry what I want... or vice-versa, you know. (AW)

The existence of established channels of communication, and the lack of necessity to open any further ones, may go some way towards explaining an observation made by Fox *et al.* (2005) in their review of the nature of links made by head teachers and school coordinators within the project. The school coordinators reported greater use of electronic communication than the head teachers, which may reflect their lack of access to telephones and time to meet during school hours, and thus a greater reliance on asynchronous modes such as email. For the head teachers, email was sometimes redundant and inferior to other communication; for the school coordinators it allowed participation in networks to which they might otherwise have been denied access. Of course, when head teachers needed to contact other members of staff with teaching responsibilities, the asynchronous nature of email allowed contact to be maintained:

e-communication is very effective when we're talking about networks. But when I'm talking with [the school coordinator, a deputy head], it's very, very easy for us to do that, because the chances of catching each other on the phone are limited. (AS)

On the whole, however, resistance to reduction of face-to-face contact is evident in the survey data as echoed in interviews, two participants stating:

They are noticing that the face-to-face links aren't as strong and they're not happy about it. (AH)

People have to see each other, they have to be able to communicate face to face. So it's supporting those relationships rather than replacing them. (AW)

Discussion

Castells (2000, p. 21) is careful to point out that a 'network society' is not just one with many computers, or one where computers are seen as being 'important'. Rather, it is one in which networks and networking have come to have a dominant role in all aspects of life, much as the 'industrial society' of the nineteenth century in Europe came to dominate all spheres—including education. The participants in our research were clearly working in schools which were, for the most part, well resourced with new technologies, and the electronic networks to which they belonged represent important sources of information and professional support. But despite the identified potential applications and benefits and the positive attitudes we discovered, it would be hard to identify even the best-networked schools in our sample as 'network societies' in miniature, or parts of a larger 'network society'. In Castells's terms (2000, pp. 442–446), the electronic and informational 'tiers' of the network may now be well established, but the 'actor' tier is, as yet, less well developed.

Both the teachers and the school leaders in our samples appeared to assess new technologies primarily in terms of their potential to support or enhance existing practices rather than to transform them or to support innovation. Fullan (1991) suggests that one of the main reasons for the failure of educational reform is that the rationale for change is not fully understood by participants, and that time is needed for teachers to make sense of new practices for themselves. As such, wholesale adoption of new technologies can be seen by school leaders as potentially risky and damaging to existing relationships, particularly where not all participants are convinced of the benefits (a key barrier identified by Becta, 2004). Thus while email, for example, is increasingly being used as a replacement for fax and telephone communication, it has not replaced face-to-face meetings, briefings, notice boards and paper newsletters. We did have some reports of interesting developments, however. The asynchronous nature of email allows a greater range of individuals to gain access to communication channels—although this is largely dependent on out-of-school working; among our participants there were a number who had established websites as central and authoritative sources of information. In some cases, however, problems with specific technologies—LA-administered email being the most obvious example—had led to a lack of confidence in all-electronic systems and processes. As noted earlier, LA coordinators reported sending emails to schools and then paper

copies as well; even those schools with extensive wireless networks still had daily whole-staff meetings.

The most obvious disparity, however, is between the perceived potential of ICT to support professional development and its employment for this purpose in reality. It was in this area that the technologies identified as offering greatest potential benefit (notably video conferencing) were in fact least widely deployed, and perhaps this contributed further to the sense of as yet unrealized potential. What teachers reported, and the school audit confirmed, was an asymmetric network structure in that much of the 'traffic' flowed from central resources (such as government agencies and commercial providers) into schools—and this traffic is predominantly composed of resources designed primarily to support planning and teaching rather than to support reflection, enquiry or collaboration around the development of practice. As yet, the 'education epidemic' described by Hargreaves (2003) appears not to have arrived; even when teachers are innovating at an individual or school level, a combination of personal, organizational and technological factors prevent either teachers disseminating their experiences and findings via central resources, or school-to-school sharing through local, regional or national networks. This challenge is not confined to school settings; Engeström (1999, p. 385) highlights the difficulties of scaling up local innovation across organizations. Organizations such as subject associations and LAs (while clearly seen as useful online 'landmarks') are still, according to our data, seen as sources of information rather than as potential sites for exchange and innovation, despite the efforts of our LA coordinator participants to initiate school-to-school networking.

What are the implications of these findings for the transfer of practice, particularly that which is developed in schools through activities such as development and research projects (like 'Learning How to Learn'), action research or other reflective practice? A number of authors have pointed up the importance of aligning the introduction of new technologies with the professional concerns of teachers and reflecting their approaches to development of teaching and learning (see, for example, Fullan, 1991; Becker & Riel, 2000; Cuban, 1993). We quickly realized that we were unlikely to be able to identify some set of conditions which allowed transfer of knowledge about 'assessment for learning' and 'learning how to learn', ideas which themselves are challenging to much existing practice in schools. With the benefit of insights gained from the data presented in this article, we realized that rather than seeking some ideal combination of technology and organization which would somehow make project knowledge 'travel', we should devote our efforts to developing a better understanding of how existing and emerging organizational forms such as LAs, Networked Learning Communities, VEAZ and other informal groupings might support teacher learning. In Carmichael *et al.* (2006) we describe how schools are adapting both to new ideas about classroom practice and to a new 'networked' educational landscape; central to this activity is a view of teacher learning as the development of new knowledge, which itself requires the development and application of new technologies capable of being used to support reflection, collaboration and other forms of knowledge construction and sharing.

So, 'are we there yet'? If the 'destination' is an increased use of network technologies and online resources in support of their classroom practice, then our participants seem well on the way; if it is the establishment of a consensus that new technologies can have benefits in both supporting classroom practice and professional development, then, again, progress has clearly been made. However, there is still much to be done in the area of providing resources, services and online environments which are supportive of innovation and knowledge creation about teaching and learning and which align with teachers' current and future professional development needs.

Notes

1. The 'Learning How to Learn' project (ref. L139 25 1020) was directed by Mary James (University of Cambridge until December 2004, then at the Institute of Education, University of London) and co-directed, from 2002, by Robert McCormick (Open University). Other members of the research team were Patrick Carmichael, Mary-Jane Drummond, John MacBeath, David Pedder, Richard Procter and Sue Swaffield (University of Cambridge), Paul Black and Bethan Marshall (King's College London), Leslie Honour (University of Reading) and Alison Fox (Open University). Past members of the team were Geoff Southworth (University of Reading until March 2002), Colin Conner and David Frost (University of Cambridge until April 2003 and April 2004 respectively) and Dylan Wiliam and Joanna Swann (King's College London until August 2003 and January 2005 respectively). Carmel Casey-Morley and Nichola Daily were project administrators. Further details are available at <http://www.learn2learn.ac.uk>.
2. Chi-squared = 11.49; degrees of freedom = 2; n = 249; significant at <0.01.
3. Chi-squared = 7.38; degrees of freedom = 2; n = 269; significant at <0.1.
4. Case-studies of some other schools involved in the project, including some smaller ones, will be presented in James *et al.* (2006b, forthcoming).

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