Local Government Association

new technologies supporting teaching and learning

by Mark Cunningham, Sue Harris, Kirstin Kerr and Rhona McEune
National Foundation for Educational Research

LGA educational research programme

LGAresearch • Report 49

new technologies supporting teaching and learning

Mark Cunningham
Sue Harris
Kirstin Kerr
Rhona McEune

Local Government Association

INVESTOR IN PEOPLE

Published in November 2003
by the National Foundation for Educational Research,
The Mere, Upton Park, Slough, Berkshire SL1 2DQ

Registered Charity No. 313392
ISBN 1 903880 61 0

Contents

Acknowledgements

The research reported here was sponsored by the Local Government Association. We are most grateful to them for making this possible.

We would also like to thank the local education authorities (LEAs) and schools who participated in this study. Particular thanks should go to the schools and staff involved in the case studies, who gave their time to share their experiences of using new technologies to support teaching and learning.

The following National Foundation for Educational Research (NFER) colleagues are also due thanks: Peter Rudd for his helpful and insightful comments on the report; departmental secretarial support and the staff of Communications, Marketing and Information Services.

Executive summary

Background

New technologies have an important part to play in raising standards in schools, by developing both students' and teachers' competence with information and communications technology (ICT). The Government has introduced initiatives to promote the wider use of ICT in schools and, as new technologies are being developed, teachers are gaining a better understanding of the place of ICT in the curriculum.

Businesses are increasingly becoming involved in the delivery of ICT in the curriculum, bringing a further dimension to students' learning experiences. In addition, the new technologies are contributing to the provision of opportunities for lifelong learning in schools, opportunities which should be beneficial to those involved in education, business and the community as a whole.

Aims and objectives

This study, which forms part of the Local Government Association's Educational Research Programme, explored the ways in which some of the new technologies have been used in schools and classrooms. The study also set out to examine the ways in which ICT was benefiting teaching and learning in a variety of contexts by considering:

- the impact on teachers
- the impact on students
- the wider impacts
- the role of the LEA
- the future developments.

Methodology

The study presents a series of illustrative case studies focusing on the ways new technologies are being used in seven schools in different LEAs in England. To ensure that a range of new technologies were investigated, LEA ICT advisers were approached to ascertain which new technologies were being used within schools in their authorities. Preliminary visits were made to those schools which had been identified by their ICT advisers as those using new technologies in innovative ways, in order to clarify the nature of their particular approaches and to decide whether to invite them to take part in the research. These visits resulted in the selection of seven schools from six LEAs. Data were collected in these case-study schools by means of interviews with teachers, headteachers, ICT staff and students and through analysis of documents and classroom observations.

Key findings

A wide variety of new technologies have been introduced into the classroom including laptops, digital cameras, digital microscopes, video-conferencing facilities and electronic, interactive whiteboards. Factors influencing schools' abilities to make use of these new technologies include:

- finance
- technical support
- teaching and learning priorities
- in-service training
- their readiness to adopt new approaches.

In presenting the perceptions of teaching staff and others using these technologies this study primarily considered the impact of new technology on teachers, students and the wider community.

The impact on teachers

Several key points emerged regarding the impact of the new technologies on teachers:

- where teachers were invited to apply their diverse background knowledge in the implementation processes and running of new technology projects, they have felt encouraged by the fact that their expertise was being recognised
- primary schools teachers, in particular, had positive attitudes to the application of a range of new technologies as a means of enhancing delivery of the National Curriculum
- the use of new technologies required time and financial commitment to ensure successful implementation in the classroom
- new technologies offered opportunities to develop courses combining a range of subjects.

The impact on students

The key points impacting on students were:

- the use of ICT, through independent learning facilities, allowed students greater control over their learning and encouraged the development of new ways of learning, both autonomously and cooperatively
- motivation and interest in ICT was enhanced for students and teachers especially in cases where they were learning and sharing experiences together
- the assumption that very young children are unable to use ICT successfully was challenged.

Wider impacts

The key findings regarding wider impacts were:

- making ICT facilities accessible to parents enabled them to support their childrens' learning
- ICT helped to forge links between schools, local businesses and academic communities
- the role of the LEA was important and it was felt that this could be enhanced by offering opportunities for schools to share their expertise and experiences with the new technologies and to disseminate good practice.

The study also draws attention to the many challenges that face those using new technologies to enhance teaching and learning. It suggests that schools require further ongoing support, both financial and professional, in order for the full potential of new technologies to be realised.

1 Background

Schools are adopting new approaches to teaching and learning, supported by new technologies, in order to take advantage of the wealth of learning resources, which have been made more accessible through increased provision of information and communications technology (ICT). In 1998 the Government set out its strategy to develop schools' and communities' abilities to engage in new technologies (Department for Education and Employment, 1998). In this document the Government committed itself to ensuring that:

- *teachers feel confident and are competent to teach using ICT in the curriculum*
- *school leavers have a good understanding of ICT, with measures in place for measuring their competence in it.*

(DfEE, 1998, p.6)

This Local Government Association (LGA) sponsored study investigated the extent to which schools have embraced new technologies and documents some of the interesting and innovative ways in which they are being used to enhance teaching and learning. Initiatives such as: 'TeacherNet' (http://www.teachernet.gov.uk), 'Learndirect' (http://www.learndirect.co.uk) and 'Schools for the Community' (http://www.ngfl.gov.uk/news.jsp?sec=5&cat=99&res=3072) (promoted by the Local Government Association) provide educational resources for teachers, students and parents and encourage community involvement in supporting schools. These initiatives work to promote wider use of ICT hardware and software in schools.

A major strand of the Government's programme to raise standards in schools through increased use of ICT is the drive towards broadband internet connectivity. Broadband is the term used to describe the technologies that support high-speed and enhanced connections between computers and the internet. The Government made £710 million available to schools for the period 2002–04, to cover ICT infrastructure costs and broadband connectivity with the intention of ensuring that all schools have broadband internet connections by 2006 (Kitchen and French, 2003; http://www.ngfl.gov.uk/features.jsp?sec=16&cat=99&res=31615). A survey conducted by the National Centre for Social Research in association with the University of Bristol, reported that 84 per cent of secondary schools had broadband internet connections, whereas just over a fifth (22 per cent) of primary schools had these connections (Kitchen and Finch, 2003). The survey formed part of an evaluation of the Government's Curriculum Online initiative, which was launched in January 2003 and aims to provide teaching staff with easy access to a range of digital online materials to support their teaching across the curriculum (Kitchen and Finch, 2003). Additional key findings of the report included:

- the median amount spent per annum for software on each pupil was £2.70 in primary schools and £3.08 in secondary schools.
- the average ratio of computers to pupils was 1:8 in primary schools and 1:5 in secondary schools (Becta, 2003a).

Schools are not expected to achieve these targets alone; rather, they are encouraged to work in collaboration within clusters of schools, with LEAs or with private sector organisations. Businesses are encouraged to become involved in school projects, impacting on the teaching practices, but ultimately also adding a real life dimension to the learning experiences of students. The quid pro quo provides benefits for industry through a potential pool of individuals who have a

wealth of relevant and transferable knowledge and skills. By supporting partnership arrangements between schools and businesses, opportunities for lifelong learning are created, which are beneficial to whole communities.

The British Educational Communications and Technology Agency (Becta) provides support for the Government's programme to develop the use of ICT in education. Becta is committed to promoting the use of ICT and states that the organisation's purpose is '*to support the transformation of education through the integration of ICT into learning and teaching, educational institutions and systems*' (Becta, 2003b). Becta, in partnership with DfES published the ImpaCT2 report in December 2002, which was the last in a series of studies looking at the impact of ICT on student attainment (http://www.trainingfoundation.com/research/default.asp?PageID=948). This study builds upon ImpaCT2 by looking at the benefits of using new technologies in teaching and learning in a more holistic sense.

Resources which have been introduced into the education system include laptops, hand-held computers, interactive whiteboards, digital microscopes, video-conferencing facilities, wireless technology, internet and intranet facilities, interactive toys and literacy and numeracy software, as well as online resources. Teachers can select from the range of ICT resources available to support the teaching and learning in their own schools.

It is worth bearing in mind that the extent to which schools make use of new technologies that are available is influenced by a number of factors which include:

- finance
- technical support
- teaching and learning priorities
- in-service training
- readiness to adopt new approaches
- time available.

This report presents the findings from the research carried out in seven different schools. Our findings are presented thematically, using illustrative examples from our work in schools. Chapter 2 describes the research aims and methodology in more detail and provides summaries of the case-study schools. Chapter 3 considers the impacts on teachers of using new technologies within the classroom. In Chapter 4, we discuss the impacts on students' motivation and the outcomes of their work. Chapter 5 addresses wider impacts which occur as a result of teachers using new technologies, both within the school and outside the school. The role of LEAs in supporting schools as they adopt new technologies is discussed in Chapter 6. In Chapter 7 we identify some possible future developments for schools using ICT to support teaching and learning. Finally, we present some points for schools and LEAs to consider as they continue to implement new approaches supported by technology.

2 Project aims and methodology

2.1 Introduction

This research was carried out as part of the programme of educational research conducted for the Local Government Association (LGA). The school-based work was carried out during the 2002–03 academic year. The research investigated some of the ways in which ICT is used in the classroom by teachers and students in a variety of schools in England. Data were collected from primary, special and secondary schools in a number of different settings, including small, rural schools and large, urban schools.

The main aims of the project were to:

- look at how a range of new technologies have been supporting teaching and learning
- identify both the benefits of using the new technologies and any problems that may have been encountered in implementing these approaches
- examine the cost benefits of the practices studied.

The research was undertaken by means of case studies in schools. The case studies were selected to focus on the ways in which new technologies were being used in a variety of different settings in different LEAs in England.

It was important to gain an appreciation of the extent of ICT development in schools prior to selecting schools in which to conduct case studies. LEA ICT advisers/inspectors served as a valuable source of information about schools in their local authorities, as they supported and advised schools in their various stages of ICT development. The research team began by making telephone calls to these advisers/inspectors for information about schools in their area that were using ICT in innovative ways.

The LEAs initially contacted included:

- shire counties
- unitary authorities
- metropolitan authorities
- inner- and outer-London boroughs.

After these initial contacts, visits were made to 13 LEAs to find out more information about ICT practices within schools. Preliminary visits were subsequently made to seven schools in order to clarify the nature of their particular approaches and to confirm their willingness to take part in the research. As a result of the visits, all of these schools agreed to participate in the research. For the purpose of this report we have created the following pseudonyms by which the schools will be referred to, in order to preserve their anonymity:

- Kedlar High School
- Lambert High School
- Fairfield Community College
- Haymill Infant School
- Wingate First School
- Gateley Primary School
- Beechwood Special School.

2.1.1 Research methodology

Within each of the case-study schools, data was collected by means of interviews with teachers, school managers, ICT staff and students. Classroom observation and analysis of documents (e.g. school ICT policies, lesson plans and students' work) also helped to build a more detailed picture of the approaches being implemented in schools.

The interviews with teachers were designed to explore:

- teachers' backgrounds, including their experiences and training with new technologies

- teachers' responsibilities in their schools
- the specific requirements in their school for the new technologies, including initial set-up costs and ongoing costs
- relevance to curriculum requirements
- impact of the new technologies upon teachers and students, including student attainment
- issues relating to extending the use of new technologies to other schools and sharing successes and problems
- LEA support to individual schools
- technical support within the school and the LEA.

Headteachers were additionally asked about:

- management issues related to the new technologies
- their vision for the school as it embraced and developed new technologies.

Student focus groups helped us to gather their perceptions of the value of new technologies and the impact of these technologies on their attitudes towards learning and attainment.

2.2 Summaries of the cases

2.2.1 Case studies

This section describes the seven case-study schools to provide a context for the rest of the report. The research focused on three primary schools, three secondary schools and one special school catering for the primary school age range.

Kedlar High School

Kedlar High School is a large Technology College in the east of England. There are approximately 1300 students on roll, aged between 11 and 18. Students are from a socially mixed area, including higher than average eligibility for free school meals. The proportion of students with English as an additional language is also higher than average.

ICT is managed jointly by a Director who is part of the Senior Management Team and one of the Deputy Heads. The school has a large number of computers arranged in suites for whole class and individual work. Several departments have their own computers and software supporting specific subjects, e.g. science, music, design and technology and modern foreign languages. The ICT department consists of nine people, including teaching staff and technicians. The school has more than 200 personal computers (PCs) and is soon to increase this to over 300 upon completion of a new building to increase ICT facilities. Other resources include interactive whiteboards and video-conferencing facilities, with the latter regularly used by four of the feeder junior schools for Computer Aided Design/Computer Aided Manufacture (CAD/CAM) work. The school is also involved in links with local industry and other schools in the area.

Lambert High School

Lambert High School is a large Technology College in the South East. There are approximately 1340 students on roll, aged between 12 and 18, including nearly 300 students in the sixth form. The school feels that internet access alone has improved student results. It has invested in a range of new technologies including broadband via microwave links with the local university and interactive whiteboards in each subject department. It also has an independent learning centre (ILC) where lesson plans are held on a shared network, allowing students the facility to access learning materials beyond the normal school day. They have also invested in a laptop leasing scheme and wireless laptops are available to subject departments, for example modern foreign languages.

Fairfield Community College

Fairfield Community College is in the West Midlands and is an over-subscribed school that accommodates approximately 1200 students, aged between 11 and 16. The school has a range of technologies in use, including digital cameras, desktop and laptop computers, internet and an e-mail service for all students.

When year 9 students choose their GCSE options for years 10 and 11 they now have an additional choice, Mediaonics. Through the Mediaonics course students learn how to combine principles from the art and music disciplines to produce work using digital technology. The course is responding to the media design requirements of business, commerce and industry by producing two– and three-dimensional animation, digital film-making, digital photography and image manipulation, motion graphics and sound recording. These techniques are also enhanced with aspects of dance, light and sonic graphics.

Haymill Infant School

Haymill Infant School is in the East Midlands, situated in rural surroundings in a combination of Victorian and mobile classroom accommodation. It has a single year group in each class from reception to year 2 with approximately 80 pupils on roll. The pupils generally come from socially and economically advantaged backgrounds.

The school aims to provide an ICT-rich learning environment through use of a variety of forms of computer equipment, including a digital microscope and roamers (programmable robots for work on measurement and control). Each class has three stand-alone computers with printers attached that are regularly used for Research Machines (RM) Maths and Successmaker work. The teachers also have their own laptops, which are used in and out of school to support their preparaton and teaching.

Wingate First School

Wingate First School is a one-form entry first school in the West Midlands. There are approximately 150 students on roll, aged between 5 and 9. The headteacher also fulfils the role of ICT coordinator and is keen to use ICT as a tool for developing teaching and learning materials to match individual learning preferences. She was interested to explore the potential of interactive whiteboards and her enthusiasm for this was communicated to colleagues. Teachers and pupils have access to interactive whiteboards throughout the school: within reception/year 1 there is a portable interactive whiteboard that is set up in the television/music room for use with small groups of pupils withdrawn from the class and in years 2–4 there is a static interactive whiteboard in each class. In accordance with the school philosophy of placing emphasis on kinaesthetic approaches to learning, the boards used in key stage 1 are touch-sensitive analogue boards and those in key stage 2 are digital boards controlled by a pen/remote keyboard and mouse.

An important factor in supporting the whole-school use of interactive whiteboards was the headteacher's approach of underpinning the resources purchased with a staff/time investment. Over the course of one term the year 2 teacher was allocated one day per week to prepare materials for use with the interactive whiteboards to support mathematics, geography and music; the year 3 teacher was allocated half a day for a term and the year 4 teacher had occasional days to prepare resources.

Gateley Primary School

Gateley Primary School is in a rural, eastern county and has 254 pupils on roll. The school is heavily ICT oriented with a pupil to computer ratio of 3:1, well above the national average of 6:1 (DfES, 2002) and has a variety of ICT facilities regularly available for pupils' use. In addition to a computer suite, classroom PCs and interactive whiteboards, pupils use digital cameras, digital microscopes, a digital video

recorder and a range of programmable toys. The school has also piloted the use of broadband and wireless technology for the LEA as a whole, with approximately forty laptop computers available for classroom use.

The most extensive programme of ICT development in the school relates to teaching and learning at the Foundation Stage. A range of interactive toys and software packages have been purchased specifically for use at this level. These include 'Pixies' (programmable toys for teaching measurement and control, which move forwards, backwards and side-to-side); 'Mibots' (Lego toys which have 'smart bricks', each brick being programmed with a specific function, for example, making a light flash); and an interactive software package that allows pupils to role play making telephone calls to the emergency services. The school has sought to disseminate its use of ICT at the Foundation Stage to other schools and, through this, challenge what it sees as the widely held perception that ICT is ill-suited to teaching and learning at this level.

Beechwood Special School

Beechwood Special School in the East Midlands opened in 1999 as a purpose-built school with an ICT suite of eight networked computers and stand-alone machines in each class. There are 40 pupils on roll (currently all boys) in five classes. Technology has been a key feature of the design of the building. Between each pair of adjacent classrooms there is an observation room with one-way mirrors looking into each classroom. This allows relevant staff such as teachers and educational psychologists to observe pupils' behaviour without being in the classroom and potentially influencing the behaviour of the pupils. Microphones and video-cameras placed within the classrooms allow the observers to hear interactions and to record particular patterns of behaviour on which they want to focus. This feature of the building design supports observation and diagnostic activities.

Throughout the school ICT is seen as a strong motivator for the pupils. All classes have a 25 minute daily session using an Independent Learning System (ILS) in the ICT suite, as well as a dedicated ICT lesson once per week for each class, plus one extra half hour per week to follow-up other work. In addition, pupils use the stand-alone machines in each classroom and can earn time to play on a computer games console by behaving well.

Each of the above schools made valuable contributions to this research through case studies. The next chapter looks at the ways in which some of the ICT projects that schools were engaged in have impacted on teachers and their teaching practices.

3 The impact on teachers

3.1 Introduction

Some of the greatest impacts upon teaching in the last few years have resulted from wider use of new technologies. The data reported in this chapter illustrate how the introduction of new technologies in our seven case-study schools has changed teachers' roles. The data suggest that when using the new technologies, teachers have come increasingly to act as facilitators and mediators, setting aside more didactic approaches to teaching and learning.

To explore this perceived change in role, this chapter illustrates the variety of technologies seen in practice in the case-study schools. It considers the diversity of teaching experience, expertise, subjects and phases taught and looks at how these factors have shaped teachers' reactions to the introduction of new technologies. These issues are considered throughout the chapter and discussed under the headings of:

- teachers' roles and previous experience of ICT
- using new technologies to address students' needs
- teachers' attitudes towards the new technologies
- the perceived benefits of introducing new technologies, compared with the costs involved.

3.2 Teachers' roles

Teachers' previous experience and knowledge of ICT may be one factor in determining how they perceive the role of new technologies in teaching and learning. The facilities available to them in their schools and, for example, their experiences of industry, all contribute to the use they make of new technologies in the classroom. Notably, initial teacher training courses now require students to have some training in ICT and this is supportive of moves to introduce new technologies into schools.

Headteachers, ICT coordinators and school governors have an important role to play in determining how a school's ICT use will develop. In the case-study schools, headteachers generally had an overview for the introduction and development of the new technologies in their schools. The ICT coordinators complemented this by presenting a practical and curriculum-related approach and assisting the subject/class teachers to use the new technologies most appropriately for their individual classroom settings. Importantly, if new technologies are to be integrated successfully across a school, the staff need to be committed to use of new technologies. While headteachers' visions for developing ICT use are a key factor in driving change, if new technologies are to have an impact in the classroom, teachers must be willing to embrace them.

This makes teachers' backgrounds an important factor when exploring the introduction of new technologies into schools. Examples of the diversity of experience and expertise teachers bring to the use of technologies can be seen by comparing two teachers' very different descriptions of their own backgrounds. One teacher of technology at Kedlar High School, a large comprehensive, had a background in industry. He was able to draw on this when developing the school's CAD/CAM work:

> *My background was as a toolmaker for 21 years and I was a metalwork, technical drawing and woodwork teacher. Everywhere I go I offer to help with CAD/CAM. The engineering background is important to ensure the right equipment is bought to save money. A major problem in*

buying machines is that [suppliers] do presentations but may not do what the schools want.

At the other end of the spectrum a teacher in her first year of teaching at a first school commented:

As a classroom assistant in a small school I set up a network with a governor. The teacher gave me the QCA scheme to follow and I took groups out to teach. In my PGCE I taught ICT and in my degree module. My background is varied and I am self-taught from the early days of computers.

These teachers' contrasting backgrounds, give some indication of the range of knowledge and experiences, from which they approach the introduction of new technologies in teaching and learning. Notably, despite their varying backgrounds, both teachers had in common a commitment to use ICT in their teaching and for their schools' wider benefit.

The facilities available to teachers also have an impact upon the use they make of new technologies. For example, at Beechwood Special School, the move to a purpose-built building allowed teachers to consider how ICT could be built into the school from the earliest stages to benefit pupils. Reflecting on their experiences of teaching pupils with emotional and behavioral difficulties, the teachers were keen to make observation rooms, with video and audio links to classrooms, a key feature of the school's design.

To use new technologies effectively, teachers also require access to sufficient technical support, suggesting a vital role for non-teaching staff. This is especially pertinent for those who do not have a strong background in industry and ICT use. For example, a technician at Kedlar High School described how he visited a number of Kedlar's feeder schools to establish video conferencing links, which allowed pupils in local junior schools to interact with those at Kedlar High School. On these visits, the technician explained the operation of the Millcam and the video-conferencing equipment to pupils in the feeder schools and talked about how they may design and make items using CAD/CAM software. In addition to this, the technician had a role in maintaining the hardware and software used for CAD/CAM and video-conferencing.

Classroom assistants were also found to have an important support role. A classroom assistant at Wingate First School described how she used an interactive whiteboard to support small groups of year 3 pupils' with their literacy skills by writing sentences on the whiteboard, modelling correct grammar and displaying reading materials. She commented that the children especially liked animations, such as 'Planet Wobble', which is an interactive early years reading system.

Our research suggests that it is important that all members of staff are engaged in using and supporting the use of new technologies – from headteachers' presenting visions for ICT development, through to technicians and classroom assistants supporting teachers' use of new technologies. Within this, it is important to recognise and build on teachers' existing knowledge of and experience with, ICT.

3.3 Using new technologies to address students' needs

ICT is increasingly being perceived as a tool in the teacher's pedagogical tool kit. The new technologies have opened a world beyond the immediate classroom for both teachers and pupils in a number of cases. As the case-study data shows, teachers' pedagogical beliefs and practices have been challenged by the introduction of new technologies. This is supported in much of the research literature about ICT. Kinnear *et al.* (2001) suggested that new technologies are a stimulus to radical change leading to improved educational opportunities for learners. They argued that teachers must be confident in their use of ICT, including understanding how to organise the classroom and integrate ICT resources, to

improve the quality of the lesson content. This means that effective use of ICT should take into account the purpose of the activities and be organised in such a way as to facilitate successful learning outcomes.

Teachers in the case-study schools have used ICT effectively in a variety of ways to enhance teaching and learning. The ways in which they have used new technologies, reflect the varying needs of students as they progress through their schooling. At a secondary school level, new technologies were being used to support transfer between key stages 2 and 3 and to develop curricular subjects suited to the needs of industry as well as to students' interests in art and music. At a primary school level, teachers had introduced new technologies to support pupils' learning in established curricular areas, for example literacy, and to help pupils meet specific learning goals. These different uses are detailed below.

At Kedlar High School, CAD/CAM software was being used not just with students currently attending the school, but also with those in feeder schools, making CAD/CAM an integral feature of students' transition from key stages 2 to 3. As explained earlier, a technician from Kedlar High School was supporting the use of CAD/CAM in Kedlar's feeder schools. From a curricular perspective, this helped to ensure curriculum continuity for students; on transferring to Kedlar, students were in a position to build upon the skills and knowledge they had gained when using CAD/CAM in their junior schools.

Students' transition from one school to another was also eased by the video-conferencing link which was set up between Kedlar High School and its feeder schools, to allow CAD/CAM work to take place remotely. Through the video-conferencing link, year 6 pupils were able to talk to students at Kedlar High School and foster friendly relations with them. This helped students to feel that the transfer to key stage 3 and to a new school was not going to be too daunting. Both teachers and students felt that as a direct result of CAD/CAM work, year 7 students were able to settle more quickly into the secondary school environment. Year 7 students at Kedlar supported this, commenting that the CAD/CAM work had helped them to learn about their new school and the teachers there and that this had made them one step ahead of other pupils coming from junior schools, which had not participated in CAD/CAM.

Ensuring curriculum continuity was also an issue that teachers at Lambert High School chose to address through the use of new technologies. An independent learning centre (ILC) had been established at the school, which students were able to use throughout the school day. This centre was managed by a teacher and a teaching assistant and was used in a variety of ways by the students. Subject teachers were able to put lessons onto the network to ensure continuity for their students for planned and unplanned teacher absences. The teacher managing the independent learning centre commented:

> *Not all teachers are using the ILC facilities but it is available if they want to. The ILC is commonly used when a teacher is taking sick leave. In these instances the classes are sent to the ILC where they can access previously prepared lesson instruction.*

This has helped teachers to ensure curriculum continuity for students, while at the same time cutting down the costs of supply cover.

Rather than using new technologies to ensure curriculum continuity, teachers at Fairfield Community College have used them to draw together the curriculum's arts and ICT dimensions. Teachers have sought to address the falling numbers of students taking arts subjects at GCSE, specifically by introducing new technologies into this area of the curriculum. Art and music teachers worked together to look at ways of linking their subjects to ICT and, through this, offer students a way to develop their ICT skills, without having to sacrifice the opportunity to take arts subjects at GCSE.

Initially, teachers from Fairfield invested a significant amount of time to investigate how an industry-based, technological dimension might be brought into arts teaching. This culminated in a weekend 'master class' (held on a Saturday), with people from industry coming into the college to teach, for example, 3D modelling and animation. Following this, the teachers developed a Mediaonics course, aimed at enhancing students' skills in dance, drama, music and art through using computers. Within this, students are taught how to produce work digitally using their own original music and artwork. As a teacher at Fairfield Community College explained, through Mediaonics:

> *there are other things students can do,* [it's] *not all about drawing.* [You] *can do well in the arts with ICT skills and knowledge that you have, which help you get a job.*

Having developed this 'new' subject, the Qualifications and Curriculum Authority (QCA) became interested in the course and said that there was a need to put *'a language to this new idea'* (Mediaonics teacher, Fairfield Community College). This resulted in input from those in industry and those working in universities, helping to formulate the technical jargon for the course. In this instance, the impact of new technologies has extended beyond the immediate environment of the school.

To reflect, the secondary schools in our study had introduced new technologies for a variety of purposes including:

- to creatively adapt the existing curriculum
- to address extra-curricular issues, such as students' anxiety on transfer between key stages 2 and 3
- to ensure curriculum continuity in teachers' absence.

The primary schools studied were, by contrast, predominantly concerned to use new technologies as a means of enhancing teachers' delivery of the National Curriculum. Teachers at Wingate First School were using interactive whiteboards to deliver the National Literacy and Numeracy Strategies across the school. Each classroom was equipped with wall-mounted interactive whiteboards, to be used for whole-class teaching and the year 1 teacher also had access to a portable board in order to support small groups outside of the classroom. With specific reference to the literacy strategy, a year 4 teacher described how the interactive whiteboard was used:

- as a stimulus for work in small groups away from the classroom
- as a touch board for letter/number formation
- for writing on, highlighting specific words/numbers
- for talking about the content of the text/picture on the screen
- for editing and revising text
- for sharing skills
- for the assessment and monitoring the achievement of learning objectives.

The same year 4 teacher also described how he used the interactive whiteboard on a daily basis for teaching mathematics. He had taught his class to set up bar graphs using computer software and explained that the advantage of using the interactive whiteboard over the ordinary whiteboard was that, at the click of a button, he could demonstrate to his class how to change the scales on the graphs' axes.

Gateley Primary School also provided a good example of how teachers were using new technologies to help pupils to meet specific learning targets, most notably at the Foundation Stage. In the foundation stage, pupils' learning was supported by the use of Lego Mibots. These were Lego toys containing 'smart bricks'. Each brick was programmed with a specific function, for example, making a light flash. Working with these toys helped pupils meet the early

learning goals of making choices, designing and building and beginning to think analytically. Illustrating this, the teacher described what could be achieved using the Lego Mibots:

> *Taking something like the Lego Mibots, they have to make choices about what they want to build; they actually have to build it; they have to talk about what they're making, what they want it to do. Building together fosters personal and social skills; choosing the right bricks for what they want it to do is making them think analytically. So using the Mibots covers a range of early learning goals – maths, science, literacy, social.*

She went on to describe the impact on pupils:

> *The pupils love it – there's a lot of communication between them about it. When you get it out they all gather round it. The boys tend to move in first and the girls pick it up later, so it isn't gender exclusive. It's good for the boys. It makes them feel like it's a pleasure to learn – they enjoy it so they don't realise they're learning.*

Thus, the Foundation Stage teacher at Gateley Primary School had clearly identified the learning goals she wanted the pupils to meet using new technologies and a technology appropriate to her pupils' needs and abilities. She had then structured activities to allow pupils to learn through talking and working together to meet the QCA's early learning goals.

3.4 Teachers' attitudes to the use of new technologies

In all the case-study schools, the teachers were positive in their approaches and attitudes towards using new technologies, although they were at various stages of integrating these into their practice. The teachers' enthusiasm was clearly communicated by their keenness to demonstrate how they were using new technologies in their teaching. At Haymill Infant School, a teacher allowed us to observe the first lesson in which she was using a digital microscope in conjunction with an interactive whiteboard. She was already experienced in using the interactive whiteboard and wanted to connect the digital microscope to the whiteboard to conduct a demonstration for the whole class.

The teacher began by emphasising how much more powerful the digital microscope was than a hand-held magnifier, with the students being invited to view a selection of objects. Connecting the digital microscope to the interactive whiteboard ensured that all the class could see the objects and talk about what they saw. The pupils were interested and able to participate fully in viewing objects under the microscope.

As this was the first time the teacher had used the digital microscope, she encountered a number of unexpected difficulties during the lesson, such as ensuring the room was dark enough to enable all the pupils to see everything placed under the microscope. Nevertheless, using the microscope and interactive whiteboard together opened up a range of learning opportunities for the teacher and her students. This example demonstrates the importance of teachers:

- recognising and exploring the possibilities that new technologies allow them
- not being afraid to act upon these possibilities and 'have a go'
- seeking ways to overcome any difficulties that arise
- disseminating good practice, so that other teachers are aware of the potential new technologies open up and the difficulties that they may need to address.

This final point, of disseminating good practice, is an important one, both within and across schools. Teachers, themselves, need to be willing to work cooperatively and share

their knowledge of new technologies. At Lambert High School, teachers saw the introduction of new technologies as an opportunity for collaboration between departments, with teachers working together to create independent tasks for their students. For example, a French teacher had designed a grammar task with graded levels. She had been helped in devising this task by a colleague from the Mathematics department who had expertise with the software. He described the approach used by the school in the development of the shared work, explaining that he had used Excel to develop a format for worksheets, which was now being used across departments.

The positive attitudes teachers at Lambert High School have towards the use of new technologies have, in turn, helped to foster positive attitudes amongst students. With teachers' encouragement, students have embraced the possibilities for individual work using ICT at the school's independent learning centre. Thus, a whole-school ethos has been fostered that supports the belief that using ICT to deliver the curriculum can help to ensure the highest possible student achievement.

In a similar way, the CAD/CAM and video-conferencing at Kedlar High School has helped to foster positive attitudes towards the use of new technologies, both among staff and students at Kedlar and in Kedlar's feeder schools. Having seen the value of CAD/CAM work in easing students' transition from key stage 2 to key stage 3, staff have been more than willing to participate in video-conferencing activities. For example, the technician at Kedlar High School commented:

> *In the video-conferencing staff are sitting ready to answer questions and are prepared to answer questions about the school. It is helping the students' skills and understanding. The personal touch is important to introduce the children to design and talking across schools using the video link.*

Where staff have been reluctant to embrace new technologies, collaboration and cooperation, both among staff and between staff and students, has been particularly important to overcome this. Although Wingate First School introduced the interactive whiteboards as a whole school policy, there were some variations in the teachers' reactions to it. For example, the year 4 teacher commented:

> *I was quite apprehensive, had certain reservations – as with most teachers, [I] don't like change, but I'm glad I've made the decision and moved into [using] it, because I'd only been teaching 2 years. I go more slowly, it's a lot to take on at once.*

Such attitudes suggest that in some instances the integration of new technologies into teachers' practice may, at first, be a slow or partial affair. Teachers need to be confident with the equipment they are using and receive guidance and encouragement from others as to how they may use it to greatest effect. Recognising this, the headteacher at Wingate First School had provided regular non-contact time for some of her staff to develop e-resources and to enable teachers to use the interactive whiteboards more effectively in their classrooms.

Using new technologies has also altered the teachers' role in the classroom. As well as being competent with new software and hardware, teachers also need to be open to new pedagogical approaches and styles of classroom management, so that they can make best use of the new technologies.

In the case-study schools, a number of the teachers discussed how they had adapted their teaching styles, to become less didactic and act more explicitly as an enabler and critical partner to their students. For example, at Lambert High School, teachers were facilitating students' independent learning by preparing work for students, which students could access via the shared network. The students appreciated the advantages of this and, as one sixth form student explained, the

use of the shared area for an English author study was useful because the teacher had created the opportunity for the students to continue the task in more depth than would have been possible in a traditional teaching situation.

In the Foundation Stage at Gateley Primary School the teacher had also provided the pupils with freedom to extend the tasks with the Lego Mibots. The pupils were following instructions and using toys with a clearly-defined purpose as part of an assessment of their mathematical knowledge. The change of roles, from instructor to enabler, is therefore crucial, since both teachers and students are learning together through the use of the new technologies. In each of the schools there was a feeling of a partnership between teacher and student using the new technologies. For example, at Fairfield Community College the teachers needed to learn how to use the software involved in the Mediaonics course, alongside their students. This has increased communication between teachers and students and made teachers consider their approach to delivering Mediaonics. This sharing of knowledge and skills across the curriculum is an important aspect of embedding ICT in the curriculum, because it draws all 'experts' together: the ICT experts, individual subject experts and students' expertise.

To conclude, rather than being pushed to show an immediate return on the school's investment in software or hardware, teachers need time to become familiar with the new technologies and to adapt their teaching strategies. During this process, teachers may come to realise the wide range of opportunities that access to new technologies opens to them. As discussed earlier, having grown confident using an interactive whiteboard, at Haymill Infant School, teachers were willing to experiment by linking a digital microscope to the whiteboard. Teachers at Lambert High School and Gateley Primary School, having grown competent with new technologies, had changed their pedagogic approaches to act in more of a facilitating role. The use of new technologies to support teaching and learning is a progressive exercise, with teachers working from different initial starting points.

3.4.1 Teachers' concerns

As the previous section shows, teachers' confidence to use new technologies and their willingness to adapt their teaching styles had been key issues when introducing new technologies into the classroom. Nevertheless, as the use of new technologies has become increasingly established within the case-study schools, teachers have identified a number of concerns that will need to be addressed in the future.

The headteacher at Gateley Primary School expressed concern about taking the use of new technologies beyond the setting-up phase and actually embedding the new technologies within the curriculum. She commented that when introducing new technologies, they had, to date, focused on art and music and were currently exploring the most effective use of new technologies at the Foundation Stage. The headteacher was, however, concerned that the school could not integrate ICT across the curriculum at once, commenting that ways of supporting pupils' literacy and numeracy skills through the use of new technologies were too great to investigate and implement at once. Consequently, the headteacher felt the most constructive way forward was to embed ICT within specific subjects, a subject at a time. Her fear was that in taking such an approach, some subjects (and possibly those which took most curricular time) might unavoidably be left behind.

At an individual level, a year 4 teacher explained that he had initially expressed a concern about the introduction of the new technologies into the school, but once he had seen the technology in action and thought about the implications for his practice, he had embraced it wholeheartedly and was able to

implement it in his classroom. He described some of the ways in which he used technology to support work in PE and history:

> *In PE I use the digital camera to monitor and evaluate performance [of] both teacher and pupils, e.g. take pictures of rolls round the apparatus and photos highlighting the technique. We can comment straight away on the performance to draw attention to technique. It is used as a teaching tool to further their development. The CD player is used for dance. The other teachers use it in the same way.*
>
> *The video player is well used for projecting images onto the interactive whiteboard which we can freeze, e.g. Viking shields and swords, from the video went to the internet, which brought the session alive. We used a pre-recorded video we downloaded from the internet.*

Nevertheless, despite the benefits this teacher found from using new technologies, he was concerned about its cost and whether its use could be sustained. These worries were also expressed by the headteacher at Fairfield Community College. His concerns related to the introduction and the management of the Mediaonics course. The course was at an early stage and some areas still had to be addressed to ensure that students could achieve the most effective results. There is a question of whether, if teachers believe their use of new technologies to be limited due to issues of funding and sustainability, they will be willing to wholeheartedly embrace new technologies and seek innovative and creative ways to use them in their teaching.

3.5 The costs and benefits of introducing new technologies

When introducing new technologies into schools, there are a number of cost implications, going beyond the procurement of hardware and software. The costs associated with training teachers to use new technologies, both in terms of expenditure and time required, clearly need to be considered by schools. There are other substantial cost implications which must also be taken into account. These include procurement, teacher workload and time taken to learn to use the new technologies, or to find resources and evaluate them to ensure 'best fit' into the curriculum. This section explores how schools are trying to maximise the benefits of new technologies for their students, while trying to keep costs manageable.

The cost of procuring new technologies is a major issue for schools and decisions to invest in new technologies are not taken lightly. Schools need to be certain that students will benefit more from investments in new technologies than in other areas. In our case-study schools, the decision to invest was often made only after a whole-school consultation exercise to determine the benefits that would arise from bringing particular technologies into school. For example, the headteacher at Wingate First School spoke about the factors that had to be taken into consideration when trying to decide whether to purchase interactive whiteboards for the whole school. The decision to purchase was made only after:

- staff and governors had been consulted
- the use of interactive whiteboards throughout the school had been considered
- the advantages of interactive whiteboards in enhancing pupil achievement had been identified.

Once interactive whiteboards were established in the school, teachers were able to identify more benefits than they had at first anticipated. These included: opportunities for more effective lesson planning; the creation of more stimulating lessons and the ability to display web pages to the whole class, allowing teachers to make much greater use of internet resources.

Schools also need to meet the costs that arise from ensuring that teachers receive the training they need to be able to use new technologies effectively. Without this,

teachers may be unable to realise the benefits of the technologies purchased by their schools, meaning that students are unable to receive the maximum benefits of a school's spending on software and hardware.

All the teachers involved in the case studies had received training (mostly through the New Opportunities Fund (NOF)) and various observations were made about how effective it had been. NOF training had provided a basic introduction to a range of commonly used software packages. Responding to this, the teachers emphasised the importance of receiving training that related directly to the new technologies they were using in their classrooms. Acting on this, the case-study schools were providing training in a range of ways, including:

- the use of external training providers, for example, LEA ICT advisers and/or companies supplying new technology
- in-house training with teachers sharing their expertise
- schools sharing good practice with others.

The first of these approaches was found at Gateley Primary school, where the school had invested in an external training programme to develop teachers' use of interactive whiteboards.

Wingate First School had set aside specific occasions for in-house staff training on interactive whiteboards. Some staff had regular, non-contact time and staff meeting time to develop their skills and knowledge. This was provided to ensure the interactive whiteboards were going to be extensively used throughout the school. The cost of providing teachers with non-contact time was absorbed within the school, with the headteacher covering lessons.

At Kedlar High School the technology teacher was able to offer help with the CAD/CAM training drawing upon his background in industry. His knowledge meant he was able to highlight mistakes in suppliers' demonstrations. This helped the school avoid making expensive errors in the initial stages of implementing new equipment. Training at Kedlar High School was also given a cross-curricular dimension, with the aim of increasing opportunities for teachers to use the new technologies in more lessons. If opportunities are given for teachers to use the new technologies after receiving good training, the quality of teaching will be enhanced. If teachers are competent and confident with new technologies this should, in turn, increase the interest and motivation of students, making schools' investments worthwhile.

Networking and the dissemination of good practice amongst teachers, both within and across schools, provides a further cost-effective means for teachers to acquire skills using new technologies. At Beechwood Special School, for example, staff have been able to share their practice with colleagues from other schools, by inviting them to use the video and audio facilities set up in the school's observation rooms. As a teacher at Beechwood remarked:

> *The rooms are useful for other professionals, e.g. educational psychologists. If they have to do an assessment/reassessment, it's an ideal opportunity for pupils to be observed.*

This way of sharing good practice with teaching colleagues has been very cost effective for local teachers. Through observing the teachers at Beechwood Special School working with pupils, other teachers were able to refine their own classroom practices. Importantly, pupils at Beechwood were unaware that groups of teachers were observing lessons and so the routine of their lessons was unaffected by the visitors. Crucially, using the observation rooms as a means to share good practice has allowed teachers, who may have had one or two pupils with special educational needs within their own classes, to observe the practices of teachers working with a class of such pupils (eight pupils). This has enabled teachers in mainstream schools to refine their own

practices so that pupils with special educational needs can be effectively integrated into mainstream classes.

Finally, once new technologies have been introduced into schools, they have also been used to cut expenditure in other areas, for example, the cost of supply cover. At Lambert High School, the ILC allowed teachers to make lesson materials available in their absence, enabling students to work in the ILC as opposed to working under the direction of a supply teacher. The students were also benefiting by being able to work independently. Teachers at Lambert reinforced this, saying that although there were initial costs, the students were well motivated and access to relevant work on the shared networks ensured the work was appropriate. Although the costs of materials and supervision are ongoing for the ILC, teachers nevertheless felt the expenditure was justified, in that it allowed students to work independently, was helping to raise student achievement and had the added benefit of ensuring curriculum continuity in a teacher's absence.

In each of the cases detailed above, schools have looked for ways to maximise the benefits students receive from the school's investment in new technologies. In some schools this has involved further expenditure, for example, to invest in relevant training, but such spending has been considered worthwhile to increase teachers' confidence and competence. In other instances, having procured new hardware and software, schools have been able to make savings in other areas, through disseminating good practice amongst themselves, or by saving on the cost of supply cover. In each of the schools the additional cost of procuring and supporting teachers' use of new technologies was felt to be most beneficial to students.

3.6 Summary

This chapter has explored the impact of the new technologies upon teachers. Within our case-study schools each of the teachers interviewed indicated that they valued the role ICT now has and they have adapted their practice to develop the various technologies in their schools. The teachers in each school suggested that for the most effective and efficient use of the new technologies, collaboration with senior management, non-teaching staff, technicians, governors and with students was very important.

Although the teachers recognised there were great demands placed upon them, there were effective professional development opportunities available to help them extend their skills and knowledge in using ICT in the most appropriate manner to raise student attainment. Also, when teachers were comfortable with ICT, they used it as the most appropriate tool for the subject being taught. This was demonstrated in the schools visited, where in all the lessons observed, teachers were convinced the new technologies represented the most effective way of communicating certain knowledge and understandings. At Gateley Primary School, for example, the introduction of new technologies into the Foundation Stage was driven by teachers' belief that even the youngest pupils can benefit from the increased use of ICT.

All of the case-study school teachers held positive attitudes and a desire to use the new technologies across the curriculum. They saw their practice with the new technologies as innovative.

Having highlighted the diversity of teaching expertise that had been developed through the implementation and use of new technologies, the next chapter focuses on the impact this has had on students' practices.

4 The impact on students

4.1 Introduction

This chapter explores how the use of new technologies has led to changes in students' experiences of learning. It considers the impacts that new technologies have had on:

- the ways students are expected to work
- students' motivation to learn
- perceived barriers between different curriculum subjects and between schools and the wider community.

The chapter is divided into three broad sections that reflect and discuss these areas in detail:

1. developing new ways of working
2. the role of new technologies in enhancing students' motivation to learn
3. breaking down barriers within and beyond school

4.2 Developing new ways of working

As seen in Chapter 3, teachers' use of new technologies has led to changes in their pedagogical approaches. This has had a significant impact upon students, both in the ways they are required to work using ICT and the extra-curricular skills they are expected to develop through this. For example, the headteacher at Gateley Primary School commented:

> *Gone are the days when you stuck a pair of headphones on a child and left them to it... ICT needs to be social and it needs to relate directly to what children are doing in class... Using ICT is not a sedentary activity. We want children to play, inquire, socialise, not be isolated sitting at a computer.*

The use of new technologies has had a two-pronged impact upon students' ways of working. First, the data reveal how new technologies have helped to promote cooperative learning strategies. Second, they show how, by allowing teachers to differentiate effectively within a mixed ability group, students are able to take greater control and ownership over their learning.

4.2.1 Promoting cooperative learning strategies

In each of the schools visited, both teachers and students noted how new technologies had encouraged the use of cooperative learning strategies. On a whole-class basis, interactive whiteboards were widely referred to as a focus for cooperative learning. For example, a teacher at Wingate First School reflected:

> *It's only recently that I've had* [ICT] *as a tool for the whole class as a result of the interactive whiteboard. It's made a substantial impact on classroom practice.*

Students have also noted the cooperative nature of teaching and learning arising from the use of interactive whiteboards. One pupil from Beechwood Special School commented he liked being taught using the interactive whiteboard because *'It helps us learn together – there's a bigger screen than normal so more people can use it.'* Given that pupils at Beechwood Special School have behavioural difficulties and often find it hard to work cooperatively, this can be considered particularly significant.

More generally, it is interesting to note the extent to which cooperative learning strategies have been linked, by students and teachers, to the use of interactive whiteboards. There are three points to be

made in relation to this. First, interactive whiteboards make a single computer accessible to the whole class at once. This allows students to work cooperatively on a computer on a scale not possible before. As one class teacher commented:

> *Before you just couldn't get the whole class round the class PC – only about four of them could see what was going on, but now we can all work together, perhaps look at a website as a class. Everyone has equal access to it that way.*
>
> (Gateley Primary School, year 2 teacher)

Second, if using a computer to generate the information displayed on an interactive whiteboard, teachers are able to position their computers so that face-to-face contact can be maintained with students. Teachers suggest that this encourages students to contribute readily and to view learning as partnership with other students and perhaps more significantly, with teachers.

> *One can see the benefits* [of interactive white boards] *in terms of motivation, the students interacting, which helps to generate supportive learning environments. If they are focused on the whiteboard, the teacher is not 'talking to the wall'. They focus on the board rather than the computer and the whiteboard can show work, presentations... which the students can share and demonstrate, leading to greater understanding.*
>
> (Teacher, Kedlar High School)

Third, both students and teachers saw the opportunity for students to write on the interactive whiteboard and explain to the class what they had written, as facilitating cooperative learning. At Wingate First School, pupils were learning to spell together, taking it in turns to write a word on the interactive whiteboard, with help from other class members to determine the correct spelling. Pupils commented that one of their favourite activities using ICT was *'to share our experiences with the interactive whiteboard in spellings'*.

What is particularly interesting about this is that such activities could also take place using an ordinary whiteboard. However, even though the teaching strategy is not specific to interactive whiteboards, when these are used it seems that activities are perceived differently by students and teachers alike. Whereas standard whiteboards have been associated with the

> *'chalk and talk tradition of teaching', interactive whiteboards are seen as something 'innovative and exciting, fun to use', and the children see that.*
>
> (Teacher, Kedlar High School)

Further to this, at Wingate First School, interactive whiteboards have explicitly served as the focus for creating a learning environment in which students feel secure on an affective, emotional level. A year 3 teacher explained that the ethos in her classroom was not to laugh at others, as she did not want to discourage children from using the interactive whiteboard. She discussed the accuracy of answers with the class and they agreed that it was not wrong to be supportive of each other. The teacher said that the class could be competitive, because there were more boys than girls, but that they worked hard to change and worked hard on their PSHE, as they all wanted to try and would offer to help others.

This wider ethos of respecting each other's learning and creating an environment, in which students feel secure and supported, extends well beyond work using interactive whiteboards. At Beechwood Special School, for example, there were initial concerns about introducing ICT facilities into the school: teachers were concerned that vandalism would result from students' behavioural difficulties. However, the pupils enjoy using the computers and, according to the Deputy Headteacher: *'they respect them'*. The introduction of new technologies has helped to change expectations within the school, both in terms of students' behaviour and attitudes to learning and the facilities which can be made available to them. This can be

considered a big step forward both for students and teachers.

The use of new technologies is also promoting trust and cooperative learning through small group work. For example, at Gateley Primary School, Foundation Stage pupils work in groups of three to programme Pixies. By taking turns, helping each other and explaining why they are programming their Pixie in a particular way, pupils are learning to work cooperatively and to justify their actions, covering many of the early learning goals for the Foundation Stage.

Small group work has also helped to break down gender divisions relating to the use of technologies. While, as many of the teachers commented, boys traditionally dominate the use of ICT equipment, by working in small, mixed-gender, groups, they are learning to share. At Gateley Primary School, the Foundation teacher suggested that girls may be reluctant to play with Lego Mibots, due in part to the Mibots' appearance – the Mibots are largely grey and intended for building planes and rockets. The boys, however, are enthusiastic about the toy and the Foundation teacher has noted instances in which they involved reluctant girls, for example, by sharing their building plans. Even at a secondary level it is noted that there is greater cooperation between genders when new technologies are being used. A teacher at Kedlar High School commented that the use of new technologies had *'improved* [boys'] *behaviour because they very much want to interact.'*

When students work in small groups using new technologies, cooperation often takes the form of peer mentoring. In some schools, students have deliberately been paired so that a student with higher literacy levels can help a student with lower literacy levels, or a student who is more competent with ICT can help a more reluctant student.

Students, themselves, recognised the value of working with someone who could help them. When asked how they liked to work on computers, the majority of students, across primary and secondary schools, said that they liked to work with someone older and more knowledgeable – be it a friend, parent, older sibling, or teacher. Rather than resenting the fact that someone is showing them how to use new software or ICT equipment, it appears that students are actively choosing to learn from others. Students recognise that others have skills which they need to develop in order to use new technologies more competently and effectively. At Beechwood Special School, one of the students specifically commented that he liked working with his teacher because she could show him how to do things and by copying her was able to develop his own skills.

Students also tended to see it as their duty to help one another. Students felt that where they had a capacity to help others, this was something to be acted upon. A student at Fairfield Community College commented: *'I help everyone as often as I can, as me and Mark know how to use the equipment more than most people in the group'.*

In essence, together with the introduction of new technologies in their schools, students are being encouraged to work cooperatively. They are learning to:

- take turns and respect each other's work and opinions
- develop a willingness to learn from each other
- recognise what they are able to do and need help to achieve.

4.2.2 Meeting students' individual needs through the use of new technologies

In a number of the schools visited, the ratio of computers to students was higher than government recommendations and there were regular opportunities for students to have individual access to computers. In these

instances pupils were able to use responsive, diagnostic software packages specifically designed for individualised learning. At a primary level, the 'RM Maths' programme and 'Successmaker' integrated learning system (ILS) for enhancing students' literacy skills, adjust the difficulty of the questions students are asked according to their previous performance. They provide structured learning opportunities and reinforcement, pitched to a student's individual needs. At Lambert High School, the ICT coordinator commented that when using such programmes:

> *The learning is more to the pace of the students and it is easier to spot problems and teacher reinforcement becomes easier. The materials are there and the class like to work at their own pace. I can find the individual problems through IT and I know where I stand as a teacher and can follow student progress and can differentiate for them.*

Recognising the benefits of such programmes, teachers from the modern foreign languages department at Lambert High School have worked with the ICT coordinator to develop responsive, self-adjusting programmes for learning French grammar. One of the school's French teachers highlighted the main advantage of the programme as:

> [giving students] *immediate feedback which the whole class couldn't get. The pupils are involved on a specific task where they are testing themselves, with immediate feedback on an individual basis.*

Software packages which are able to respond to individual students' needs offer a means of solving the problem of differentiation, albeit in limited contexts. Rather than the teacher consciously having to pitch the content of a lesson towards a certain ability level, software can be used which adjusts to students' individual capabilities. Teachers draw attention to the benefits of such programmes specifically for students with special educational needs (SEN), or those classed as gifted and talented, who tend to lose out in mixed-ability groupings. For example, the Headteacher at Gateley Primary School commented: '*We want to use ICT more for gifted and talented. They can go as far as they want. It's not limiting.*'

As these examples show, the use of new technologies is being used to encourage students' individual progress – challenging students to better themselves, as opposed to competing with and judging themselves against others. This may be considered a more constructive way to further the development of students' knowledge and skills.

The use of new technologies also provides students with greater opportunities to individualise their learning activities. In one part of the Mediaonics course at Fairfield Community College new technologies have allowed students to '*create an initial image and experiment with it, whereas previously they would have been given an image*' (Mediaonics Teacher). By enabling students to create their own images, they are, perhaps, provided with a greater sense of involvement in their learning, with this helping to engage students.

The use of new technologies can also provide students with opportunities to learn autonomously. Having access to the internet in school and particularly at Lambert High School, where students can work in the ILC, allows students to research topics that interest them and to extend their learning outside of the classroom. The internet has given students greater access to resources and more opportunities to direct their own learning than have previously been available. Students have also noted how they can teach themselves to use computer software, or extend their knowledge using the internet. They see the knowledge they acquire in this way as knowledge they own. Students are often conscious of the skills they are acquiring and the capacities this gives them to further their learning. In learning to use new

technologies students are learning to learn, so that they begin to develop the skills to address their own learning needs.

Students' individual needs are also met indirectly through the use of new technologies. This was evident at Beechwood Special School, where the observation rooms are used to allow professionals to assess the children's behaviour and develop appropriate strategies for their needs. These pupils' home lives may also benefit from a project run by the school which allows parents to learn new strategies for managing their children's behaviour. Parents are invited to the school to observe their children, using the observation rooms and through an audio link, and to play with their children while receiving guidance from staff watching in the observation rooms.

4.3 The role of new technologies in enhancing students' motivation to learn

In previous research the use of new technologies in teaching has been seen to enhance students' motivation to learn. The ImpaCT2 report: Learning at Home and School: Case Studies (DfES\Becta 2002) noted that teachers often linked the motivating effect of ICT to:

> *Shifts in pupils' attitude to and involvement in learning activities... Not only was ICT generally perceived to encourage pupils to become more focussed on the task, but it was also seen by some teachers to enhance both the performance and cognitive functioning of those who had hitherto been on the margins of classroom activity or traditionally had performed poorly.* (pp.8–9)

The data collected during this study corroborate such earlier findings. One student at Lambert High School commented: *'I enjoy using* [ICT] *because it's creative, imaginative and fun'* and this can be considered representative of the majority. Similarly teachers have observed that when using new technologies *'there is a tremendous "wow!" factor'*. As a teacher at Haymill Infant School noted: *'We have seen the excitement it generates in children. It motivates children with poor motivation and concentration'*. At Wingate First School, the use of interactive whiteboards was felt to make learning *'more fun and alive, it grabs their attention more'*.

In part, the very newness and novelty of the technologies now available in schools is seen by teachers as a motivating factor. For example, a teacher a Kedlar High School commented: *'The first time we used video conferencing we couldn't get a reaction because they thought it was rocket science'*. This does, however, raise the question of how long new technologies can sustain any increase in students' motivation to learn. It is heartening that even where teachers have been expecting students' interest to wane, this has not yet been noticed:

> *As soon as they start they are interested and if they stopped being interested then it would change.*
>
> (Teacher, Lambert High School)

> *I have looked for the honeymoon period but the children are still engaging well and appreciating the range of resources.*
>
> (Teacher, Wingate First School)

In instances where students have moved on to schools without the new technologies to which they have grown accustomed, students have felt the loss of the opportunities that new technologies had opened to them. For example, the middle school for which Wingate First School is a feeder school does not have interactive whiteboards. Students from Wingate First School are often disappointed by this, looking back favourably upon their previous learning experiences:

> *Older siblings are coming and visiting from the middle school and although they have moved to a more equipped school they are looking back because of the boards.*
>
> (Teacher, Wingate First School)

As this example shows, students' desire to use new technologies provides a strong impetus to engage with learning in school.

That students themselves can see a number of benefits in using new technologies acts as a motivator. For example, at Lambert High School students choose to work in the ILC, recognising it as a place where they can work quietly and revise for exams without distraction. Students comment that they feel better able to concentrate when working in the ILC than in other places.

> *I like to work searching the internet, doing homework, schoolwork and the quiet atmosphere... It's good for revision work,* [there are] *no distractions when preparing for exams.*

Supporting this, the teacher who runs the ILC comments:

> *Initially I was sceptical about the independent learning centre but was proved wrong because the place is never empty. There is a good atmosphere, students use it and it is a good learning environment with books and computers.*
>
> *Students respect* [ILC] *as a disciplined area where they can come and do their work. Students know that while in the ILC the emphasis is on working.*

The use of new technologies has also increased students' expectations of what they can achieve and the resources open to them. Teachers note that providing students with access to the internet and ways of communicating with others outside school through e-mail or video links, has made them more curious and ready to investigate topics. At Gateley Infant School, pupils extended a topic on road safety to include the safety of animals, contacting the RSPCA and university lecturers in environmental conservation by e-mail. The ILC at Lambert High School has increased students' access to the internet, with this being seen to have a knock-on effect in terms of students' motivation to learn:

> *The Internet has moved the students' expectations beyond belief, with more relevant information to find, and there is not a problem with plagiarism because students don't just copy and paste.*

Similarly, at Wingate First School teachers comment that teaching pupils to use the internet has:

> *...made them independent and able to pursue their own interests. They want to go on it and ask if they can.*
>
> *Technology has improved children's confidence to learn. We're using outside resources. They go home and find things on the Internet for themselves.*

New technologies are also seen to motivate students by giving them the ability to produce work of a standard that they might not otherwise have had the skills to achieve. The use of music and art packages allows students who are not otherwise musical or artistic to produce work of a high standard. As one of the Mediaonics teachers at Fairfield Community College commented:

> *Students realise they are using many skills they didn't realise they had, particularly pupils who thought they had no art/music skills.*

In particular, teachers note that students with learning difficulties respond well to the use of new technologies. Again, at Fairfield Community College, it was noted that:

> *One pupil who is dyslexic, usually disorganised (but in Mediaonics his folder is immaculate), has a wacky creative imagination and he has finally found an outlet for it which doesn't involve writing.*
>
> (Mediaonics teacher)

The fact that using keyboards takes away the need for writing is also highlighted as a motivational factor at Gateley Primary School. The headteacher argued:

> *I think* [ICT] *is especially good for children who find writing a struggle. Children can find self-esteem through computers, especially for under-achievers. ICT can build self-esteem and self-esteem builds achievement. If you can't write well and the*

work you produce always looks an awful mess it puts you off. Enthusiasm and motivation comes from doing nicely presented work using ICT.

The Foundation Stage teacher at Gateley Primary School also provided concept keyboards (a touch-sensitive board, with pictures rather than letters) for her pupils to work with. When pressed, a word/words corresponding to the picture appear on the computer screen. The Foundation Stage teacher drew attention to how, when using a pre-programmed 'concept keyboard', her pupils were able to retell a story in much more detail than when asked to write or retell a story using puppets:

If I ask them to write I'll get maybe one sentence and they'll give up at that. With puppets I'll get a bit more, but they'll still focus on a little bit of the story. With the concept keyboard I get much more detailed, complete stories.

One pupil at Beechwood Special School demonstrated a strong motivation to learn independently when using diagnostic, self-adjusting software. When asked what he liked doing most using ICT, he said he liked '*completing things*'. He explained that he had been working with a maths software package at home and it had taken him six months to progress from the most basic level to the most advanced. The programme set him a series of realistic targets, which he had wanted to meet, providing an incentive to learn.

The benefits of using new technologies to present subjects commonly perceived as 'dry' and 'dull' in a more stimulating way, was noted in a number of the other schools visited. At Lambert High School, the modern foreign languages teacher commented:

I teach through ICT, especially on my GCSE modern languages... It can transform grammar to a quiz game. There is the competitive element and immediate feedback, it's self-adjusting. ICT is positive.

At Beechwood Special School, the headteacher drew attention to the benefit of using Successmaker material for literacy to present activities in a context to which pupils were able to respond positively: '*ILS is a motivator, many of these children have been getting extra support for years. ILS has helped to present things differently, it helps get over blocks in learning*'.

The use of software packages for teaching maths was also seen to motivate pupils at Wingate First School. One of the classroom assistants commented: '*It brings things to life... things move and you can see the shape...*'

Further to these motivational benefits, the use of new technologies to teach particular elements of the curriculum has had a wider impact on students' perceptions of learning. Firstly, students have made links between the work they do using technologies and other more traditional learning exercises. As the literacy coordinator at Beechwood Special School explained:

Successmaker, it's American but it fits into the literacy strategy. It starts with basic sounds, goes on to blends and vowel phonemes, so it follows the same progression. We use a lot of additional literacy support material in the classroom. Children love it. They'll recognise it and they'll say things like 'we did this in class'.

Because the pupils are able to make connections between the two, it helps to make classwork more meaningful and again, this acts as a motivator.

In addition to changing students' perceptions of learning, one of the teachers at Lambert High School suggests his use of new technologies has changed students' perceptions of him as a teacher:

I suddenly became a 'cool' teacher because they see all teachers as old, so ICT has made me appear more modern.

Finally, there is also the 'carrot factor'. What ICT cannot be used to change, such as the need to write, can be used to motivate students to carry out such tasks. A key stage 1

teacher at Gateley Primary School commented:

> *I try not to bribe them with it, but for the boys especially who are reluctant to pick up a pencil saying if they finish their writing they can have ten minutes playing on the computer gets them going.*

At Beechwood Special School, computer use forms part of the reward system established to promote good behaviour. Each pupil's behaviour is assessed on a half-hourly basis, with good behaviour earning 'credits'. Pupils who earn enough credits are then allowed to choose from a range of activities for the last fifteen minutes of the day, including playing with Lego, with playdough and computer games. The headteacher explained:

> *We use ICT as a motivator, games consoles as motivators, part of a reward system. Children can play games through the medium of ICT. We have a class credit system [where pupils' behaviour is assessed on a half-hourly basis] which allows the children to choose a reward and buy time on the computer.*

To reflect upon the impacts detailed in this section, new technologies appear to have had an impact on students' motivation to learn in two key ways. Firstly, they have helped to interest students in curricular learning and secondly, can be used to provide rewards for students who work well.

4.4 Breaking down barriers: within and beyond the school

The use of new technologies in teaching and learning has helped to break down many of the barriers traditionally built into the school curriculum in a number of key ways. For example, it has helped to break down the compartmentalisation of different curricular subjects within the school timetable. In several of the case-study schools the use of new technologies was integrated across the curriculum, with students drawing on their knowledge of ICT to aid their learning in different subjects. Rather than ICT being seen as a discrete curricular subject, it was seen to infuse the curriculum as a whole and provide students with the skills to learn, regardless of the subject. As a teacher at Lambert High School stated: *'ICT develops life-long skills. It's learning about learning.'*

Students are able to see the relevance of the work they do using ICT in school to the outside world in various ways, depending on the level of schooling they have reached. At both primary and secondary level, the use of new technologies has challenged any perception students may have that what they learn in school is exclusive to a school context. They are able to apply knowledge learnt outside of school to ICT use in school. For example, at Haymill Infant School a year 1 pupil described how she was able to show her teacher how to clean the mouse on a school computer when it didn't work, having been taught by her father at home.

For Foundation Stage pupils at Gateley Primary School, ICT was used to allow them to experience real life situations in the classroom. The Foundation Stage teacher explained:

> *We use ICT in role play situations – looking at how ICT can support role play, so at a foundation level, there's a software package which actually allows the children to make a telephone call to the police or the fire brigade and the computer talks to them so it's like a proper telephone call.*

For year 6 pupils, video conferencing at Kedlar High School is valued as a medium to learn about the secondary school to which they will be transferring. One pupil commented:

> *We were a bit frightened to use the ICT at first and were put off but it was good to use a new programme with help and to know what the new school will be like. We're one step ahead of people who have come from other schools and not had the chance to use CAD/CAM.*

Teachers recognise the benefits of using CAD/CAM in this way:

> *The facilities help the year 6 transfer process because the children see the school, the canteen, the size of the school and they offer a lot to each other... It takes away the feeling of being insular.*

At a secondary level, the relevance of new technologies to the world outside the school is seen predominantly in terms of helping students to develop skills that are directly relevant to the needs of industry. Students at Kedlar High School are involved in enterprise schemes which rely on the use of new technologies for production:

> *The school supports local businesses in the selling of bookmarks made from CAD/CAM... We have gained business support as we support local businesses with our students getting jobs in them. At key stage 4 we make real products and have real businesses in technology to extend into Business Studies.*

Again, such schemes act to break down the compartmentalised nature of the curriculum, by integrating ICT, technology and business studies.

At Fairfield Community College, the new technologies are being used to challenge students' perception that ICT and Business Studies as discrete subjects are the only subjects available to them which are relevant to the needs of industry. As the Head of Music explains, the Mediaonics course was developed in response to:

> *...a drop in interest in art. I talked to the children to find out why they preferred other options — business studies/ICT. Many stated that they liked using computers and were going to have to use them in the future. Although many liked art, they couldn't see how it was going to help them in the future.*

In order to marry students' concerns about employment with their interest in arts subjects, the Mediaonics course was developed:

> [as] *a new dimension in the arts. You can do all the things you want with computers and use your skills from dance, music, drama, art. We can prove to you that this is something industry is interested in, as you will be taught by people from industry who will tell you how important these skills are. You will also learn to be part of a team and in the real world you have to function as part of a team.*
> (Head of Music, Fairfield Community College)

In this way, the Mediaonics course meets the needs of two client groups: students, who wished to study creative arts but still develop the skills required by industry, and businesses who want to employ those, not just with ICT skills, but with creativity and imagination.

4.5 Summary

This section of the report has explored the impact of the new technologies upon students. Across our case-study schools, teachers reported many benefits for students arising from the use of new technologies in teaching and learning. These were seen to:

- come directly through the use of new technologies – for example, through the use of digital microscopes
- come through changes in attitude and expectations associated with the use of new technologies.

The positive views held by teachers were supported by students' comments. Students were broadly enthusiastic, stating that they enjoyed using new technologies. At Key stages 3 and 4, students also drew attention to what they saw as the real-life relevance of using new technologies, seeing this as a means of enhancing their employment prospects.

More specifically, the data suggests that the use of new technologies have:

- encouraged students to develop new ways of working, learning to work both cooperatively and autonomously

- enhanced students' motivation to learn
- helped to break down traditional barriers between schools and the wider community and between curricular subjects.

Clearly, the use of new technologies in teaching and learning has had many benefits for students. Expanding the use of new technologies to benefit larger numbers of students has many implications, both for schools and for external agencies such as training providers and for industry. These wider impacts are explored in the next chapter.

5 Wider impacts

5.1 Introduction

It is pertinent here to discuss some of the divergent ways in which the use of new technologies has impacted on those concerned with providing education services. We look at the extent to which ICT development in schools have affected parents, communities and industries. In doing so, we document the ways in which schools have invited partnerships and developed strategies to secure the most appropriate technologies for their students. The chapter is organised under the following headings:

- training
- the cost of new technologies
- school partnerships
- community links
- linking with industry.

The section concludes by drawing together some of the main points that have been identified.

5.2 Training

When discussing the impact of ICT development on teachers, Chapter 3 also addressed the issue of training of teachers to use new technologies in their various ICT projects. In this section we document teachers' views about the value and cost of ICT training received, in terms of time and quality. Attitudes towards the general ICT training received by teachers varied considerably. Some of the training sessions that teachers and headteachers had taken part in included:

- New Opportunities Fund (NOF) training
- European Computer Driving Licence (ECDL) (basic word processing, spreadsheet, file management and e-mail skills).

Whilst some teachers had been positive about these external training sessions, most of those who were interviewed suggested that they had gained more knowledge from in-house one-to-one sessions with their colleagues. A teacher confirmed *'the in-house training has had the greatest impact on my classroom practice'*. As part of their training, newly qualified teachers (NQTs) receive ICT training and are required to acquire a mandatory standard before they are awarded Qualified Teacher Status (http://www.tta.gov.uk/training/skills tests/). These teachers did not find the general ICT training offered to be useful and most NQTs chose not to attend the NOF training sessions (which were not mandatory for NQTs). The in-house training that schools provided for their teachers, conducted by their colleagues along with other informal training, was identified by the majority of teachers to be meeting their needs. Teachers felt that they gained more knowledge about the systems and software that they were using from their school ICT coordinators or ICT Managers. One of the headteachers pointed out that his ICT coordinator *'has good knowledge and disseminates to staff and runs after school drop-in sessions for staff'*.

Specialised training, which may be needed by staff prior to using certain new technologies, is sometimes offered by suppliers in the form of a demonstration when the school has purchased a piece of equipment. As is often the case, teachers do not always make immediate use of the new technologies and may find it difficult to recall how to operate the equipment. The delay between training and actual use of the technology may be due to factors which are out of the teachers' control. For example, one of the teachers interviewed commented that she received training on interactive whiteboard use, however, with no whiteboard in her classroom she was unable to put these new skills to immediate use. Again, teachers found

that even with the specialised training necessary in order to use the new technologies, the support offered by their colleagues was more helpful. In several instances, ICT coordinators have received training on the use of equipment and in turn relayed these skills to other teachers at appropriate times.

Some of the new technologies that schools have invested in have demanded a considerable amount of time and commitment from staff, in order to place themselves in a position where they felt confident to use the systems in class. None of the headteachers we interviewed said that they recruited staff as a result of introducing new technologies. Rather, existing teachers have invested their own time, sometimes with the assistance of their ICT coordinators, into developing their understanding of new technologies both during and outside of school hours. A Foundation teacher at Gateley Primary School explained that she spent many hours at home perfecting her knowledge of the new machines which her school and a neighbouring school had jointly invested in. Her self-taught knowledge put her in a position where she was able to accept the machines which the neighbouring school had abandoned as they were unable to make similar time commitments, doubling her own schools' resources for the Foundation Stage students.

5.3 The cost of new technologies

A major problem for some schools that wish to invest in new technology is the fact that they are hindered by space restrictions or other architectural designs that do not accommodate new technological equipment. Schools which occupy old buildings may already have exceeded the pupil capacity for which they were designed. The ICT coordinator at Haymill Infant School observed that the school was trying to install *'21st century technology into a 19th century building'*. In several cases schools were converting teaching and recreation areas into ICT suites or making other changes to school layout to house the cabling necessary for new technologies. At Lambert High School part of the library area has been converted into an independent learning centre (ILC) with £60,000 invested in equipment and a further £14,000 on air conditioning. As this equipment is depreciating at an approximate rate of £50,000 every three years the school has given serious consideration to the cost effectiveness of the new installation. With its technology status the school is considered to be a centre of excellence which encourages students both from within and from neighbouring schools to use its facilities. The centre is open beyond normal school hours (from 8am until 5pm) enabling student access throughout the day in a controlled learning environment.

At Kedlar High School a single milling machine for the CAD/CAM work cost the school £40,000 and this is coupled with the £1500 cost to replace parts every 3 years. However, the ICT Manager is keen to justify these expenditures, *'People would say it's a lot of money but we've won awards at key stage 2 and key stage 3'*. The school has actively involved pupils at primary schools in the use of the technology by carrying out joint projects, where *'students and staff from both schools work well together'* to achieve an end product.

Other schools have invested comparable amounts of money either from their own school budgets, through collaborations with industry or government initiatives. At Gateley Primary School, a primary school with 300 pupils, the pupil to computer ratio is 1:3, which far exceeds the government target of 1:8 for primary schools. When asked about the cost effectiveness of this ICT strategy, the headteacher explained, *'We think it's very valuable or we wouldn't be doing it. We have to produce children who are proficient and keen with ICT, so we have to buy it'*.

Schools were convinced that they had made sound judgements in their decisions to invest in the new technologies and felt that their

students were gaining both academically and socially. Teachers and headteachers have recorded improvements in the attainment levels of their students, since investing in certain technologies. The headteacher at Beechwood Special School said, *'we have monitored students' achievement and seen results in pupil attainment'* since using both ILS and the observation rooms. He went on to comment that teachers had seen the *'knock-on effects on pupils' confidence, self-esteem and better behaviour'*. Most of those interviewed also mentioned the ways in which students' involvement with the new technologies had helped in their ability to interact with teachers and their peers.

Two primary schools had ICT service agreements with their LEAs through which they obtained support. For an annual subscription, they received advice from LEA advisors in the form of periodic visits and telephone helplines. Two of the schools have also benefited from bulk purchasing programmes, coordinated by their local LEAs. Advisors have arranged for the purchase of computers and other ICT equipment for clusters of primary and secondary schools. The cost savings of this approach means that schools are able to buy machines with higher specifications that are more resilient to technological advances, which often render standard equipment out-dated. This method of purchase also promotes continuity for students, as recognised by the headteacher at Gateley Primary School who reported that *'the county coordinates [ICT purchases] so that all the schools in the area have compatible hardware and software'*. Students in this area who are moving across phases would be familiar with some of the resources that they were expected to use, which would provide an element of continuity.

5.4 School partnerships

Primary and secondary schools have also benefited from joint working practices that encourage the sharing of technology and resources. Lambert High School opens its ILC to other local schools, working closely with its middle (feeder) school. Through the ILC the school runs summer schools, Easter revision classes and projects for gifted and talented students. Discussing the video-conferencing aspect of their CAD/CAM project, Kedlar's ICT technician explained that they have joint training days for teachers and arrangements are made for classes of junior school pupils to visit the secondary school. The technician welcomed this arrangement between the schools as he felt that *'all schools should chip in and help each other'*. When Gateley Primary School ran its art and ICT project across three local schools, the results were disseminated via the internet, culminating in an art and ICT course for teachers in that authority. In organising its ICT project, Kedlar High School included a secondary school in the same area, which was in special measures as part of the collaboration with industry, with the view to assisting with the school's redevelopment.

Secondary schools that obtain technology status are required to work closely with partner organisations or schools. Primary and infant schools have benefited from this arrangement, through support with purchasing technology, teacher training and open access to resources, amongst other schemes. The headteacher at Haymill Infant School explained that her school had benefited from the local technology college which provided free ICT support. A teacher at Kedlar High School summed up the importance of collaborative working between schools:

> *There is outreach work [from Kedlar] to the infants as well as the junior schools to support them and they will benefit and do work with the students to raise standards right through from infant to secondary...it is very important investment in the long term.*

5.5 Community links

Some of the schools taking part in this study were proactive in including other sections of their local communities in various aspects of

ICT projects. Links were being developed with further and higher education establishments, parents and other local residents. A range of opportunities have arisen for students and the wider community through the involvement of these groups which were sharing technologies, providing technical support and sharing resources. Joint working has resulted in Lambert High School obtaining a Broadband connection via their local university, using wireless technology. The Mediaonics project which Fairfield Community College has developed has stimulated interest in the technology department of their local university, to the extent that they are seeking the assistance of the school's subject leaders to work with them in establishing a Foundation Stage degree course for undergraduates at the university. The collaboration of school and university professionals may benefit students currently studying Mediaonics at the school, should they decide to continue this field of study at undergraduate level.

Not all of the schools had been successful in generating university links. Recognising the financial implications of sustaining some ICT-related projects, Gateley Primary School have attempted to involve their local university with some of their projects. They are working closely with other primary schools but have been unable to attract similar interest from university professionals, who they feel have shown less vision, perhaps as a consequence of primary school pupils being further removed from the university sector. Gateley Primary School has been more successful, however, in securing the interest of local residents, which is important to the school's aim to promote further community activity. The school's ICT coordinator confirmed:

> *We've worked with a resident artist who is an ICT expert and school teacher. It's been a huge benefit to the school. The school hasn't had to work out the link and ways to integrate ICT and art because we have an expert with both backgrounds.*

Schools are also securing the support of local residents in other ICT projects, as in the case of Gateley, which had received assistance from a local website designer who had invested £5000 to promote the work of the school.

Other individuals who are devoting their time and expertise into supporting schools are governors. Some schools have designated ICT governors who have included in their brief the responsibility for promoting excellence in school ICT development. There was considerable variation in the level of support received by case-study schools. Governors attached to Fairfield Community College attended conferences on behalf of the school, in order to understand ICT issues and obtain ideas for future projects. As well as having a designated ICT governor at Haymill Infant School, their Chair of governors has a particular interest in the school's technological advancement and is very active with his support. The headteacher at Haymill Infant School, whilst praising the level of support received from governors, acknowledged that these governors who are freely investing their time also have other professional and personal commitments. Consequently, they are often limited in the amount of time that they can offer in support of school ICT activities.

Lambert High School has made impressive progress in their school ICT projects with the use of laptops for students, wireless technology, interactive whiteboards and their ILC, amongst other activities. One of their plans is to invest in technology that would support home to school links for students, enabling them to access school computer network areas outside normal school hours. Staff at the school see the ability of students and their parents to access lesson plans and other school resources from other locations as an important part of ICT development

Schools also seek to engage the support of parents and other members of their local communities who have been invited to contribute towards and share in school ICT projects. Different strategies have been used to attract the attention of these groups, such

as video presentations, newspaper articles and school events. Through these methods, schools are able to secure support and, as in the case of Kedlar High School, sponsorship from local businesses. This school has, for the past three years, offered ICT courses to parents, which are free of charge and conducted by an expert lecturer. At Fairfield Community College parents were given the opportunity to create their own web pages and work with their children in the school. Beechwood Special School encouraged parents to engage in activities with their children whilst staff watched from an observation room. A teacher at Kedlar High School explained that the involvement of parents and others from their local community has been crucial to their ICT project, which was in need of £130,000. He was given the responsibility to canvass and publicise the project and described his experience with the local community as *'a breath of fresh air'*. As part of his mission, he said that he had been talking with parents, local residents and industry and the drive to raise £130,000 became a community issue *'which brought many sponsors together within the community'*.

5.6 Linking with industry

In addition to working within school networks, another form of collaboration involved local industries. Businesses and schools have found mutually profitable ways of enriching school curricula in order to advance students' awareness of ICT. Through special projects, businesses are able to introduce students to the world of industry, where they can observe the ways in which the ICT skills that they may have learned at school come to life in the real world. By using industry-standard hardware and software, both Fairfield Community College and Kedlar High School have introduced their students to techniques used by professionals. A teacher at Fairfield Community College explained how they made a conscious decision to tailor their ICT project to match industry. He explained that they researched the market and *'once we had established what the professionals wanted we started to look for the tools that could produce those results'*. These schools have embraced opportunities to invite experts from industry into schools to offer advice to teachers and support for students during lessons. Fairfield Community College has accommodated Saturday sessions, where industry representatives teach students new technology skills, such as 3D modelling and animation. This school/business interaction has attempted to make the learning experiences of the students as close to that which they would experience in working life, should they choose to use these technologies in their future careers.

There are other dynamics which these partnerships have affected, such as the teacher/student and student/industry relationships. Some of the new technologies have created situations where students and teachers have learned new techniques together. The teaching and learning processes have, in these instances, taken on a different format to those which would normally be expected. Teachers have found this to be a positive experience for students and as they work together to find solutions to problems, students *'will also learn how to be part of a team and in the real world they will have to function as a team'* (Fairfield Community College teacher). The headteacher at Fairfield Community College is keen to reinforce this way of working, pointing out that *'Mediaonics is not about the teachers presenting themselves as experts, rather there is a shared learning environment where teachers also learn from students'*. This process works towards fostering an attitude in students which will be helpful to them when they leave school.

The relationship between students and industry is one which both schools and industry are encouraging. In both Kedlar High School and Fairfield Community College, teachers have designed new technology projects which give students insights into industry. Students have been introduced to the worlds of engineering and media, where

they have been taught by industry representatives and worked with industry standard hardware and software. The interest that businesses have shown has had a positive effect on students, who have been encouraged by the fact that they are capable of producing products that are marketable. One of the schools also has an arrangement with industry where industrialists can award students with a certificate of achievement in order to motivate students. Some of the students were motivated by their learning experiences as they saw real employment opportunities for themselves. At the same time businesses were conscious of the possible advantages to themselves, as discovered by a Fairfield Community College teacher who *'wanted to know if Mediaonics had any advantage or value to industry... we approached a number of industries and the reaction has been very positive'*. A business contact told this teacher that:

This is exactly what we need from young people coming into industry, that they've got this overview of what technology can do. We don't mind if they become an expert in one area, we need team players in industry and want young children with such skills as it's what they'll have to do in their job.

5.7 Summary

By drawing on the crucial points which have emerged through the case-study interviews, we have outlined the potential of ICT to assist schools to develop home, community and industry links. The interaction between schools and these partners have worked towards maximising the benefits of ICT development for students. The next chapter discusses the support that schools receive from their LEAs for their ICT development.

6 The role of the LEA

6.1 Introduction

LEAs may offer a range of support services to schools to assist them in implementing new technologies, including:

- INSET programmes
- advisory teacher support
- the provision of resources to support the curriculum
- contracted technical support.

All of the case-study schools had been supported to some extent by their LEA. This chapter covers the following main areas:

- technical support to schools provided by the LEA
- specific support received by the case-study schools
- school partnerships
- further potential LEA support that schools would welcome.

6.2 Technical support

Our interviews with teachers and headteachers indicated that LEAs were offering general support to maintained schools in their area in a number of ways, including:

- NOF training programmes (though other sources for NOF training were also used)
- INSET programmes that were offered to teachers in all LEA schools
- advice concerning hardware and/or software purchase
- advisory teacher support within classes
- broadband connections for faster Internet access
- sending out resources to support initiatives such as the Numeracy Strategy
- purchases using e-credits at discounted rates via the LEA
- technical support services by contract.

Some teachers also spoke positively about the range of resources available via the internet, mentioning those provided by their own LEA local grid for learning. They also indicated that they used the resources on other authorities' websites, although web-based resources seemed to be used more extensively by some teachers than others. Staff in two schools referred to their LEA having funded subscriptions to Learn Premium, an online service used to access resources to support work across the curriculum.

One headteacher outlined how the school planned to draw on the LEA as part of the school's programme of continuing professional development in ICT:

> *We had two years of NOF training with good termly updates of information for one section. We can buy people from the LEA in, do focus sessions and we plan to do some PowerPoint sessions as a result of an audit from the NOF training. We have also identified individual needs and allocated staff meeting time to use colleagues' expertise. We have twilight sessions, an LEA booklet of training courses, have had two focused staff meetings and two or three coordinator led sessions.*

On the issue of hardware purchases, one headteacher acknowledged that the school had made some mistakes, but had learnt from them:

> *It's better to buy machines which are more expensive, more powerful, more memory, because they get old so quickly.* [The LEA]

coordinates this so all schools in the area have compatible software and hardware.

One headteacher noted that technology was not only changing the approaches to teaching and learning but was having a substantial impact on administration. This was largely driven by the LEA: *'In administration, a lot of the changes are top-down, authority-led changes.'*

6.3 Specific support

The case-study schools varied in the level of support they had received from their LEA for their own integration of new technologies to enhance teaching and learning. Some of those interviewed cited the involvement of advisory teachers and the provision of specific resources that had had an impact on their practice. A year 3 teacher at Wingate First School (who was also a newly qualified teacher) outlined how an advisory teacher *'...from the LEA has visited for two days and gave me some good year 3 websites and ideas to link PowerPoint to the Internet...He came in to find out how we're using the interactive whiteboard and offered some advice.'*

However, some areas seem to have seen a reduction in the scope of advisory services and one secondary school teacher indicated that there was no subject-based support for using ICT, as the advisory service no longer existed.

Staff at Beechwood Special School reported that they had received an interactive whiteboard, data projector and DVD player from the LEA on condition that they reported back to the LEA on their use of these resources.

Teachers at Gateley Primary School reported that the LEA used it as a test-bed for new developments. *'We're the only school to try out broadband and wireless technology so we get a lot of extra support which other schools don't get. We are a trialling ground for new technologies so we get all sorts of perks.'* Clearly, some feelings of inequity could arise as a result of additional support being targeted to particular schools. LEAs need to consider how best they can assure schools that their needs are not being marginalised at the expense of developments within selected schools. There is a need for an understanding that resources and approaches trialled in certain schools will ultimately benefit other schools within the LEA, as the pilot exercises enable clarification of the benefits and disadvantages as well as the issues to be confronted.

Schools also appreciated the specialist advice available from LEA colleagues when embarking on major purchases, such as equipping a new ICT suite. Not only were LEA staff able to offer advice on the specification of machines, they were also able to secure discounts for bulk purchases through the LEA.

In the case of Beechwood Special School, staff described how the LEA had been receptive to the school's needs. The headteacher reported having worked in special schools catering for pupils with emotional and behavioural difficulties for more than 20 years and commented that, in his experience, such schools had always been housed in accommodation not originally designed as schools (e.g. large Victorian houses). An Ofsted inspection in the school's former accommodation included in its report the unsuitability of the building and recommended that the school be re-housed in a purpose-built school. The LEA was complimented because it encouraged the headteacher to liaise closely with the architect designing the new school and allowed the original plans including craft/cookery areas to be replaced with a room for a computer suite. In addition, the headteacher suggested the inclusion of the observation rooms located between adjacent classrooms, a feature that would allow teachers and other professionals to observe the behaviour of particular pupils without the unwanted 'observer effect'. Given that this feature was a radical departure from the features of most school buildings and incurred additional costs relating to the equipment necessary for it to

become fully functional, this showed considerable flexibility on the part of the LEA. One of the teachers explained:

> *The LEA supported this in the first place – provided the funding, they were happy to go along with our ideas – the LEA have been very good – they took on board the recommendations of Ofsted at the previous school.*

6.4 School partnerships

Interviewees gave several examples of practices where clusters of schools were sharing their expertise and/or approaches with nearby schools for mutual benefit. Clearly, collaborative ventures could be initiated as part of cluster activities promoted by the LEA: the priorities within each cluster are likely to vary as each group of schools brings its own agenda to the forum. Our visits to the case-study schools revealed several examples of teachers and students benefiting from liaison with other schools. In one instance this was partly driven by the fact that the school had Beacon status (as in the case of Gateley Primary School) and in another, the school had Specialist School status (formerly Technology College Trust) and was an accredited NOF training provider (Lambert High School). These initiatives actively encourage partnership working between schools. In Kedlar High School, ICT was assisting in collaborative work:

> *We have four feeder schools and the primary schools can ask us for help and we have a help desk for them to approach. This is free and we help with training across the LEA and in other schools. We offer 'free' things – the video conferencing across two schools, an infant and a junior using the system are already set up. We have a language link across the schools. [We] do the support with an open supportive approach to the schools. We do not have specialist status on the back of the educational resource but we are a community school with sponsorship from local businesses. We place emphasis on the home and the open community. We offer support to non-partner schools but they pay.*

A teacher in Lambert High School stressed that cross-phase collaborative work benefited teachers in both schools:

> *We will take a whole school staff and deliver training tailored to their individual needs, e.g. we got a website out of the training for one school which we hosted on our server, then they could go away and use it in the classroom immediately after the training. We share skills and pedagogy. The primary school teachers use PowerPoint in a more colourful way and we are open minded for ideas. Sharing is a two way process.*

While these practices may operate effectively with minimal involvement from the LEA, an overview of the collaborative practices taking place would enable advisory staff to direct other schools to examples of good practice using ICT. References to good practice could be included on LEAs' local grids for learning. Staff at Wingate First School were working effectively within their own school, sharing their practice using interactive whiteboards, but were unable to benefit from sharing ideas with other schools in their own cluster because none of the other schools had these resources. There may be a role for the LEA in helping teachers within schools that are utilising particular resources/approaches to contact each other, when this sort of collaboration is not already facilitated by existing cluster activities. A year 4 teacher at Wingate First School highlighted another concern:

> *There is the issue of the first school pupils having to move to the middle school and not having that facility for the same style of teaching. This will cause confusion as the children move from one school to the other. We may need to look at this. It would be nice for us to share what we've done with the middle and high schools but some people work a top-down pyramid.*

This issue of discontinuity of students' experiences is clearly of interest both to the

students' families and the schools concerned, but should also be addressed by LEAs as part of their role in monitoring the provision of education across different phases. Where particular practices have been established (such as the extensive use of interactive whiteboards within primary/first schools) it may be beneficial not only for staff within the feeder and receiving schools to liaise, but also to involve LEA advisory staff, who may have a wider overview of how similar issues are being effectively approached by other schools.

6.5 Further potential LEA support

Our case studies suggested that small schools, especially primary schools, have particular problems when trying to introduce new approaches involving ICT, especially the need for funding, both to install equipment and to provide technical support. In some areas it seems that local secondary schools are providing informal technical support, which has the added benefit of strengthening links between schools.

Teachers at both Kedlar High School and Haymill Infant School indicated that secondary schools were actively providing primary schools with technical support. The headteacher at Wingate First School suggested that sharing a technician within a cluster of primary schools, perhaps visiting each school once a week, might enhance the existing levels of support. However, in another school that had already had experience of this approach, this also seemed less than ideal, as one teacher explained:

> *Support is provided in-school by the ICT coordinator, but of course he has limited time. It's a problem when something goes wrong. We have a technician but he only comes on Tuesday so if it goes wrong on Wednesday you've got to wait a week and if it goes wrong the children get very frustrated and your lesson is ruined. It would be good to have a technician in school the whole time.*

As schools invest more in technology to support teaching and learning, the issue of technical support becomes more pressing and LEAs could consider how they (and perhaps other service providers too) could improve on existing arrangements for providing technical support.

In some cases, there was some feeling that teachers were investing considerable time, effort and money in order to effect substantial changes to their classroom practice by making greater use of ICT, but with relatively little acknowledgement from the LEA of their efforts. This seemed to be a source of some frustration as teachers were keen to share the issues that they were confronting with a wider field of colleagues, perhaps helping others to consider these new approaches with greater understanding of the opportunities for benefiting teaching and learning, yet at the same time with a heightened awareness of issues that may have to be resolved. In some instances, schools felt that their LEA could be more pro-active in encouraging other schools to visit them in order to find out more about their approaches to teaching and learning using technology.

A teacher at Beechwood Special School commented:

> *The LEA needs to make people more aware of this school (we've produced our own video) and need to say 'here's what can be done with these facilities [observation rooms]' and say if there's a need [the LEA] will provide the finance.*

In some instances, such as Gateley Primary School, there was evidence of the LEA working closely with a school, not only for the benefit of that school, but for the longer-term benefit of other schools too, as the school trialled resources with the potential to be utilised elsewhere. It is difficult for LEA advisory teams to maintain close links with all schools in their area but, by having an overview of practices within many schools, they can help to put schools in touch with

others using similar approaches. In this way teachers and students can benefit from others' experience of using particular types of technology to support teaching and learning. With this in mind, LEA advisory teams may want to consider how best they could collate and maintain information about the practices being implemented in particular schools; a first step may be to invite schools to 'self-nominate' their particular approaches, perhaps via the local grid for learning. In this way, schools would strengthen their relationships with their LEA colleagues, as well as enabling the LEA to identify schools that may want to share details of classroom practice with each other.

6.6 Summary

This chapter has highlighted the range of ways in which LEAs had supported the case-study schools, both through general programmes available to all schools within the authority and through specific activities at school level, such as providing additional equipment. It has also identified some of the wider issues concerning the provision of support for schools, such as cross-phase continuity and mechanisms for sharing effective practice between schools. The next chapter considers future developments relating to the use of new technologies in schools.

7 Future developments

7.1 Introduction

Each of the schools included in the case studies represent a success story which is driven by the mission to provide learning opportunities for their students with the support of new technologies. These schools have employed modern strategies in their approach to teaching and learning. They seek to enhance the future experiences of students by understanding the ways in which technology can enhance performance and by embracing opportunities to collaborate within and outside of the school environment. Some teaching staff have expressed their desire to take their teaching programmes forward with further use of new technologies and this chapter presents the views of these teachers and headteachers. We also discuss here some of the recommended practices and approaches adopted by teaching staff, under the following headings:

- financing future projects
- future pedagogy
- technology
- parental involvement.

7.2 Financing future projects

According to some of those interviewed, money is by far the biggest influence on schools' abilities to invest in new technologies. Schools are seeking ways to raise funds for new ICT projects and to sustain existing projects. As school budgets have limited capacity to support their ICT development programmes, the evidence gained from headteachers and ICT Managers shows that schools are increasingly finding it necessary to look to other sources of income. When offering advice to other schools who may be thinking of embarking on similar ICT projects, most of the interviewees suggested that the prime consideration should be raising the finance for initial investment and for sustainability. Explaining the continued concerns at Beechwood Special School, the ICT coordinator said that they are *'never quite sure where the money for ICT innovations is coming from'*.

The need for future government funding is seen by teaching staff as crucial to the success of their ICT plans. Some schools have been supported financially from government funding through the Beacon Status scheme, Standards Fund, Specialist Status and Technology Status, which have provided essential sources of support. With the end of these schemes in sight, schools are worried about funding and question the wisdom of government policy decision-making. A headteacher was concerned that the end of Beacon Status would be detrimental to schools if not replaced by an alternative initiative.

With no knowledge of an alternative government initiative in the pipe-line she described the loss of Beacon Status as *'short-sightedness'*; although schools were made aware, from the outset, the time span of the initiative.

Another school, Beechwood Special School, has benefited from financial support through the Standards Fund, which has been used to incorporate ICT into the wider work of the school. For the future development of ICT programmes, Beechwood Special School's ICT coordinator suggested that *'we have to be funded appropriately'*. He felt that the LEA should be in a position to fund their outreach project on an on-going basis through Standards Fund grants.

Other schools, such as Kedlar High School and Fairfield Community College, advocated the need to look to other sources of funding and encourage other schools to work with local

communities, industry and school collaborations. However, both of these schools continue to seek government assistance for various aspects of their ICT strategies. The ICT Manager at Kedlar High School explained that one of their plans was to achieve the national target for the student to computer ratio using possible funding from the National Grid for Learning (NGfL). ICT Managers and headteachers have emphasised the need to ensure that adequate funding is available in the future, in order to retain teachers' interest and drive to engage in ICT projects.

7.3 Future pedagogy

The level of skills, enthusiasm and commitment with which teachers approach ICT ventures is important to the success of these projects. However, the ways in which teachers use the technology in class and the relevance that they attach to it is equally as important. Teachers, especially the lead teachers involved with the ICT projects discussed earlier, have stressed the importance for teaching staff to use new technologies as a tool to support teaching and learning, without allowing the technology to become the focus of the study. This approach to ICT is thought to be of long-term benefit to students who may continue to use these methods in their future careers. Discussing her vision for ICT at Gateley Primary School, the head of ICT said that *'we don't want discreet ICT, ICT must be integral and must be a tool to further teaching and learning'*. Through this process students are 'developing life-long skills' which may mean that their ICT experiences between school, higher education and work are seamless and enabling. Essential to this vision is the hardware and software in which schools are investing in order to provide students with essential skills.

Paramount to all ICT-related projects is the level of interest that teachers are prepared to show. Some of the schools that were involved in the case studies had teams of enthusiastic teachers who were directing projects and sharing the learning experiences and successes with their students. These are the types of teachers which one of the interviewees at Lambert High School felt were crucial to operating an effective ILC, in which students could access up to date and interesting work plans. She said that if schools wanted to develop similar technology centres then *'idealistically they would need staff who are enthusiastic, creative and keen – the management would need to be pro-active'*. Teachers have shown their dedication by taking time to learn new technologies to a standard which enables them to facilitate students' learning. Speaking about their intention to extend use of interactive whiteboards across the school, the headteacher at Beechwood Special School said that in order for his plan to work *'teachers need to increase their knowledge of the software and techniques for using the interactive whiteboards'*. In addition, they have sought ways to remain knowledgeable about new technologies and develop existing systems. Students have thrived on the energy emanating from the dedication which teachers have invested and teachers have attributed some of the achievements to the effective use of new technologies.

7.4 Technology

Schools were advancing towards their visions for effective ICT implementation through investments in new technologies and they had different views about the ways forward. The choices that the case-study schools were making with regard to their future ICT programmes were dependent upon their local circumstances. Most of the schools, however, agreed that it was important to secure broadband internet connections, which would open a range of opportunities for their students through faster and generally more enhanced systems. Teachers and students in some schools are currently using the internet through Integrated Services Digital Network (ISDN) type connections; however, as this internet use is

becoming more embedded into the learning processes, these groups are using the internet more frequently and for a wider range of purposes. Schools are keen to install broadband as the ISDN connections no longer have the capacity to manage the volume of information with which schools need to work. The inefficiency of ISDN connections has deterred some schools from using them, especially during lessons, as they feel that *'the Internet is useless without broadband'*. Schools have sought to gain access to broadband through collaborations and individual access as well as through Government initiatives. The headteacher at Gateley Primary School further emphasised the need for broadband saying that *'if the Government was serious about this, then all schools need broadband'*.

Teachers had visions of how the Internet could provide the opportunity for them to deliver lessons and allow students and their parents access to online learning resources. The ICT manager at Lambert High School explained how he wanted teachers to be able to communicate their lessons to students through video conferencing. Students should, from a range of locations, be able to log on and join in a class, with the teacher being aware that their student may be situated somewhere in the school, at home, in hospital or many other locations. Such flexibility may work to ensure continued education for students who are *'long-term sick, excluded pupils, sixth formers'* as long as they have the means by which they can access the lessons.

Teachers in other schools, such as Wingate First School and Gateley Primary School, advocated investments in the building of ICT suites. Many schools are occupying relatively old buildings with designs that do not lend themselves to the technology that schools are trying to install, that require a substantial amount of cabling. Some schools have dealt with this problem through wireless technology. The typical purchases are wireless laptop computers which can operate via radio waves. Many schools already have this technology which allows the laptops to operate provided they remain within a specific radius. The arrangements of some of the older school buildings, however, do not support this technology and teachers favour the option to build ICT suites. The head of ICT at Gateley Primary School felt that:

> *Computer suites are probably the best way of doing it – wireless technology just isn't up to scratch – we must balance the cost of extending the school to build a computer suite, or get wireless technology. We're having a new computer suite built.*

ICT managers and headteachers suggested other forms of technology in which they felt other schools should consider investing, such as interactive whiteboards, laptops for students and teachers. Internet access was identified as an important tool to engage parents in the education experiences of their children. The ICT manager at Lambert High School said that *'the development of the intranet/Internet for parents to access will be the next development'*.

7.5 Parental involvement

By promoting parental involvement in the information age, schools are encouraging them to have a greater input and providing easier access to school activities and ICT plans. Lambert High School had held a series of information evenings during which they had discussed their plans with parents in order to secure their support. Other schools recognised the benefits in gaining parental support and making resources available to parents both within and outside of the school buildings. Teachers need parents to support their children's learning programmes and were keen to provide the facilities and learning environments where both students and their parents can work more closely. The headteacher at Wingate First School described her plans to:

> *... provide parents with help about how to access sites and guide them and provide*

facilities in the school for those with no access at home. We want to provide access to ICT resources that the children use, setting up a club for adults to use resources out of school hours.

Parental involvement in this way would help parents to be more informed about their children's learning and provide a direct line of communication between teachers and parents. Parents could be allowed access to the Internet, lesson plans, children's reports, school information, students' homework and e-mail communication with teaching staff. Clearly, teachers see the potential for ICT to promote greater parental involvement, the challenge for the near future is how best to realise this goal.

7.6 Summary

The case-study schools and their partner organisations discussed in this chapter have a wealth of ideas for future ICT development in schools, ideas which aim to enhance the quality of teaching and facilitate learning. When articulating their visions for the use of new technologies, teaching staff have highlighted their concerns, which include issues related to the sustainability of ICT projects.

The following section summarises some of the ideas and concerns that have been expressed by individuals involved in the case-studies, presenting them in the form of recommendations.

8 Recommendations

The teaching and support staff who participated in this study spoke of the value of the new technologies which they had used to support teaching and learning in their schools. These individuals were asked, during interviews, to share their ideas for the benefit of other schools that may be thinking of adopting similar approaches to the use of new technologies. Some of the suggested strategies that teachers recommended are outlined below.

- Where there are perceived benefits to students, schools should be encouraged to forge links with communities and local industry to enhance lesson plans, learn from commercial and other experiences and create longer-term opportunities for students.
- Schools and teachers should be encouraged and given the time and online communication resources to work together and share practices.
- Teachers should be afforded the time to explore the potential of new technologies and should have opportunities to learn and practice using new techniques, so that they can fully develop the confidence to make use of them in the classroom.
- Schools should have easy access to technical support, provided by a neighbouring school, school technician, managed service or the LEA, to ensure efficient use of resources.
- There should be INSET opportunities for teachers concerning hardware and software for effective classroom use; for example, interactive whiteboards and digital microscopes.
- Teachers sometimes have skills acquired through prior work experiences (perhaps gained in industry), which may be transferable to new technology projects in schools. Wherever possible, these teachers should be invited to share ideas and make positive contributions to projects.
- Similarly, there is a need for schools to recognise that the skills and experiences that teachers have on entering the profession can have a significant impact on their ability to use new technologies in their teaching and for schools to offer continuing professional development in relation to ICT.
- One of the most valuable ways in which LEAs could assist schools, as they continue to explore the best ways in which to support teaching and learning with a range of new technologies, would be to ensure that the experiences and insights gained by teachers in one school are able to be shared with other colleagues, in other schools, for mutual benefit.

These recommendations represent the voices of teaching staff who were enthusiastic about the potential of new technology to support teaching and learning in schools. The challenge for the future is therefore to ensure that at both school and LEA level, there is support for teachers and students to explore the ever-changing opportunities that new technologies offer.

References

BRITISH EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY AGENCY (2003a). *Curriculum Online* [online]. Available: http://www.becta.org.uk/research/research.cfm?section=1&id=2745

BRITISH EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY AGENCY (2003b). *About Becta* [online]. Available: http://www.becta.org.uk/corporate/index.cfm

BRITISH EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY AGENCY (2002). *ImpaCT2 – New Report Shows ICT Raises Standards* [online]. Available: http://www.trainingfoundation.com/research/default.asp?PageID=948 [10 December, 2002].

COMBER, C., WATLING, R., LAWSON, T., CAVENDISH, S., McEUNE, R. and PATERSON, F. (2002). *ImpaCT2. Learning at Home and School: Case Studies* (ICT in Schools Research Evaluation Series No. 8). London: DfES.

DEPARTMENT FOR EDUCATION AND EMPLOYMENT (1998). *Open for Learning, Open for Business: The Government's National Grid for Learning Challenge.* London: DfEE.

KINNEAR, H., CAUL, L., McWILLIAMS, S., DUNN, S., EATON, J. and McALISTER, M. (2001). 'Dissolving boundaries through technology in education project – primary school links.' Paper presented at the British Educational Research Association Annual Conference, University of Leeds, Leeds, 13–15 September.

KITCHEN, S. and FINCH, S. (2003). *Evaluation of Curriculum Online: Report of the Baseline Survey of Schools* (ICT in Schools Research Evaluation Series No. 15). London: DfES.

NATIONAL GRID FOR LEARNING (2001). *Schools for the Community Initiative Launched in Warwickshire* [online]. Available: http://www.ngfl.gov.uk/news.jsp?sec=5&cat=99&res=3072 [16 November 2002].

NATIONAL GRID FOR LEARNING (2002). *The NGfL Guide to Broadband in Schools* [online]. Available: http://www.ngfl.gov.uk/.jsp?secfeatures=16&cat=99&res=31615 [4 November 2002].

Useful websites

http://www.teachernet.gov.uk

http://www.learndirect.co.uk

http://www.tta.gov.uk/training/skillstests/

Further reading

ANDREWS, R., BURN, A., LEACH, J., LOCKE, T., LOW, G. and TORGERSON, C. (2002). *A Systematic Review of the Impact of Networked ICT on 5–16 Year Olds' Literacy in English* (EPPI-Centre Review). London: Institute of Education, Social Science Research Unit, EPPI-Centre.

CALDERHEAD, J. (1996). 'Teachers: beliefs and knowledge.' In: BERLINER, D.C. and CALFEE, R.C. (Eds) *Handbook of Educational Psychology*. New York, NY: MacMillan.

CHENG, Y.C. (1996). 'Relation between teachers' professionalism and job attitudes: educational outcomes and organisational factors', *Journal of Educational Research*, **89**, 3, 163–71.

COMBER, C., WATLING, R., LAWSON, T., CAVENDISH, S., McEUNE, R. and PATERSON, F. (2002). *ImpaCT2. Learning at Home and School: Case Studies* (ICT in Schools Research Evaluation Series No. 8). London: DfES.

COX, M. (1999). 'Motivating pupils through the use of ICT.' In: LEASK, M. and PACHLER, N. (Eds) *Learning to Teach Using ICT in the Secondary School*. London: Routledge.

COX, M., PRESTON, C. and COX, K. (1999). 'What factors support or prevent teachers from using ICT in their classrooms?' Paper presented at British Educational Research Association Annual Conference, University of Sussex, 2–5 September.

COX, M.J. (1997). *The Effects of Information Technology on Students' Motivation: Final Report*. Coventry: NCET.

DAVIS, N. (1997). 'Do electronic communications offer a new learning opportunity in education?' In: SOMEKH, B. and DAVIS, N. (Eds) *Using Information Technology Effectively in Teaching and Learning*. London: Routledge.

DAVIS, N., DESFORGES, C., JESSEL, J., SOMEKH, B., TAYLOR, C. and VAUGHAN, G. (1997). 'Can quality in learning be enhanced through the use of IT?' In: SOMEKH, B. and DAVIS, N. (Eds) *Using Information Technology Effectively in Teaching and Learning*. London: Routledge.

DEPARTMENT FOR EDUCATION AND EMPLOYMENT (1998). *Open for Learning: Open for Business (The Government's National Grid for Learning Challenge)*. London: DfEE.

DEPARTMENT FOR EDUCATION AND SKILLS (2002). *Statistics of Education: Survey of Information and Communications Technology in Schools* (Issue No 07/02). London: DfES.

GHAYE, A. and GHAYE, K. (1998). *Teaching and Learning through Critical Reflective Practice*. London: David Fulton.

GRIFFIN, J. and BASH L. (Eds) (1995). *The Impact of ICT on the Primary Classroom*. London: Cassell.

HARRISON, C., COMBER, C., FISHER, T., HAW, K., LEWIN, C., LUNZER, E., McFARLANE, A., SCRIMSHAW, P., SOMEKH, B. and WATLING, R. (2002). *ImpaCT2: the Impact of Information Computer Technology on Pupil Learning and Attainment*. London: DFES.

HAUGHLAND, S. (1995). 'Classroom activities provide important support to children's computer experiences', *Early Childhood Education Journal*, **23**, 2, 99–100.

HIGGINS, S. and MOSELEY, D. (2001). 'Teachers' thinking about information and communications technology and learning:

beliefs and outcomes', *Teacher Development*, 5, 2, 191–210.

KINNEAR, H., CAUL, L., McWILLIAMS, S., DUNN, S., EATON, J. and McALISTER, M. (2001). 'Dissolving boundaries through Technology in Education project – primary school links.' Paper presented at the British Educational Research Association Annual Conference, University of Leeds, Leeds, 13–15 September.

LAWSON, T. and COMBER, C. (1999). 'Superhighways technology: personnel factors leading to successful integration of information and communications technology in schools and colleges', *Journal of Information Technology for Teacher Education*, 8, 1, 41–53.

LEASK, M. and LITCHFIELD, D. (1999). 'Using ICT in your particular subject'. In: LEASK, M. and PACHLER, N. (Eds) *Learning to Teach Using ICT in the Secondary School*. London: Routledge.

LEASK, M. and MEADOWS, J. (Eds) (2000). *Teaching and Learning with ICT in the Primary School*. London: RoutledgeFalmer.

LEASK, M. and PACHLER, N. (Eds) (1999). *Learning to Teach Using ICT in the Secondary School*. London: Routledge.

MacBEATH, J., MYERS, K. and DEMETRIOU, H. (2001). 'Supporting teachers in consulting pupils about aspects of teaching and learning and evaluating impact', *Forum*, 43, 2, 78–82.

McEUNE, R. (2001). 'An Exploration of Teaching Literacy.' Unpublished PhD thesis, University of Bath.

McEUNE, R., KERR, K. and HARRIS, S. (2003). *Developing ICT Use in Worcestershire Schools: an Analysis of Schools' ICT Development Plans Using the LEA Self-review Matrix. A report for Worcestershire LEA*. Worcester: Worcester LEA

MOSELEY D., HIGGINS, S., BRAMALD, R., HARDMAN, F., MILLER, J., MROZ, M., TSE, H., NEWTON, D., THOMPSON, I., WILLIAMSON, J., HALLIGAN, J., BRAMALD, S. and NEWTON, L. (1999). *Ways Forward with ICT: Effective Pedagogy Using Information and Communications Technology for Literacy and Numeracy in Primary Schools* [online]. Available: http://www.leeds.ac.uk/educol/documents/00001369.htm [7 August, 2003].

QUALIFICATIONS AND CURRICULUM AUTHORITY (2000). *Curriculum Guidance for the Foundation Stage*. London: QCA.

SOMEKH, B. (1997). 'Classroom investigations: exploring and evaluating how IT can support learning.' In: SOMEKH, B. and DAVIS, N. (Eds) *Using Information Technology Effectively in Teaching and Learning*. London: Routledge.

SOMEKH, B. and DAVIES, R. (1991). 'Towards a pedagogy for information technology', *The Curriculum Journal*, 2, 2, 153–70.

SOMEKH, B. and DAVIS, N. (Eds) (1997). *Using Information Technology Effectively in Teaching and Learning*. London: Routledge.

SOMEKH, B., LEWIN, C., FISHER, T., HARRISON, C., HAW, K., LUNZER, E., McFARLANE, A. and SCRIMSHAW, P. (2002). *ImpaCT 2: Pupils' and Teachers' Perceptions of ICT in the Home, School and Community*. London: DfES.

The LGA Educational Research Programme is carried out by the NFER. The research projects cover topics and perspectives that are of special interest to LEAs. All the reports are published and disseminated by NFER, with separate executive summaries.

The summaries are available free of charge both on paper and on the NFER website – www.nfer.ac.uk

A selection of recent publications arising from the LGA Educational Research Programme

School Phobia and School Refusal: Research into Causes and Remedies (LGA Research Report 46)

Tamsin Archer, Caroline Filmer-Sankey and Felicity Fletcher-Campbell

This study considered the causes of school phobia and school refusal and what Local Education Authorities (LEAs) and schools can do to support affected pupils. It focused specifically on identification and assessment, causes of school refusal and phobia, provision for pupils who appear to be school refusers and school phobics, and training and monitoring structures.

Published in 2003 ISBN 1 903880 59 9 Price: £8.00

School Attendance and the Prosecution of Parents: Perspectives from Education Welfare Service Management (LGA Research Report 43)

Sally Kendall, Richard White and Kay Kinder

This research is the first stage of a three phase study and provides an overview of the prosecution process within LEAs from interviews with 122 Principal Education Welfare Officers (PEWOs) or equivalent, and data on prosecutions provided by nearly 100 Local Education Authorities (LEAs) between September 2001 and July 2002. It gives an in-depth study examining the effects and effectiveness of prosecuting parents as a strategy to combat non-school attendance.

Published in 2003 ISBN 1 903880 51 3 Price: £9.00

Using Research for School Improvement: The LEA's Role (LGA Research Report 42)

Rebekah Wilson, Jane Hemsley-Brown, Claire Easton and Caroline Sharp

Schools and teachers who use research gain new challenges, insights and levels of understanding – and find it enhances the quality of teaching and learning. This report provides LEAs with information on good practice in the use of research to support school improvement. Examples of projects supported and/or initiated by LEAs are identified and show that much is being done to promote and facilitate research use.

Published in 2003 ISBN 1 903880 49 1 Price: £8.50

Saving a Place for the Arts? A Survey of the Arts in Primary Schools in England (LGA Research Report 41)

Dick Downing, Fiona Johnson and Satpal Kaur

The report reveals a degree of commitment and determination to secure the place of the arts in the face of what are perceived to be considerable threats. It further identifies perceptions of a significant mismatch between the views of school staff and the views of policy makers concerning the value of the arts in primary schools. While recent national changes in the approach to the arts have brought about some developments, schools themselves are seeking a climate change.

Published in 2003 ISBN 1 903880 45 9 Price: £10.00

Effective Interagency Working: A Review of the Literature and Examples from Practice (LGA Research Report 40)

Kathryn Tomlinson

Although the value of interagency collaboration is widely recognised, and the factors that facilitate or inhibit such work are becoming well known, concrete examples of success are frequently buried in literature covering other issues and are not immediately accessible to practitioners. This report provides policy makers and practitioners with a bank of examples from which they may draw in the development of effective interagency collaboration.

Published in 2003 ISBN 1 903880 48 3 Price: £8.00

For further information on any of the above projects or the publications, please contact:

Publications Unit, The Library, NFER, The Mere, Upton Park, Slough, SL1 2DQ.

Tel: 01753 637002 Fax: 01753 637280 email: book.sales@nfer.ac.uk

LGAresearch • Report 49

For further information, please contact the
Local Government Association at:

Local Government House, Smith Square,
London SW1P 3HZ
Telephone 020 7664 3000
Fax 020 7664 3030
E-mail info@lga.gov.uk
Website www.lga.gov.uk

or telephone our general information helpline on 020 7664 3131

Price £8.50 (including postage)

For further information on the research or
to purchase further copies, contact:
Publications Unit,
The Library,
National Foundation for Educational Research,
The Mere, Upton Park, Slough,
Berkshire SL1 2DQ
Telephone 01753 637002
Fax 01753 637280

ISBN 1 903880 61 0
Code No. SR099