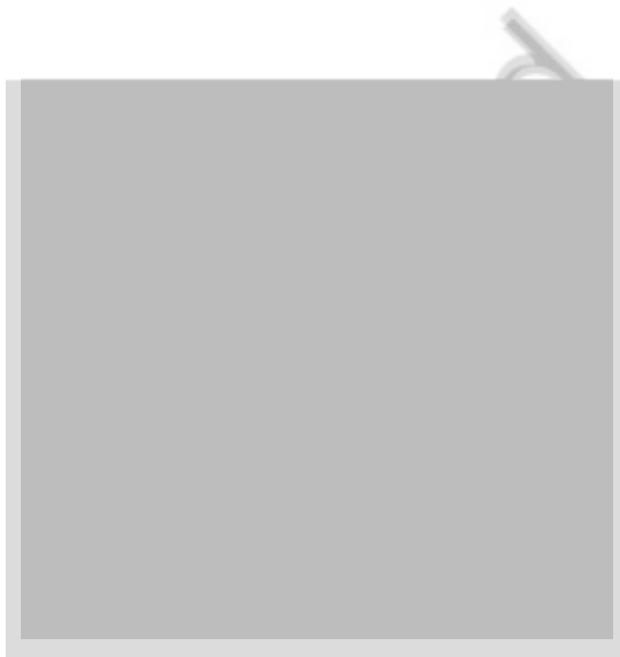


Using ICT to enhance home-school links

An evaluation of current practice in England

A report to the DfES by Bridget Somekh, Diane Mavers and Cathy Lewin

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The research on which this report is based was managed by the British Educational Communications and Technology Agency (Becta) on behalf of the Department for Education and Skills (DfES), and conducted by Bridget Somekh, Diane Mavers and Cathy Lewin of Manchester Metropolitan University

The full text is available on the Becta Research web site at:

www.becta.org.uk/research/reports/homeschoollinks

Home–School Links

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Contents

Preface	2
Executive Summary	4
Aims and Background of the Study	7
Research Design	7
The Policy Framework	9
The Knowledge Base: evidence from recent and current research	10
The nature of home–school relationships	10
The use of ICT in the home	10
The digital divide	11
Using ICT to link home and school	12
Continuing technological advances	12
Other issues raised by research	13
The Surveys	14
Schools actively using ICT for home–school links	14
Commercial companies currently investing in home–schools links	15
The Case Studies	17
Findings	19
Types of technologies and models of use in practice and development	19
The software and web-based content available in the home to support home learning	23
The benefits and potential benefits of using ICT to link home and school	23
Implications of ICT-based home–school links for the digital divide	27
Issues associated with the implementation and management of ICT to support home–school links	28
Embedding the use of ICT for home–school links within the school's work as a whole	28
Conclusions: implications for policy and practice	30
Teachers' professional development	30
Expert knowledge on choosing an infrastructure to support home–school links	30
Technical support in the day-to-day running of systems	30
Long-term sustainability	31
Equity of provision to schools: funding	31
Equity of provision to schools: regional infrastructures	31
Taking action to combat the digital divide	32
Planning for future developments in technologies	33
Annex: Products and Services	34
Acknowledgements	34
References	35

Home–School Links

Preface

The National Grid for Learning (NGfL) is the Government's key initiative for improving ICT provision in schools, developing a wide range of digital resources for teaching and learning and equipping teachers to be effective users of ICT. The NGfL programme seeks to involve learners, the education and lifelong learning services, industry and local government in a vision focused on three key areas:

- Stimulating the development of high-quality on-line and off-line digital content relevant to the UK education system, and developing an accompanying Internet portal – the NGfL web site (<http://www.ngfl.gov.uk/index.html>)
- Ensuring that schools and other educational institutions have the means to access and use these resources effectively
- Providing teachers with appropriate training opportunities so that they are able to incorporate the use of these technologies and resources into their everyday teaching.

Since it was launched in 1998, the NGfL web site has grown to over 362,174 unique indexed documents. Resources for teachers include the VTC (Virtual Teacher Centre) and the Teacher Resource Exchange to which teachers are invited to contribute lesson ideas. The needs of pupils are also addressed in GridClub, which provides a safe but stimulating range of activities and information.

Substantial funding has been made available to schools from the Standards Fund to purchase hardware, software and networks, so they can take advantage of communications technology and the resources it makes available through the Internet. A programme of professional development for teachers is also in progress, to ensure that they are both competent and confident in using ICT, provided by the New Opportunities Fund (NOF).

The NGfL programme has links with several initiatives to raise standards in teaching, learning and administration, including Excellence in Cities, Education Action Zones, Technology Colleges and the Information Management Strategy.

Evaluating the NGfL programme

The NGfL programme underpins the Government's vision for transforming education. Evaluation is being undertaken using a variety of techniques, both qualitative and quantitative, and at both national and local level.

The ICT and Home School Links Project is part of this overall evaluation. The specific objectives of the project are to:

- identify both the types of technologies being used and the various models of use being developed in a range of home–school initiatives (including both established practices and special short-term projects)
- identify the particular benefits that may result
- investigate the ways in which these benefits may relate not only to teaching and learning but also to the way schools are managed and administered
- consider a range of software and web-based content that is available in the home that might support home learning
- consider the implications of these developments for decision makers, schools, LEAs, students and parents
- consider issues associated with the implementation and management of ICT to support home–school links
- consider any further potential benefits of using ICT for home–school links which may accrue in the near future as the technology develops.

The research was commissioned by the British Educational Communications and Technology Agency (Becta) on behalf of the Department for Education and Skills (DfES) and was carried out by Manchester Metropolitan University, Institute of Education (<http://www.mmu.ac.uk/ioe>).

As part of the NGfL evaluation there are several other major studies that are ongoing, including:

ImpaCT 2 – this is a major longitudinal study (1999 – 2002) involving 60 schools. Its broad aims are to identify the impact of networked technologies in and out of school, determine whether this is affecting the attainment of pupils and provide information that will assist in the

formation of national, local and school policies on the deployment of ICT. A full report will be available in 2002. Emerging findings from ImpaCT2 were published in October 2001. Copies can be obtained from DfES publications (tel. 0845 60 222 60) or visit <http://www.becta.org.uk/impact2> to download the full version of the interim document.

Pathfinders Evaluation – this is an important strand of the NGfL evaluation strategy. It focuses on the roll-out of the NGfL programme in schools in ten Local Education Authorities (LEAs) identified as following innovative ICT strategies. Emerging findings which help to inform good practice, are published at <http://www.becta.org.uk/pathfinders>. Copies can be obtained from DfES publications (tel. 0845 60 222 60).

Computers for Teachers Evaluation – this aims to assess the impact that teachers' personal access to ICT has on teaching and learning. The evaluation is split into two parts. The first phase involved a random sample of 6000 teachers responding to questionnaires, while the second phase will build on the findings identified in phase 1 through case studies and further evaluations. Copies of the Phase 1 report can be obtained from DfES publications (Tel. 0845 60 222 60) or visit <http://cft.ngfl.gov.uk/> to download the document in full.

In addition to the above, the School of the Future reports also investigated links between ICT and attainment. These reports are available as printed documents from Becta: *Primary schools of the future – achieving today. A report to the DfEE*, and *Secondary Schools of the future – achieving today. A report to the DfEE*. They are also available on-line at <http://www.becta.org.uk>.

All of the above are also available from the research section of the Becta web site at <http://www.becta.org.uk/research>.

Further information on the NGfL programme is available at <http://www.ngfl.gov.uk>; details of projects managed by Becta are available at <http://www.becta.org.uk>.

Home–School Links

Executive summary

What are home–school links with ICT?

Home–school links with ICT are defined broadly to include formal and informal communications between the school and the home, remote access from the home to school records and information, and all the ways in which ICT can enable pupils' learning to take place in an extended home–school environment. The enormous increase in home-ownership of powerful computers, and in particular the increase in access to the Internet from home, has radically changed the potential for ICT to extend pupils' learning opportunities beyond the school day. The ICT and Home School Links project was carried out between February and August 2001. It investigated current innovative practice in a small number of schools which are leaders in the field.

Why are home–school links important?

The study shows that ICT can be used to make radical changes in the links between home and school. A survey was carried out in 115 schools selected for their involvement in innovative work of this kind. In these schools a range of technologies are being trialled and implemented, including on-line access to the school intranet from home, pupils' use of laptops between home and school, and remote teaching and communication via video conferencing.

Most of the schools which took part in the survey are very much in the early stages of developing the use of ICT for home–school links. Almost a quarter have experimented with providing pupils with laptops. The responses suggest that primary schools believe they have less need to develop ICT-based links because they have good face-to-face contact with parents. Secondary schools, where links with parents are more problematic, are investigating and developing numerous initiatives to use digital communications and on-line facilities to support learning in the home. However, in all but a small minority of schools, this work is still in the early stages.

One case study school has set up wireless links within an approximate 11 kilometre radius. This and other case study schools have set up an infrastructure that allows parents and pupils 24-hour access to the school web site. Although still at an early stage, development work is in hand in these schools to give password-protected access to web-based curriculum materials and a wide

range of information including attendance and achievement records.

The case studies show that pupils are making extensive use of ICT at home, for leisure purposes including Internet searching, and to a somewhat lesser extent for school work. Some pupils are making regular use of homework and revision sites, such as BBC Bitesize and Channel 4's Homework High. At present their use of school-based resources is low because few are available. Where schools have a clear policy for developing web-based materials, these are likely to become extensive and provide an important learning resource for pupils. It will be important to ensure that such materials are educationally valuable.

At best, the use of ICT for home–school links can transform the role and status of homework into a pattern of integrated learning between home and school that might be called home–school-work. The case study schools provide evidence of high levels of pupil motivation and engagement in ICT-based tasks, particularly when such work is undertaken at home without the constraints of short time frames.

Pupils with their own laptops have the flexibility to work at their own pace, carrying on their work without interruption as they move between home and school. This is particularly the case where the school provides wireless connectivity in all classrooms.

All the schools in the study have web sites, although many of these are at an early stage of development. Public information held on web sites includes materials such as location maps, staff photographs, the mission statement, the school calendar, electronic newsletters, pupils' work, information about post-16 courses and community links.

What are the benefits of ICT-based home–school links?

Teaching and learning

The research provides evidence, from both pupils and teachers, of ICT being used flexibly to extend learning beyond the school walls and the school day, enabling pupils to resume, refine, expand and extend their work. In some cases pupils are submitting work to teachers and receiving comments back electronically.

In several schools teachers have been provided with their own laptops for use at home and at school and this has resulted in a significant increase in their use of ICT for lesson preparation and communications, as well as presentation during class contact time.

In some of the case study schools, pupils who have been provided with personal laptops are reported to have exceptionally advanced ICT capability and the ability to use ICT resources with discrimination. This is also true of pupils with extended access to a computer at home, and frequent access to computers in school.

ICT links between home and school have a special value for pupils who are unable to attend school on a regular basis. At one case study school, which caters for children in hospital and those with long-term irregular school attendance, video conferencing and other forms of on-line communication have provided continuity of teaching and communication that would not otherwise have been possible.

Administration

ICT-based links between home and school are contributing to changes in the patterns of administrative work in schools. In several of the case study schools, teachers and parents either have, or soon will have, access to information and pupil records via the intranet. E-mail access to teachers by other teachers and parents has many potential advantages, because of the limited amount of non-teaching time when teachers are available to meet parents or come to the telephone. However, in the case study schools, e-mail use between teachers and parents was still at an early stage and there were anxieties about the potential increase for teachers' workloads that might result.

There is evidence in the case study schools that ICT-based administrative systems have the potential to reduce teachers' workloads while, at the same time, increasing transparency through improved communications with pupils and parents. Of particular value are digital attendance registers, report writing software and the storage and retrieval of achievement records and other data by means of the school intranet. Although these procedures are at an early stage in the case study schools, staff and parents regarded them very positively.

What are the issues?

Integration with the school's educational vision

The schools where these initiatives are successful are those where they are integral with the overall vision for teaching and learning. Strong leadership and good administrative skills are essential since this kind of innovation has implications for all areas of the school's work. The most successful schools are those where staff have the freedom to experiment within a shared educational vision.

Access to high-level technical expertise

To set up an infrastructure capable of providing 24-hour access to the Internet for all pupils, staff and parents, via the school web site is a demanding task, both technically and financially. A small number of case study schools have developed innovative solutions. In one school, staff and governors believe that they have been able to spend funds much more effectively and develop a more ambitious service, because of the high level of technical expertise of a small group of staff, governors, parents and friends. Once the infrastructure is in place, the need for expert technical advice and management continues.

Equity of funding and infrastructure

The study suggests that those schools which have made the greatest progress have received considerably more funding than the average school and that this has been a significant factor in what they have been able to achieve. Schools in urban areas or areas where there is a regional broadband infrastructure are also considerably advantaged. While ISDN access to the Internet is adequate for small schools and the home, those schools that provide 24-hour external access, and are developing the most ambitious plans for web-based resources, are among the minority with broadband facilities.

The management of web site development

In the majority of schools in the study, web sites have initially been developed by teachers. However, the work involved is onerous, particularly where the aim is to provide a full range of curriculum materials and wide ranging records, information and hotlinks that will need constant updating. The case study schools with the most ambitious plans for their web sites are moving to appoint a professional web manager, although in all cases teachers will continue to play a prominent role in the actual production of curriculum materials.

Home–School Links

Teachers' professional development

The study shows that the use of ICT for home–school links increases the demands on teachers to develop ICT skills. However, the case study evidence suggests that teachers' level of ICT skills increases more quickly when the use of ICT is fully integrated in the school's policy and practice. The most successful schools are those in which teachers are being given in-house support to meet ICT targets as part of their normal work.

Safety issues and problems arising from 'solutions'

All the schools in the study are aware of the need to protect pupils from accessing undesirable web sites or communications via the Internet. A range of screening devices are in use and in two schools all parents and pupils are asked to sign an 'actual use agreement' before pupils are given Internet access.

Nevertheless, this 'solution' creates some new problems because it blocks some material that would be beneficial and reduces pupils' sense of control in using the Internet. The evaluators did not find any evidence of home use of computers being controlled in this way. Schools should be aware of the need to teach pupils self-regulation as a necessary Internet skill.

Anxieties about changes in the system

Parents and some teachers in the study expressed anxiety about potential dangers of using ICT extensively for learning. These are relevant to the use of ICT for home–school links, since such use greatly extends the amount of pupils' computer-based work. Anxieties centred on potential damage to handwriting and spelling, as well as on 'replacing books' and the increased opportunities for plagiarism. What is clear is that these are all problems arising from major changes in patterns of work in our society. None is particular to pupils in schools and all raise fundamental questions about what counts as valuable in terms of educational processes and products. For example, paper-based examinations and tests are in tension with the exploratory work in innovative schools that is the focus of this study.

Potential inequities between pupils resulting from variable access to ICT

The study investigated the extent to which using ICT for home–school links may increase inequities between pupils who have access to computers and the Internet at home and those who do not. Such differences impede

choice, flexibility and convenience in ways of working and are likely to have knock-on learning effects. The case study schools provide evidence of such inequities as well as a number of strategies to address the problem.

However, since the majority of pupils have access to computers in the home, and most other pupils can get access in other ways outside school time, the more serious problem appears to be differences in the use of available computers. These appear to depend on family values and choices made in the home about the kind of computer use that pupils engage in. This is a problem that appears to be compounded by schools since teachers in all the case study schools say they are unwilling to ask pupils to use computers at home for schoolwork, preferring to leave such use as a voluntary activity.

There is also considerable evidence that pupils with their own laptops are not able to use them effectively during school time, because both they and their teachers are embarrassed when other pupils in the same class are not similarly resourced. Laptop projects, therefore, appear only to be fully successful when all pupils in the class have the same equipment.

This study has implications for policy and practice to combat such inequities. A suggested strategy is put forward in the conclusions to the report. It recommends that schools should introduce an audit of pupils' home access to computers, together with a Personal Access to ICT Plan (PACT) to be agreed with parents, as precursors to introducing a policy of requesting ICT use for a proportion of homework.

Planning for future development in technologies

The advent of light, portable technologies, combining computer processing power with the Internet and communications connectivity has the potential to change the use of ICT in schools radically. These 'mobile phone-computers' have the potential to make the innovative use of ICT for home–school links described in this report commonplace in all schools. They already exist and are dropping in price. There is an urgent need to plan for their use in schools, not least to develop policies for allowing pupils to provide their own equipment if their parents so wish and for making equivalent provision for other pupils. To achieve this, the education system will need to be able to rely upon inexpensive commercial provision of such equipment. Providers have already demonstrated their interest in working towards educational provision of this kind.

Aims and Background of the Study

The ICT and Home-School Links Project was commissioned by the British Educational Communications and Technology Agency (Becta) on behalf of the Department for Education and Skills (DfES). Its aim was to gather information about existing use of electronic home-school links and to evaluate and exemplify good practice. The project was timely because of growing interest in the role that ICT might play in promoting improved communication and partnership between home and school. There was a need for research to inform policy and practice.

The specific objectives of the project were to:

- identify both the types of technologies being used and the various models of use being developed in a range of home-school initiatives (including both established practices and special short-term projects)
- identify the particular benefits that may result
- investigate the ways in which these benefits may relate not only to teaching and learning but also to the way schools are managed and administered
- consider a range of software and web-based content that is available in the home that might support home learning
- consider the implications of these developments for decision makers, schools, LEAs, pupils and parents
- consider issues associated with the implementation and management of ICT to support home-school links
- consider any further potential benefits of using ICT for home-school links which may accrue in the near future as the technology develops.

The evaluation, which ran from February to August 2001, was conducted at the Manchester Metropolitan University by Bridget Somekh (Project Director), Diane Mavers and Cathy Lewin.

Research Design

Defining home-school links

The evaluators took a broad definition of the concept of using ICT to link home and school. The knowledge-mapping exercise included work on teacher-parent partnership, traditional links without the use of ICT and the use of ICT in the home, in the school, and to link home and school.

Home-school links using ICT have been defined broadly to include:

- electronic communications between the school (including the head, teachers and administrative staff), pupils and parents
- remote access to school records and information from the home
- uses of ICT, such as the school intranet, Internet resources and portable technologies, which enable pupils' learning to take place in an extended home-school environment.

The evidence base

This was a small-scale study in a fast-moving field. Existing practice was likely to be highly exploratory and carried out without benefit of prior experience. It was essential to build up a sound evidence base over a short period of time and to spend time talking to teachers, pupils, parents and commercial providers who were at the forefront of developments. Evidence was collected as follows:

A 'knowledge-mapping' exercise

Information was drawn from recent and current research published in books, papers and on the Internet, or sent to the evaluation team by e-mail through their international network of research contacts. Owing to the limited amount of research in this area, the team also used conference presentations, unpublished papers, newspaper reports and advice from LEA representatives, commercial companies and Government personnel. In addition, the evaluators interviewed five key informants with specialist knowledge of ICT policy and practice in the UK. These interviews with representatives from the DfES, Becta Board, QCA, Ofsted and TTA provided the evaluators with current policy information and key informants' perspectives on issues they considered key to the project's focus. In this way, the evaluators ensured that the research was appropriately targeted.

Home–School Links

A survey of 100 schools

Questionnaires were sent to a sample of schools thought to be already using ICT for home–school links. This was not a random sample. Schools were selected because they had been mentioned in reports in the media or had been recommended by national agencies, LEAs or commercial companies. Many of them were involved in development projects, in some cases with commercial funding and support. The aim was to get at least 100 questionnaire responses and, in anticipation of a low response rate towards the end of the summer term when schools would be under pressure with testing and report writing, a total of 286 questionnaires were sent out. 115 schools responded (37 primary, 65 secondary, 6 special and 7 independent). As this sample was neither random nor representative of the full range of schools, but a carefully selected group, an element of self-selection will have assisted the identification of schools actively involved in the use of ICT for home–school links.

A consultative seminar

A consultative seminar was held at the beginning of April 2001 after a preliminary analysis had been carried out of the evidence from the knowledge-mapping exercise and school questionnaires. It was attended by more than 50 researchers, teachers, commercial providers and representatives of DfES, Becta and other Government agencies. This provided an opportunity to present the outcomes of preliminary work and collect detailed feedback from well-informed stake-holders. Individuals' perceptions and advice were collected by means of small group discussions and in plenary sessions.

A survey of commercial providers

Questionnaires were sent to a small number of commercial companies involved in developing hardware or software for communications between home and school, or known to be actively supporting home–school links through sponsored projects. Information was also collected from their web sites and in one or two cases through face-to-face or telephone interviews.

Case studies

Eight schools were selected on the basis of their questionnaire responses as exemplars of different approaches to the use of ICT for home–school links. Seven of these case studies are presented in this report. Due to unforeseen pressures on the eighth school, sufficient data collection for a full case study was not possible.

However, general findings from this school have informed the report as a whole. The case studies provide a snapshot of the schools' current work, based on one full day spent by one researcher in each school in June and July 2001.

Teachers with different roles were interviewed. Pupils from different year groups and parents participated in focus groups in order to collect their perceptions of the use of ICT for home–school links. In addition, each school was asked to provide us with an extended dossier of information by adding further responses to its initial questionnaire. These were not in-depth studies and did not involve any observation in school or at home, or examination of pupils' work. They present accounts of work in development rather than established practice and the focus is upon giving an account of an approach and strategies that other schools might wish to try out.

The empirical study included:

- the school's existing practices and procedures for home–school links
- details about school organisation and management of ICT to enable and extend home–school links
- types of hardware used in school, at home and elsewhere (including PCs, wireless portable technology, digital television and mobile phones)
- infrastructure in school, at home and elsewhere (including modem, network and broadband technology)
- resources used in school, at home and elsewhere (to support literacy and numeracy, project work and key stage tests)
- e-mail use by pupils, parents and teachers (how, when and why)
- web site use by pupils, parents and teachers (how, when and why)
- teachers', parents' and pupils' perceptions of ICT in home–school links, for example, what is considered to be of importance with regard to supporting, enhancing and extending learning.

The case studies are presented in full at <http://www.becta.org.uk/homeschoollinks>.

The Policy Framework

The starting point for the project was current Government policy for ICT in education and, in particular for the development of better partnerships between home and school and the role that ICT might play in achieving these. The NGfL programme is part of the Government's broader strategy to improve educational attainment and an important part of its mission is to break down the traditional isolation of the school. Considerable progress has been made:

- Investment in ICT in schools in England through the NGfL programme, launched in 1998, will total £657 million by 2002, and a further £710 million by 2004.
- £180 million for training teachers in the use of ICT in the classroom has been allocated through the New Opportunities Fund.
- By 2001, 96% of primary schools, 99% of secondary schools and 97% of special schools were connected to the Internet¹
- By 2001, 37% of primary schools, 71% of secondary schools and 33% of special schools had their own web sites (as against 34%, 62% and 31% respectively in 2000)²

The importance Government places on partnership between home and school was made clear by David Blunkett, as Secretary of State for Education and Employment, in a speech in 1998: "The involvement of the family in the learning process and the links between home and school are vital to the success we are seeking in raising standards and providing real equality of opportunity".³ ICT can help to deliver this vision, both in linking home and school and, more broadly, in making education available to all beyond the confines of educational institutions.

A consultation paper, published in May 2001 (during the conduct of this research), set out the Government's aim to establish a resource of on-line educational materials.⁴ Such materials will be accessible from the home and in the community as well as at school. This suggests the need for a new kind of partnership between parents and schools. Such partnerships are still at an early stage, but, by 2001, research carried out for the Parents Information Network (PIN) found that 21% of schools in the sample had an area on their web site specifically for parents.⁵

Currently, a small but significant body of innovative development work is being carried out, much of it sponsored by commercial ICT providers. For example, Microsoft's Anytime, Anywhere, Learning scheme seeks to encourage and enable increased ownership of laptop computers by children. Initiatives such as the E-Learning Foundation and Computers Within Reach are also seeking to increase access to ICT and the Internet amongst low-income families.

¹ Full references can be found on pages 35-6

Home–School Links

The Knowledge Base: evidence from recent and current research

The nature of home–school relationships

It was important to start by looking at research into the nature of relationships between parents and schools. The 1998 School Standards and Framework Act requires that all maintained schools in England have a written home–school agreement and an associated parental declaration. This document should identify the school's aims, values and responsibilities, parental responsibilities and pupil expectations with regard to the school. The underlying rationale for the agreement is that parents are crucial partners in helping their children to learn and that young people can achieve more when schools and parents work together. Yet precisely how this improved achievement through home–school partnership might be achieved remains unclear, with Government, schools and parents' bodies tending to start from different assumptions.⁶

The key factors in establishing genuine partnerships between parents and teachers are identified by McNamara *et al.*⁷ in a case study of five schools (two secondary and three primary), funded by the Nuffield Foundation. They show that good home–school links that are genuinely supportive of pupils' education in its fullest sense are not easily achieved. Parents often have to 'rid themselves of emotional baggage' in terms of their attitudes to school and are not easily involved in a genuine partnership. Although they feel reasonably well informed about their children's progress, their expectations are strongly influenced by their own prior educational achievement and social class. While they want to support their children at school, their level of active intervention declines rapidly after the transfer from primary to secondary school, as a result of a lack of specific information about homework and the absence of advice from school on how best to provide support. A complicating factor is that secondary pupils, in particular, may be keen to maintain a sharp distinction between home and school and may work actively to 'demobilise' partnership.

In one of the few studies that has specifically looked at the development of ICT-based links between home and school, Passey⁸ suggests a range of necessary considerations, including:

- a willingness to develop relations between parents and teachers and to enable greater parental involvement in formal learning
- leadership by the head and senior management and the setting up of an ICT and home–school links management group
- opportunities for parents and pupils to share in developments and clarity on aims and specific learning benefits of using ICT between home and school, along with advice to parents on what to expect and how to support their children
- evaluation of the benefits and limitations of the system and the establishment of an internal moderation system, including talking to parents and pupils personally (for example, senior managers talking to parents about financial issues, teachers able and willing to offer guidance on issues of equity and technical support).

The use of ICT in the home

Home ownership of ICT increased rapidly during 1999–2000. In a survey of over 2000 pupils in 60 schools across England, the ImpaCT2 evaluation found that in autumn 2000:

- 75% of pupils at KS2 rising to 88% of pupils at KS4 reported that they had a computer at home
- 48% of primary pupils and 64% of secondary pupils reported access to the Internet at home
- 52% of primary pupils and 67% of secondary pupils reported that they had their own e-mail address (with no distinction being made between a home or school e-mail address)
- 19% of KS2, 49% of KS3 and 60% of KS4 pupils reported owning a mobile phone.⁹

By April 2001, 5.6 million (75%) of 7–16-year-olds were reported to be Internet users as against 4.8 million in October 2000, with increasing use by girls (2.7 million girls compared with 2.9 million boys).¹⁰

There is, nevertheless, evidence that parents often restrict the extent of their children's access to the Internet. The reasons for this appear to revolve around cost and concerns about child safety and access to unsuitable materials.^{11, 12, 13, 14}

Studies carried out in both Australia and the UK show that only a small number of children have their own

computer so that use is generally on a shared basis within the family.^{12, 13, 15}

Young people often consider only the latest technology appropriate for regular use and older equipment is deemed either redundant or suitable only for games.^{12, 13}

In the UK, most homes now have access to standard software packages such as Microsoft Office, Microsoft Works or Claris Works which, in conjunction with a move away from Acorn machines in schools, offers a potentially more unified home–school experience to young people.¹⁵

Research by Furlong, Furlong *et al.*¹³ indicates that boys predominantly prefer to use the computer for entertainment, especially skill and strategy games, whereas girls favour use for homework, writing and information retrieval. This is likely to advantage girls' achievement unless teachers directly suggest to all pupils that they use ICT for homework.

Downes¹⁶ suggests that computers are a 'natural ingredient' of young Australian children's daily lives (since computers have been in existence as long as they can remember), taking precedence over such leisure activities as reading, crafts, board games and unstructured play. Television remains the dominant technology, along with video, electronic games and computers and music-related technologies.¹²

Recent research in the UK^{17, 18} shows that, although parents might purchase computers to enhance their children's educational attainment and future prospects, primary aged children mainly use ICT for games and there is a gradual move to electronic communication and increasing use of the web through Key Stages 3 and 4 and beyond. Nevertheless, a 1999 NOP survey found that eight out of ten children (79%) between the ages of 7 and 16 think that on-line resources help them in their learning, the Internet being considered the most popular application for school projects and educational material.¹⁹

The digital divide

The Stevenson Report,²⁰ which was influential in shaping the Government's vision for ICT in education, identified a serious problem arising from the differential access to ICT in the home: those who do not have access to ICT in the home are disadvantaged in the same way as those who do not have access to books.

Although, as discussed in the previous section, a significant proportion of young people now have access to a computer at home, there is still a marked differential between upper (80%), middle (68%) and lower (54%) income families.^{14, 21}

However, pupils are also using computers outside school in a variety of locations (including in libraries, Internet cafés and friends' houses). For example, in ImpaCT2 baseline data gathered in autumn 2000, 79% of pupils (of whom 69% could access the Internet) reported accessing computers outside school but in a location other than the home.²²

Parents often limit their children's access to the Internet for reasons of cost and running costs can lead to restrictions in lower income families.^{13, 23}

More recently, a report from the Institute for Public Policy Research²⁴ raised a further problem in relation to current policies for parent–school relationships. It highlights four variables relating to families, which are critically important in shaping the education of their members:

- Socio-economic status
- Household choices
- Genetic factors
- Family structure.

It can be deduced from this that parents' own education, and their involvement in learning and school, are factors that are just as important in improving their children's educational achievement as home ownership of ICT. The report raises the problem that increased home–school links may place greater reliance upon parents' involvement to support their children's learning and that, rather than overcoming social disadvantage, this might only reinforce existing inequalities in levels of parental involvement. Given the differences in parents' level of ICT skills, this problem may be reinforced when ICT becomes an important component of learning at home as well as in school.

Facer, Furlong *et al.*²⁵ point out that the expectations and constraints that adults place on use of the Internet, and the values that these convey, also strongly influence young people's use. They suggest that '...unless these difficulties are recognised and addressed, there is a real possibility that the NGfL will deepen rather than challenge existing social divisions within society. Technology therefore has the potential to replicate and intensify existing differences as well as to offer new opportunities.

Home–School Links

Using ICT to link home and school

The EDSI evaluation (Education Departments' Superhighways Initiative) provided extensive evidence of what could be achieved by schools with ISDN or broadband links to Wide Area Networks and the Internet.²⁶ It also demonstrated, across a range of settings, the difficulties in making the kind of use of on-line communications which would have a substantial positive impact on learning. For example:

- the infrastructure varies between different parts of the country, giving differential opportunities between schools
- commercial sponsorship gives schools a big advantage but it is mainly available to schools in urban areas, particularly in the south-east of England
- teachers' professional development often concentrates on ICT skills and not on pedagogy and classroom use, and this is less effective in transforming practice
- the learning gains for pupils are likewise reduced when technology is used mainly to deliver ICT skills rather than as a support to pupils' learning.

Some schools have tried a different approach to encourage continued learning beyond the school walls and the school day through the provision of laptop computers. Laptops have the convenience of portability and can therefore be used flexibly not only within school but also between home and school by both pupils and teachers. High gains in ICT capability and improved confidence and motivation have been noted in pupils owning laptops²⁷. Passey and his team noted that the provision of laptops for homework can not only enable autonomy and individualised learning but can also lead parents to become involved in their children's learning.²⁸

The Internet has provided a new source for revision materials through such web sites as BBC Bitesize (help with Key Stage 2 and 3 SATs; tips on GCSE coursework and advice on exam skills), Homework High, Revisewise and the Mentor Question System; some of these also enable opportunities to communicate with a panel of teachers using e-mail. Information for parents is also available on the Net, for example SamLearning (www.samlearning.co.uk) which offers practical help, progress reports and advice to parents for pupils undertaking Key Stage 3 SATs and GCSEs.²³

Nevertheless, research suggests that pupils' use of ICT in both home and school raises its own problems. There

appears to be a mismatch between school and home experience of ICT which is less to do with content and more about the processes or conditions of learning.¹³ In Australia, Downes and Reddacliff¹² suggest that there is a growing gap between primary children's experiences of new technologies at home and at school. Some 70% of children in their research expressed a preference for using ICT at home. The main reasons for this were seen as:

- the type of hardware and software available in school compared with that at home
- a quieter environment
- longer duration of access
- less restricted access
- greater control.

Lack of access and control are seen to typify school ICT experience.¹² Similar findings have come from research in the UK. Pupils often appear to be frustrated and demotivated by the restrictive and controlled nature of school learning with its emphasis on basic skills, whereas home access offers freedom with regard to time, purposeful use of content and choice in the direction of their learning.²⁹ Young people see home ICT experience as associated with agency and creativity and that at school frequently to be about passivity and control.¹³

Continuing technological advances

A well-documented problem for schools and parents is the rapid and continuing changes in available technologies. What is new today is rapidly outdated. At the same time, it is difficult to assess the educational potential of new developments. The convergence of computing and telecommunications technologies as well as their more recent merging with other leisure and entertainment media such as Playstations and digital television is opening up the range of technologies available in the home and for home–school links.³⁰ In the near future, third-generation mobile phones with high-speed Internet access will offer e-education through information, entertainment, e-shopping, e-banking, video, voice and access to corporate networks.³¹ New technologies will have an impact on what can be communicated and to whom.⁵

- Already, among the almost five million 7–16-year-olds using the Internet in the UK, 9% are using the television as their means of access with 22% of 14–16-year-old boys using digital television.³²

- Four out of every ten mobile telephones given as a Christmas gift in the UK in 2000 went to the under 17s.³³
- Virtually half of all British 7–16-year-olds own a mobile phone of their own.³⁴

Other issues raised by research

Whilst e-mail might provide parents with a new and efficient means of communication with teachers, this could lead to a significant increase in teachers' workloads unless properly managed. Freedman³⁵ considers this and other problems relating to how e-mail between parents and teachers is to be managed, including acceptable use, filtering, response times, secretarial involvement, automatic response, use of language and legal implications. What little research has been done in this area points to the need for senior managers to take a lead in establishing procedures to make the best use of e-mail communications with parents.^{35, 36, 37}

The Parents' Information Network research identifies further issues where schools need to establish policies and procedures. For example, parental access to the school's intranet, and through that to the Internet, raises issues of security. PIN recommends that schools should draw up an acceptable use policy as well as providing support and guidance for parents.⁵ This will entail teacher, parent and pupil guidance with regard to how to deal with the mass of information on the Internet as well as unsuitable materials. Whilst filtering may be one strategy, PIN suggests that blocking access is similar to holding the view that if you live in a safe cul-de-sac there is no need to teach children about road safety. Of crucial importance is that all concerned (pupils, parents and teachers) are clear about the aims of ICT use at home and its educational benefits. In its advice to educators and parents, the Superhighway Safety site (<http://safety.ngfl.gov.uk>) points out that while there is a need to exercise caution when allowing children access to the internet, they should not be deterred from using it. With the correct measures in place, such as previewing, filtering and supervision, and an awareness of how to deal with inappropriate materials, any possible dangers can be averted.

Passey's research⁸ suggests that, as well as consideration of the physical infrastructure necessary to use ICT for home–school links, schools need to develop these new links in line with their educational vision. He suggests that:

- the school's beliefs about the curriculum, learning and teaching should come first
- schools can then develop teaching and learning strategies which use ICT links with the home to support their aims for pupils' learning
- decisions about the appropriate technologies and resources to achieve those aims are the third essential component.³⁷

Another important factor is the way in which ICT may influence pedagogic practices. Facer *et al.*²⁵ note a tendency for educational policy and practice for ICT to 'construct' children as consumers rather than producers of information. In other words, the continuing emphasis on retrieving and sorting information may produce pedagogies through which pupils learn that access to information is valued above critical analysis, interrogation and interpretation. They suggest that an alternative approach might entail a rethinking of connectivity for communication and production. It may be that ICT is capable of extending learning beyond traditional boundaries.³⁸ This would suggest that a more radical approach is needed, adopting teaching strategies that are more individualised and less didactic, with an emphasis on problem solving and co-operative learning.³⁹ Educators need to consider the challenge of using technology to develop critical and creative thinking capacities.⁴⁰

Home–School Links

The Surveys

Schools actively using ICT for home–school links

The survey of schools was undertaken between March and June 2001, with questionnaires being sent out in waves as schools showing signs of innovative practice in the use of ICT for home–school links came to light. In total 286 schools were approached, of which 236 were sent paper-based questionnaires and the remainder electronic versions.

The school questionnaire was designed to provide an overview of innovative practice in ICT and home–school links across England. This was not a random sample; rather schools were selected on the basis of existing research and press reports, consultation and recommendation by national agencies, LEAs and commercial companies. The findings do not therefore provide an overview of the national picture. A full analysis of the survey of schools is provided at <http://www.becta.org.uk/homeschoollinks>.

Of the 60 English LEAs represented, 115 responses were received, from:

- 37 primary schools
- 65 secondary schools
- 6 special schools
- 7 independent schools.

These included 11 schools with Beacon status and 11 involved in EAZ projects as well as schools in England's major cities. Some were actively engaged in developing home–school projects using ICT, others were experimenting with ideas or beginning to investigate possible approaches.

The overall impression is that these schools, whilst being innovators, are very much in the early stages of developing the use of ICT to support home–school links, each being at a different point on a continuum and no one school having mastered all there is to know in this area. The responses and perceptions of the staff from the schools in the survey suggest, perhaps unsurprisingly, that development of ICT infrastructure and resources to support home–school links is more advanced in secondary schools than it is in primary schools.

Of the 115 schools surveyed:

- 57 schools had broadband, wireless and portable technologies either already in place or included in planned developments, more commonly in the secondary sector

- all but 16 schools had launched school web sites
- 101 schools had made provision for teachers' e-mail, with pupil e-mail provision in 75 schools
- 52 schools were experimenting with a wide range of different initiatives, often in the form of small-scale pilot studies involving enthusiastic staff so that they could identify issues and problems prior to school-wide implementation
- 27 of the schools had experimented with laptop provision to pupils but interestingly, only six schools believed that it had been effective in supporting home–school links. (Follow-up case studies suggest that implementation of laptop schemes raises equal opportunities issues and concerns about health and safety, as well as how teachers cope with integrating laptop users and non-users in the same class.)
- 13 schools were experimenting with alternatives to school web sites and e-mail such as digital television and commercially provided intranets. Some of these initiatives are explored in more detail in the case studies.

Many schools across the sectors described future plans and developments, suggesting trends towards further web site developments, home access to school servers in secondary schools and increased provision of parental training, particularly in primary schools. Some schools have implemented the use of e-mail between school and home to support communication and information dissemination for reasons of efficiency, whereas others perceive it to put unnecessary pressures on staff time and school procedures. Direct parental contact with teachers by e-mail is less common and even more contentious.

Web site development is generally seen as positive and although emphasis to date has been on marketing and static curriculum information, innovative and effective alternative uses for this medium are emerging. The creation of electronic on-line resources to support learning is currently being pursued by some schools, to a far greater extent in the secondary than the primary sector. More innovative uses include posting homework on a daily basis, on-line interactive materials, access to pupil attendance and achievement records, and facilities for on-line conferencing and tutoring.

The main barriers to development of initiatives are perceived to be resources such as time, funding and expertise, although to a greater extent in some schools

than in others. Issues relating to security and technical limitations are also having an impact. The digital divide, whilst clearly an issue for all schools, is in some schools constraining the development of e-mail and web sites for communication and information dissemination.

There are notable differences between secondary and primary schools, possibly for financial reasons, but also potentially linked to different stages of education and the perceived importance of homework. Primary schools seem more concerned with developing parental involvement through face-to-face contact by providing access to school ICT resources and training. Secondary schools are investigating and developing numerous initiatives to facilitate the support of learning in the home such as home access to school servers, pupil e-mail provision and laptop schemes. Although this is also happening in primary schools, it is to a lesser extent. Web site development in secondary schools is generally more advanced. Many of them have moved beyond simply providing standard information such as timetables and newsletters to the development of interactive learning materials and on-line homework tutoring.

Commercial companies currently investing in home-school links

Between May and June 2001 the evaluators approached five commercial companies known to provide a range of different ICT products and services to support home-school links in the education sector. These were:

- AAL (Microsoft)
- ABK
- CISCO
- NTL
- Oracle (Think.com).

The aims were to find out how important this market area is perceived to be by producers and what products and services are currently available and/or under development. Findings suggest that supporting learning in the home is a developing market area that will become increasingly important. Although a range of solutions was described, common infrastructure includes Internet access and portable technologies together with on-line provision of resources through education portals and intranets. This is intended by the producers to empower pupils and provide 'seamless learning'. Whilst primarily targeting schools, the

importance of supporting parents and pupils at home is acknowledged. The companies are all very aware of the problems schools face with factors such as funding, available infrastructure, technical support and staff time.

- Whilst all five of the companies had a dedicated division to support either education in general or the home-school market in particular, they were very different in terms of overall profile.
- Four had an interest in both industry and education, producing software, networking solutions and telecommunications products. The fifth focused on the education market only.
- The three companies who gave high priority to this market area valued schools, parents and pupils equally within their customer base and all had a dedicated division to support either education in general or the home-school market in particular.
- All of the companies said that web sites on products and services for this market area were aimed at schools, parents and pupils and all but one could be approached directly by parents and pupils.
- All five companies offered training for schools and teachers. Parents and pupils were offered direct training by only one of the companies whilst the remaining four offered them training indirectly through the schools.
- Technical support, as well as being offered to all schools, was available for parents and pupils in four of the five companies.

The products and services currently available or about to be introduced included the following (see the Annex for further details):

- Networking solutions, services and products for schools including e-mail, web and Internet connection
- Laptops for use at home and at school at low rental costs
- Commercial intranets and closed network learning communities facilitating easy access from school and home, with content and a variety of tools for content creation and communication
- Tools for facilitating home access of school-managed intranets
- An infrastructure for supporting school provision of laptops for pupils including mentoring, training and funding mechanisms

Home–School Links

- The introduction of services enabling voice and data to be sent simultaneously over a broadband connection, saving on traditional telephone costs.

The companies were aware that, subject to funding, they could make a contribution in some areas where schools face problems:

The digital divide

Funding mechanisms such as monthly leasing schemes had been introduced to enable parents to pay more easily. Commercial companies also considered that digital television services might reduce the differential between those who have access and those who do not.

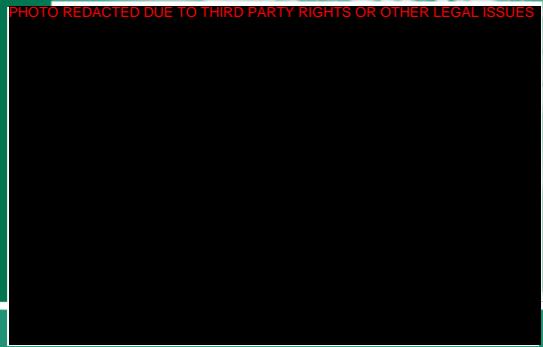
Infrastructure

There may be scalability issues in terms of storage and coping with peak demand periods for remote access to school servers. One solution is to subscribe to externally provided services with large-scale facilities and technical expertise for web hosting, storage and remote access.

Support for out-of-school use of ICT

Parents may look to schools implementing ICT home–school links initiatives for a support structure. Schools may need to work in partnership with commercial providers to support pupils' and parents' ICT needs in the home. This would include access to telephone support outside normal working hours such as in the evening and possibly on a 24-hour basis.

Commercial companies saw the benefits of ICT and home–school links as extending learning beyond the classroom walls and the school day, providing access to information, educational resources and improved communications, flexibility and support for independent self-study for those unable to attend school or choosing to work from home, and the potential for increased parental involvement. The outcomes of this survey are described in full on the Becta web site (<http://www.becta.org.uk/homeschoollinks>).



The Case Studies

The case studies were carried out between June and July 2001. Each entailed an intensive one-day visit (including an evening) where the evaluators met with teachers, pupils and parents in interviews and focus groups. There were also opportunities for informal discussions, and, in some cases, guided tours of the school's ICT facilities and demonstration of home-school electronic resources.

The seven case studies are presented in full at <http://www.becta.org.uk/homeschoollinks>. They are 'snapshots' of interesting innovative work in a challenging new area. They present different approaches to the use of ICT for home-school links and are intended as examples of how ICT can be used for this purpose rather than comprehensive accounts of all that each school is doing in the field. All of the schools are in the process of developing their ICT infrastructure and resources and exploring how to use them to best effect, so these are case studies of development and implementation rather than established practice. To varying extents they have all experienced the usual range of problems associated with the introduction of a major technological innovation and these are touched on in the case studies themselves.

Parrs Wood Technology College is a comprehensive school, which is in the process of developing and implementing its vision of ICT links between home and school. Having just moved into a new building, the school was in the enviable position of being able to transform its technological infrastructures. Expert advice on technology and procurement was available from a small group of knowledgeable parents, governors and teachers. Through its participation in Excellence in Cities, a City Learning Centre has been opened in a separate building on the school site. Staff and pupils have started to use the intranet with increasing confidence, and development of web-based curriculum resources and an on-line administrative system is now under way. With energetic leadership and a flexible approach, the school has started on the process of thinking through how electronic resources will support learning in the home.

Redruth Community School and Technology College is a comprehensive school which has developed on-line resources using RM EasyLink to support learning in the home and to extend links with the community. Three

departments have been involved in the creation of a range of interactive curriculum materials to support learning from home whilst a recently appointed community tutor has developed training and resources for the community as part of a European-funded project. The school has provided staff with laptops and access to interactive whiteboards as well as committing to a programme of professional development. A visionary senior manager committed to technology has provided strong leadership and the school has been proactive in seeking funding.

Whitchurch Middle School has made a commitment to the use of laptops both within the school and beyond. The school has a wireless network and has invested in a bank of laptops in order to raise ICT access for all pupils and to enable staff use beyond the school day. The school is also participating in a laptop leasing scheme through which an increasing number of pupils can obtain portables. Senior managers have provided strong and purposeful leadership and staff have been energetic and enthusiastic, working together as a team and committed to a shared vision. All teachers were reported to be confident and competent ICT users, there is regular professional development and each member of staff has taken on a different responsibility so that there is no one ICT expert.

The Cornwallis School is a secondary modern school which, renowned for its use of ICT, is undertaking a number of small scale, highly innovative projects to support learning in the home. It has made substantial progress in the development of on-line content to support course delivery beyond the school building and school hours. Portable technologies and wireless networking have given flexibility to pupils and staff. Whilst projects are self-initiated by members of staff, ICT is managed by a team supported by strong leadership. The school has an entrepreneurial approach to seeking funding and is willing to experiment and take risks. Teachers have demonstrated enthusiasm, drive and a positive attitude to change.

James Brindley is a special school which caters for children whose schooling is disrupted by injury or long- or short-term illness. This study focuses mainly on hospital provision and the home teaching service. Educational need has driven developments. Providing education in a number of locations across the city, the school has started to implement both 'cutting edge' and more

Home–School Links

traditional technologies to enable effective and efficient communication and shared educational resources both within and across sites. Current projects include video conferencing, the development of electronic lessons and a laptop scheme. As well as piloting a potential range of resources, there is a focus on staff development and implementation into day-to-day practice.

Sandwich Technology College is a mixed secondary modern school which is committed to the use of portable technologies. It is entering its fourth year of a pupil laptop leasing scheme, a rolling programme which has enabled the school to experiment with different models for funding and provision. For example, parents are allowed to purchase laptops of their own choice for their children. The school is also loaning Psion notebooks to Year 10 GNVQ IT pupils. With visionary leadership and senior management commitment, the school is working towards wider staff involvement and the development of infrastructure and on-line resources. Technical support has been recognised as crucial to smooth day-to-day running of the projects and the school is continuing to work on management issues and changes to current practice.

Tile Hill Wood School and Language College is a girls' comprehensive school which is developing ICT links with home as part of a wider vision of ICT in school and links with local and global communities. The school has just implemented home access to the school intranet using RM EasyLink, which enables pupils to access work files and school curriculum materials. It has also invested in a wireless wide area network using an approximate 11-kilometre range aerial on a nearby tower and wireless laptops for staff and pupils, as well as participating in a laptop leasing scheme. Senior managers have had the courage to forge ahead with innovations and have encouraged staff to work together towards a shared vision.





Findings

Findings from the evaluation into use of ICT to enhance home-school links are reported under the following headings:

- Types of technologies and models of use in practice and development
- The software and web-based content available in the home to support home learning
- The benefits and potential benefits of using ICT to link home and school
- Implications of ICT-based home-school links for the digital divide
- Issues associated with the implementation and management of ICT to support home-school links

The conclusions drawn, and their implications for policy and practice, follow in the next section.

Types of technologies and models of use in practice and development

Evidence from the case studies demonstrates a range of technologies being trialled and implemented in innovative schools, including school intranet access from home, as well as use of e-mail and floppy disks to transfer electronic work, pupil laptop ownership, video conferencing and other emerging technologies. At one school an innovative approach to ICT infrastructure has reduced hardware and software costs, and enabled the school to dispense with an external Internet service provider. Evidence from the school questionnaires also suggests other resources such as externally provided secure intranet services, mobile telephone technologies, digital television services, on-line tutoring, web-based attendance monitoring services, as well as the use of the school web site and e-mail to facilitate communication with parents.

Transfer of pupils' work between home and school by means of ICT

Transfer of pupils' electronic work between home and school was being achieved in four ways in the case study schools:

Access to work folders from home by means of telephone/cable links to the school's web site

Access to work folders on the school intranet from home has clear benefits. Pupils at three of the secondary case

study schools can access files within and beyond the school walls and the school day, enabling them to resume, refine, expand and extend their work. At the other two secondary schools, the same provision by means of an externally provided intranet such as Oracle's Think.com is being investigated. This does away with the need to carry floppy disks between school and home. As documents are moved between school and home machines, this approach relies upon pupils remembering to upload completed work back to the school servers. Staff at James Brindley School are contemplating a dial-back facility as a possible future development. This would potentially give 24-hour access to electronic resources which would incur no cost to home users. Moving ahead on this is dependent on being able to guarantee that what pupils access is of sound educational value.

The school is experimenting with a number of different means for providing home access to materials. It has been part of the pilot project for RM EasyLink, facilitating home access to the school server. The school has also recently focused on its web site as the main medium for publishing resources, and there are pilot projects, either in progress or about to start, using the on-line learning communities provided by the Digitalbrain portal and Think.com to support pupil mentoring across year groups. These portals are believed to make it easier for staff to publish resources themselves and also include features to support communication.

The Cornwallis School

Wireless connectivity between school and homes

The same benefits can be obtained by using wireless connectivity, rather than telephone or cable links between home and school. Tile Hill Wood School has a mast located on a local tower. This enables staff and pupils living within its approximate 11-kilometre range unlimited access to the school's electronic resources.

Linking home and school via e-mail

The ease of electronic communication is enabling a range of new opportunities for interactions between teachers and teachers, pupils and pupils, and teachers and pupils. At all secondary case study schools, pupils use e-mail to transfer their work between home and school and at Tile Hill Wood School and The Cornwallis School they sometimes use this means to submit work

Home–School Links

to teachers. The case studies demonstrate examples of teachers beginning to mark work or make suggestions electronically. As well as individual interactions, the Tile Hill Wood case study demonstrates that some schools use e-mail to communicate more efficiently with large numbers of pupils.

Use of floppy disks to store and retrieve work

Where on-line access is not available (for example, a pupil does not have Internet access at home), floppy disks can provide an alternative means of work transfer. Saving work to floppy disk requires pupils to be well organised as disks can easily be mislaid or forgotten. There are also problems with compatibility of hardware and software between home and school, for which schools need to develop particular procedures. Nevertheless, for some pupils and schools, use of floppy disks is proving a good means of transporting work between school and home.

Pupil and teacher laptop ownership

Many schools in the survey have been experimenting with laptops as a means of increasing the ease and flexibility of ICT use by staff and pupils. The models of laptop ownership observed in the case study schools were:

Provision of laptops to all staff by the school

There are clearly great benefits for teachers in owning and using portable technologies to support preparation, teaching and administrative work.

Use of laptops at school and between home and school has become part of everyday practice and described by one teacher as “Low key...it just goes on as part of everything we do”. One pupil commented, “After a while you get used to the idea of having a laptop. It’s just like a normal day thing – you bring it into school, take it home, nothing fussed about it”.
Middle School

For one pupil with cystic fibrosis and a heart condition, whose school attendance is less than 20%, her laptop (allocated on a long-term basis) has given her continuity between school, hospital and home and has enabled the inclusivity to which the LEA is committed.
James Brindley School

At five of the case study schools, staff felt that teachers’ confidence and competence with ICT had increased and ICT was being used more effectively in all the school’s work, as a result of teachers’ having laptops. At two of these schools, teachers were reported to be using their laptops for administration, assessment, lesson planning and the development of learning materials and many have also begun to use them in their class teaching.

For one teacher allocation of a laptop for use at home “just made me feel more professional”.
Whitchurch Middle School

Laptop schemes involving self-selected pupils

At Whitchurch Middle School, pupils have the option of owning their own laptop for use in the classroom and between home and school. Initially instigated with one year group, a programme over the past three years has extended this scheme to other year groups, also involving an increasing number of class teachers. As laptop owners are split between classes, there might be, for example, up to a quarter or a third in one class and just two in another. In lessons, learning intentions are explained and these pupils decide on the best resources to achieve those aims, so that some children in the class might be writing by hand whilst others are using their laptops. In the same way, pupils make their own decisions about appropriate resources to use for homework. At Sandwich Technology College, a similar programme has been instigated and a teacher has been nominated to develop laptop use in the classroom. In this case, pupils in Year 7 have the same nominated teacher for five of their subjects. Thus, they frequently make use of their laptops in the classroom to undertake ICT-based activities to support their learning. Pupils in this school may use their laptops in the classroom to support their learning if appropriate and they wish to do so.

“We’re normally asked to do our coursework (in GNVQ IT) on a computer so you can go home and do it as well as doing it at school. It saves time”.
“(The laptop is) easier than a bundle of books, it’s just a little computer. You can save all your work on it and it doesn’t take up much space.”
Pupil at Sandwich Technology College

A leasing system available, through a commercial provider, to enable pupils to acquire laptops at a low cost

Whitchurch Middle School has had an overwhelming response to a laptop leasing scheme which commenced in September 2001. If uptake matches interest shown, this would double the current number of participating pupils. A number of companies have been approached as the school attempts to get the best deal for parents. The lease cost is likely to be in the region of £7 per week (including software, maintenance and insurance) and there are options to end the agreement without repercussions. After three years the laptop is owned by the leaseholder (although a lump sum can be submitted at any time) and there is an opportunity to upgrade.

The laptop-leasing scheme at Sandwich Technology College operates in a similar way at a cost of approximately £35 per month. Whilst the school has experimented with other funding approaches, such as individual purchase and school-owned laptops loaned to pupils, staff believe that this is the most suitable way to fund the scheme, whilst ensuring that the laptops are compatible and all configured to the same specifications. This school is now entering its fourth year of the scheme and, with increasing interest from parents and pupils, two classes will participate in the year 2001/2002 rather than one class as has been the case in previous years.

However, at another school, uptake of the laptop leasing scheme had been low, perhaps because it was perceived by pupils and their parents to be too expensive. Even a low monthly cost becomes significant for a low income family if there is more than one child.

Provision of school-owned or commercially sponsored laptops

The Cornwallis School has provided two classes in one year group with school-owned laptops. These groups have been randomly selected, addressing equity issues arising from self-selecting schemes. As with the scheme in Sandwich Technology College, as pupils have moved up the school and entered mixed classes with pupils who do not have a laptop, classroom management issues have increased. In this school there are banks of wireless laptops that staff can use in their classrooms to compensate for this.

Problems experienced by schools

There are great benefits in using laptop computers and these are dealt with in the section on the potential benefits of using ICT to link home and school, below. Despite these benefits, the questionnaire responses showed that many schools had been disappointed in the results of their experiments with pupils' laptop ownership to date. Some explanations emerged from the case study research.

Weight

The weight of laptops has proved much more important than had been anticipated by teachers or parents. Carrying laptops between home and school raised concerns about personal injury. Many laptop owners complained that carrying their portables hurt their backs and shoulders, especially when they also needed to carry lunch bags, PE kit and musical instruments. As a result, some parents have experimented with solutions such as providing a trolley, carrying the laptop themselves or transporting it in the car.

The weight of laptops has deterred some pupils from taking them into school every day, especially when they may not be used anyway. The suggestion of a secure school cupboard, in one case study school, would defeat the object of using the laptop for homework and self-initiated learning opportunities.

However, recent technological developments mean that much lighter laptops are becoming available. They are often more expensive, but the long-term value of laptops cannot be fairly judged on the basis of projects which use heavy, soon-to-be-outdated, machines.

Safety and security

Some parents have also been concerned about their child's safety when carrying laptops, particularly the dangers of theft and mugging. In one case, the laptop bag was seen as a 'give-away', especially as there was awareness in the community that some pupils owned portable computers. One pupil's bag was reportedly opened from behind and her leads were stolen so that she has now become wary about walking to school. Rucksacks or ordinary school bags are a useful way of disguising the fact that children are carrying laptops but they provide no protection for the machines. Although no actual case of mugging was reported, this serious problem was raised by pupil, parent and teacher representatives.

Home–School Links

Laptop robustness

The pupil-owned laptops in some case study schools have been robust and reliable. However, others have been beset with problems. Teachers and parents said that in general pupils have looked after their machines but some laptops have still needed frequent repairs, in some cases having to be returned to the manufacturer six or seven times. With use, some makes of battery have deteriorated and no longer hold their full charge. These problems have been frustrating for parents who have invested a significant sum of money in the machines. Being without their laptops was perceived as very frustrating by pupils, especially when some repairs have taken four weeks or longer. Parents, pupils and teachers all recognised the need for laptops to be made more robust so they are suitable for everyday use between home and school.

Classroom management

In secondary schools, laptop projects have been perceived as being successful when the number of staff involved has been limited and staff have been given additional support to change classroom practices. This has been possible in Year 7 as pupils enter the school. However, as pupils move up the school, laptop groups become separated owing to ability setting, and classroom management issues increase. The number of staff involved with the groups also increases. Without strategies for training and support for these additional staff, this has to date led to a decrease in use of pupils' laptops in the classroom.

An example of an innovative approach to ICT infrastructure

Parrs Wood Technology College has based its network/intranet on the Linux operating system. The main financial saving is because Linux is free and runs on less powerful, and hence less expensive, hardware. Linux is an internationally recognised, high quality Unix-derived operating system which was originally developed and continues to be upgraded by enthusiasts who believe that it should be available free. The school's web proxy server uses Linux, running the open source Squid and SquidGuard software rather than a commercial operating system and filter software, which can be both expensive and overly restrictive. The software is highly configurable and updated nightly for a communally maintained blacklist of web sites.

Further savings are made by using 'thin clients' rather than PCs in large parts of the school. A 'thin client' is a

computer that does not do any local processing, but is directly linked to the powerful Citrix-based servers which provide the operating system and all the software. This allows central management of ICT resources and software, meaning a smaller team can maintain a large installed base of computers. The school, therefore, does not need to purchase powerful computers for individual desktop use although it must purchase licences for all software for all machines. Most of the school's central servers run Linux, including all the file servers, authentication servers, firewalls and print servers. This removes the need for very expensive server licences for proprietary server software.

“The decision to use the Linux operating systems and ‘thin clients’ has saved us thousands of pounds.”
(Chair of Governors, Parrs Wood Technology College)

Further considerable savings are made because old machines can be used as 'thin clients': there is no need to continuously upgrade expensive PCs, and moreover, second-hand machines can be acquired cheaply to serve as additional thin clients as and when need increases. However, it is clear that this school has access to high-level technical expertise from a group of highly qualified staff, governors, parents and friends, and that this was a crucial factor in the decision-making process and the subsequent procurement, installation, and upkeep of this highly cost-effective ICT infrastructure.

Video conferencing at James Brindley School, which works with pupils whose education has been disrupted by hospitalisation or other special problems which prevent mainstream school attendance, video conferencing has been introduced. A merging of previously independent providers into one large school (in 1997) along with provision of services on particular sites made it important to have some sort of system that would enable effective and efficient communication and shared educational resources both within and across sites.

Video conferencing enables one teacher to conduct a lesson with a number of pupils in different locations, giving them synchronous interactivity. This virtual classroom can enable electronic face-to-face contact which might not otherwise be possible, with, for example, pupils in hospital isolation units. In order to integrate video conferencing as

a normal part of everyday practice, there is a need for a structured and intensive programme of staff development.

Video conferencing is a way of bringing the outside world to hospitalised pupils. For example, pupils were given a live guided tour around the shuttle, quizzed NASA astronauts about space flight and watched their manoeuvres being practised in India. On another occasion, children were able to talk in real time with a diver just before a night dive on the Barrier Reef, thereby experiencing time difference.

James Brindley School

The software and web-based content available in the home to support home learning

Case study evidence suggests that, in addition to ICT use for their own leisure purposes (such as games and communication), pupils predominantly use ICT at home for the neat presentation of work (especially coursework) and Internet-based research. Many appear to be experienced users of search engines and to handle on-line information regularly. Some case study pupils have found revision web sites helpful in preparation for national tests.

In one innovative project, the GNVQ Intermediate IT course is presented through a 'virtual classroom' model where all resources, including lesson notes, worksheets, useful hyperlinks, assignment materials, examples, and guidance, are available on the school web site. This model has enabled pupils to work at their own pace, from home as well as school, 'empowering' the students. One pupil said, "When you get stuck you can get onto the web site and get on with it without waiting for the next lesson to come along. You don't get left behind, you can keep up with everybody."

The Cornwallis School

Pupils who used the school web site felt that access to information on coursework and deadlines was extremely helpful, enabling them to continue working from home without the need to wait until the next lesson. The ability to return to lesson presentations to review the material covered was also considered to be beneficial.

Redruth Community School and Technology College

Little use of curriculum materials on school web sites was reported by pupils because of limited available resources. However, in some case study schools this is a major area of development. The Cornwallis School is developing a 'virtual classroom' approach, providing all resources required for self-study of some of the subjects studied at Key Stage 4 on the school intranet. This school has also begun to develop an extensive resource base of interactive learning materials across subject areas to support learning in school and in the home. At Parris Wood Technology College, the production of curriculum materials for the intranet, which will be accessible by pupils from home or school, is in the early stages, but is the main focus of stage two in a carefully planned ICT development programme. Redruth Community School and Technology College has developed an area of the school web site to support the local community, including ICT training materials. In all the case study schools, teachers recognised the need to develop these materials but also pointed out related demands on their time, particularly with regard to information which requires regular updating, such as homework postings.

The evidence suggests that schools need to have a clear policy for developing web-based materials, with a person (or small group) responsible for co-ordinating the work of colleagues and putting the materials onto the web site, whilst the production of materials is a job that is shared by all. Schools are beginning to engage the services of dedicated web technicians and/or web managers rather than relying on the goodwill of enthusiastic and technically aware members of teaching staff.

The benefits and potential benefits of using ICT to link home and school

This research provides evidence that there are substantial potential benefits in using ICT for links between home and school. These are considered here under two headings: 'Teaching and Learning' and 'Management and Administration'. Problems that case study schools have experienced, which limit the current benefits, are also dealt with at the end of each section.

Teaching and learning

At this early stage, when innovative schools are just beginning to explore the potential of ICT for home-school links, it is not possible to make claims about major gains in terms of transformation of pupils' learning and

Home–School Links

improved communications with parents. However, the case study schools provide preliminary evidence of a number of benefits and potential benefits for teaching and learning in using ICT to link home and school. The following are the most notable:

Home–school-work

The use of ICT to link home and school has the potential to transform the role and status of homework. The new pattern of working might more accurately be called 'home–school-work'. Homework has traditionally been a means of continuing school-initiated learning in the home, beyond school hours. Home-school-work suggests a closer connection between home and school, a more seamless approach to working and learning.

At one school, a project investigating the effectiveness of on-line resources for homework support with Year 9 pupils has been run over the past year. This project has focused on maths, English and languages initially. Teachers from the departments have designed a wide range of different tasks using two different approaches with advice, support and the responsibility for creating the materials provided by a technician with a range of web programming skills.

One pupil commented that rapid feedback was beneficial. On-line marking of work was available at set times after school. In this way pupils were able to receive feedback, review and resubmit their work without waiting to return to school.

Redruth Community School and Technology College

The schools in this study have explored ways of using ICT to give pupils out-of-school access to their computer files for the continuation of work and to course materials and subject content. This has been by means of intranet and Internet connectivity between home and school and/or portable technologies. At best, these initiatives offer new learning and teaching potential, and pupils in the case studies were enthusiastic about ICT facilities, such as word processing, Powerpoint presentations, on-line digital materials and open-ended, web-based research.

There will continue to be work for which ICT is not appropriate and should not be used. However, this study suggests that, at its best, ICT allows work to be undertaken between home and school with more flexibility and fewer disruptions.

Personal laptops for pupils

Pupils' ownership of laptops also has great potential benefits. In case study schools, laptops enabled pupils to transfer work easily between home and school. Ownership also gave them the choice of producing homework on the computer or with pen and paper – they had access to the computer on an 'as needed' basis. In some of the case studies, pupils' ICT capability was reported to be exceptionally advanced, along with an ability to make informed and sensible choices about the appropriateness of ICT for particular purposes.

At a middle school, ownership of laptops was considered to have motivated children to learn through exploration, experimentation and discovery. One pupil commented, "When you take it home, you can learn more stuff for things and you like...when we explore, like sometimes when I click on something by accident, I learn "oh, is this how that works!" and it's like you just explore on the computer. It's like really interesting – there are so many things you can learn."

Whitchurch Middle School

Many of the pupils in the focus groups at Whitchurch Middle School considered that a major benefit of owning their own laptop was being able to carry on with or complete unfinished classwork at home voluntarily. One teacher said that this was driving learning. At The Cornwallis School, pupils' laptop provision enabled teaching staff to be flexible in their use of ICT to support teaching and learning. They could set individualised learning tasks to extend pupils who had completed class activities or set tasks for small groups. Access to laptop technologies in any classroom led to opportunities to use ICT as appropriate for varied lengths of time rather than requiring teachers to book an ICT suite in advance and feel obliged to work with the whole class for a complete lesson.

Flexible use of wireless laptops

There are also great potential benefits to teaching and learning in the increasingly flexible use of laptops within school, since this will extend the benefits to pupils of owning their own laptop. This in turn is likely to increase pupils' motivation to own and use their own laptops. For example, laptops with wireless connectivity can be used in ordinary classrooms once a wireless network is installed. At Parris Wood Technology College, which has wireless connectivity throughout the building, departments have purchased sets of laptops for use in

teaching rooms when needed. This has proved a very convenient and flexible way of using ICT in a secondary school where 'booking' computer rooms and moving pupils away from the normal subject classroom is never ideal. At Parrs Wood, laptops and wireless cards are issued to pupils at the start of lessons and pupils with their own laptops can use these, in place of school machines, provided they are wireless-enabled.

Provision for pupils with special needs

In the case of pupils with particular learning needs, such as those who are hospitalised for short or long periods of time or who attend school irregularly as a result of exclusion or particular special needs, ICT links between specialist teaching provision, the regular school and the home are of great potential benefit.

Pupils participating in an inclusion project, one tutored mainly from home and the other attending a special needs unit, have been given a laptop and have started the GNVQ IT course. With some input from the class teacher they will be expected to do most of the work in their own time, following an adapted version of the 'virtual classroom' course.

The Cornwallis School

At James Brindley School, video conferencing is enabling pupils in hospital to communicate with others in the same building who are separated by location or immobility, and across the country, with cross-site provision being imminent. There is also the potential for bringing together pupils and teachers at the school which they normally attend. Furthermore, pupils at James Brindley School can communicate more widely with other young people, nationally and internationally. Not only can video conferencing enable simultaneous teaching and learning in different locations, but also immediate feedback on work (using standard applications and a whiteboard) and discussion about educational issues.

This clearly has a significant impact on teaching and learning opportunities for pupils in these special circumstances and could potentially be valuable to other pupils in ordinary schools. It also has implications for new ways of teaching and learning and for staff development with regard to both technical expertise and pedagogy.

The case study of Cornwallis School provides further evidence that the use of self-study on-line resources and communication can support disaffected pupils, enabling them to work on their own and in a location of their choice at the most convenient times. This clearly illustrates the potential benefits of this approach for these pupils.

Tensions and questions

However, the research also showed some of the ways in which the use of ICT for home-school links is raising tensions and questions in relation to teaching and learning in the minds of some teachers and parents.

- **The potential damage to handwriting**

Parents, pupils and teachers all raised issues around the tensions between ICT and hand-generated work. For example, there was discussion, and sometimes disagreement, about ICT reducing opportunities to practise neat and swift handwriting. This was not only an issue in primary schools where teachers, parents and pupils were aware of the need for children to write their SATs tests by hand, but also in secondary schools.

One parent said her daughter's writing had become very neat although it had not been before using the computer: "think it's because they use the laptops so much that when they do write, they enjoy it, so they make an effort". Another said his son could type faster than he could write and always used ICT for homework whenever possible.

Sandwich Technology College

- **The potential damage to spelling**

There was also concern that the spell checker promoted laziness and gave an unfair advantage to those working on screen rather than on paper.

- **The danger of ICT replacing books**

In one case, parents showed ambivalence about the value of using the web rather than books: on the one hand it was seen to promote information-handling skills, but on the other hand to be something of a 'dumbing down'. In another case, many pupils claimed rarely to use the library or to read books, preferring the Internet every time.

- **The dangers of plagiarism**

Several informants spoke strongly about the potential for the ease of cutting and pasting to lead to serious problems of plagiarism. Some schools had

Home–School Links

implemented measures to address these issues, such as insisting on some handwriting, spelling and coursework completion being undertaken in lessons and for homeworks where ICT use was not allowed.

What is clear is that these are all problems arising from major changes in patterns of work in our society. None is particular to pupils in schools and all raise fundamental questions about what counts as valuable in terms of educational processes and products. It may be that some educational practices – such as testing pupils only on the basis of hand written texts – need to be changed in response to the advent of ICT. Too easy assumptions about how things 'should' be done could undermine the educational value of using ICT to link home and school.

One parent who said he was worried about problems of plagiarism, went on to say that access to the Internet was changing the nature of teaching and learning: "It's perhaps a different approach to education – to assimilate what's outside there and put it together for the purpose in view. I think that's a higher level skill which doesn't develop at the same pace – a more subtle approach to learning."

Parent at Parrs Wood Technology College

School management and administration

Parrs Wood Technology College is transferring from SIMS (School Information Management System) to a new web based system called Facility CMIS (Central Management Information System) produced by CCM Software Services. This will provide the databases of information within a new e-portal. The system for making pupil records available on the intranet has been partially implemented to staff only, but a form tutor spoke of the advantages of being able to access information about his tutor groups electronically, and a science teacher found it useful to be able to access pupils' marks and test scores across the whole year group learning science.

Staff at Parrs Wood Technology College spoke of the advantages of electronic registration, in particular: easy access to information about pupil attendance including late arrivers who are recorded on the system as an 'L'; and considerable time-saving when entering individual attendance records on reports for parents.

All staff at Tile Hill Wood School have an e-mail address. There are no staff pigeon holes in the school: paper-based messages have been replaced by electronic communication. Approximately one third of staff have used e-mail for some sort of communication with pupils. Group listserves have been created so that teachers can contact whole year, tutor and subject groups by e-mail with ease. Individual teachers have also prepared their own address lists where necessary.

All case study schools have a web site which contains general information about the school for access by parents and prospective parents. Tile Hill Wood School has three: an administrative site, a public curriculum site and a secure curriculum site. Its public school web site, developed in-house, contains the following information:

- School location, map of the campus, still images of the campus and live longshot webcam images
- Staff photographs and contact details
- School and departmental organisation
- Post-16 information
- A foreword from the head, a mission statement and school aims, principles and ethos
- School calendar
- School performance data
- News
- Community links (for example, the nursery located on the campus and swimming information).

The Whitchurch Middle school web site contains pupil, teacher, parent and governor information:

- General information about the school
- The school prospectus
- A calendar of events
- Dates (such as parents' evenings and PTA events)
- Electronic versions of paper-based newsletters
- Links to curriculum planning for each term
- Annual SATs results
- Homework information
- Hyperlinks to useful educational sites
- Pupils' work.

All school web sites have been developed initially in-house. However, at three of the case study schools where the development is becoming extensive and has begun to

include curriculum materials and/or information that needs to be updated regularly (such as attendance records), a web site manager has been appointed. James Brindley School is buying in support from a company to help build the third version of its web site.

Case study evidence suggests that school web sites are used rarely by pupils at this early stage in development. Some parents have found it useful for information lost in paper-based format. The school web site was seen to be an important means of contact with prospective parents.

Parental access to such information as pupil monitoring and assessment was generally seen as an area for future development. Two case study secondary schools have started to plan access to attendance and test scores for parents in password-protected areas.

Teachers' workloads

Benefits in terms of saving teachers' time are already observable in those schools where ICT is being used for report writing and record keeping (registration of pupils' attendance, for example). Three of the case study schools are using optically read registers which feed into the SIMS management system. At Parrs Wood Technology College this has been found to make it easy for form tutors to keep track of pupils who arrive late and register in the school office. Parrs Wood is currently introducing software for report writing and those staff who have used it are enthusiastic about the amount of time it saves.

The development of on-line materials is being accelerated by setting targets for faculties, such as providing new on-line materials suited to pupils in each key stage before the break for the summer vacation. To generate new on-line materials, staff need only prepare a file (in Word or Excel) and send this to the data manager who will put it up on the intranet.

Parrs Wood Technology College

Implications of ICT-based home-school links for the digital divide

All the case study schools are fully aware of what has come to be known as the 'digital divide' and are employing strategies to overcome it. However, the problems are complex and not easily solved.

The digital divide can be defined as differential access to ICT for pupils from different families that enables or impedes choice, flexibility and convenience in ways of

working. These are likely to have knock-on learning effects. Access is about resources but it is more complex than merely totalling time spent at a computer. Factors that enable or inhibit access include family income, rules, attitudes and values. Access is also influenced by age, gender, and the location of ICT equipment in the home.

In the case study schools, the evaluators observed a tension between those who have and wish to use technologies and those who have not and therefore do not have the choice. It was noted that pupils were not being encouraged to use ICT resources at school if teachers felt that the opportunity was not open to all. Pupils, too, appeared to be 'embarrassed' to be seen to be using equipment which was not available to others in the same room. In some cases their reluctance was observed to be because of feared peer reaction and the perceived danger of social exclusion. Thus, laptops owned by some pupils, were not being fully used by their owners.

The case study schools were working hard to provide opportunities that diminish inequities by offering access to computers within and beyond school hours, loaning equipment and offering clubs outside lesson times. In the best cases pupils were benefiting greatly from the provision of special facilities within the community, such as libraries with good ICT provision or City Learning Centres within the Excellence in Cities initiative.

Yet, despite schools – and indeed the community – working as an equaliser, pupils who have no access to ICT at home remain educationally disadvantaged. For them, anytime, anywhere learning must either be non-technologically based or entail particular personal efforts. One teacher expressed the view that if all pupils were asked to use ICT for homework some would, in effect, be set 'two homeworks' – the actual homework plus the time and effort spent in getting access to ICT to do it.

However, as a majority of families do appear to have computers and on-line connectivity at home, in many cases the differences seemed to be more to do with two other factors: one was the lack of priority given to some children's access to ICT in the home – as one girl said, "It's not just having a computer at home, you have to get to use it" and the other was the kind of use that pupils chose to make of ICT, itself potentially influenced by their parents' educational background and cultural capital. In one school, all of the teachers interviewed said that they very seldom made it a requirement for pupils to use ICT for their homework, because they thought this would be unfair to

Home–School Links

those without a computer at home. Ironically, the outcome of this may have been to reduce the amount of usage of ICT for homework across all but the most advantaged pupils whose homes provided what sociologists call the 'cultural capital'* to cause them to exercise this choice.

In the case studies there was also evidence that some projects were increasing inequalities of educational experiences between pupils, causing social divisions and highlighting socio-economic difference. Despite case study schools' best efforts to compensate, it is possible that personal laptop ownership might provide educational benefits to some pupils that are denied to others. Whilst benefits to learning were difficult to measure, it was observed that pupils who owned laptops often had advanced ICT capability and were enthusiastic about using their laptops for learning, especially when they were among other laptops owners.

The need to address these issues more directly is dealt with in the section on the implications of the research, below.

Issues associated with the implementation and management of ICT to support home–school links

The research provides a considerable body of evidence about what works in terms of implementing and managing an ICT infrastructure and institutional practices, to promote improved home–school links.

School vision and commitment

Schools that are currently using ICT to develop links with the home are leaders in the field. They have had the vision and courage to forge ahead with innovative projects. These are early days in the use of ICT for home–school links and it is a rapidly changing field.

This school has adopted a unique approach to management of ICT, with a 'project team' of ten members of staff including a deputy head teacher and staff from a variety of departments including IT, English and science. This team shares responsibility for overseeing the day-to-day management and development of ICT facilities in the curriculum. In terms of innovation and creativity, it was found to be far more effective to pool expertise and generate new ideas from a group than from one or two individuals. The team works collaboratively, members are supportive of each other and many enthuse and involve other staff members through their self-initiated projects.

The Cornwallis School

"The overall aim...is that any child will be able to access education at any time, day or night, from wherever they are, and that's what James Brindley is trying to organise." Teacher, James Brindley School

The case study schools show that, despite the pressures under which they are working, senior managers have demonstrated strong and energetic leadership and staff have given time and commitment. As is always the case with innovations, those models which appear to be particularly successful are characterised by a shared vision: staff move forward together as a team and those who are hesitant or resistant are kept on board and given support. As pioneers in the field, schools are necessarily discovering the benefits and pitfalls in extending the role of ICT into home–school links. One of the limitations of being a forerunner is that it is not always possible to learn from the mistakes of others.

A flexible, exploratory approach

Although initial planning is important, the most successful schools appear to be those where staff are encouraged to be flexible and responsive to opportunities within a shared educational vision. There is a fluidity in the ways that equipment and content are used at school and beyond the school walls and the school day. Individual initiative and effort bring their own rewards but can also inspire others when they are given recognition by management.

The ethos driving ICT development within the school is to support innovation and creativity in order to be pioneers in this field. Ideas are quickly put into practice not only to identify and overcome hurdles but more importantly, to inspire other members of staff, making them aware of all possibilities. Perfection is not demanded immediately and there is an expectation that successful initiatives will become more polished over time. There is a feeling of 'constant movement with implementation' as staff continually push developments in all directions.

The Cornwallis School

Embedding the use of ICT for home–school links within the school's work as a whole

The development of ICT for home–school links needs to be seen as part of wider developments within the school, not as something discrete from day-to-day school practice.

* See *Distinction: a social critique of the judgement of taste* by Pierre Bourdieu, translated from the French by Richard Nice, Routledge, 1989, p.13

It should contribute to achieving the school's educational vision. There is a need for strategic planning, taking into account the necessary resources, including funding and the allocation of responsibilities to teaching and administrative staff.

Innovations have not only been implemented with a view to raising educational attainment and building home-school links, but also to improve facilities within the school, to develop partnership with other schools and to link with local, national and international businesses, institutions and communities. Pedagogic visions, which embrace learning beyond the school walls and outside the standard school day, are thereby woven together in a multi-functional approach to resources.

Tile Hill Wood School

Where some schools have embarked upon funded projects with external sponsors without sufficient time to look at their implications for the school's work as a whole, it has proved difficult to sustain initial enthusiasm. For example, problems have developed when pupils have moved on to new classes with 'uninitiated' teachers the following academic year.

Keeping parents informed

In order to sustain the impetus and smooth running of the laptop project, parents at Whitchurch Middle School are kept up to date with letters, flyers, questionnaires and announcements, official reports, research findings and meetings. One evening, one teacher taught her class of 25 pupils in front of a group of parents, undertaking a maths investigation using laptops. A colleague provided a commentary. All teachers volunteered to either teach or supervise around 200 children undertaking a range of ICT-related activities in another curriculum evening attended by approximately 250 parents.

Through publishing homework guidelines courses parents can be "empowered to support learning in the home". This has already stimulated parental involvement and support in this school. Parents at open evenings have commented that they now have a clearer understanding of what pupils are expected to do and they feel more able to support them in the home.

The Cornwallis School

Computer-generated work at Whitchurch Middle School is also shared at termly parents' evenings. Two teachers

also ran a successful series of basic ICT skills evening classes attended by approximately 16 parents.

The gap between aspiration and delivery

In all the schools, there was evidence that vision, if not policy, for using ICT to develop links between home and school was well in advance of actual practice. In some cases, there have been heightened parental expectations which schools have not been able to meet. It is important to recognise that vision must come first and that all innovations are characterised by a lag between planning and implementation. The schools which are best able to address this problem are those which have planned the developments in stages and made these clear to teachers, pupils and parents.

Internet safety issues and the dilemmas arising from apparent 'solutions'

Teachers in the case studies recognised the need to protect pupils from unsuitable material on the Internet and contact with strangers through e-mail and chat rooms. All the schools had put into place a system for screening incoming material from the Internet, and some were also screening e-mail communications. This was handled in all but one case by the school's Internet Service Provider and, in another case, a second system gave teachers additional control over which sites were included.

Nevertheless, this apparent 'solution' creates some new problems. In particular, filtering can block materials needed for schoolwork, particularly for older pupils, and schools should be aware of the need to teach pupils self-regulation as part of the skills necessary to make good use of the Internet.

Some of the schools have developed detailed policies for use of the Internet when accessed through the school intranet, and in at least two cases, parents and pupils are asked to sign an 'actual use agreement.' This is in line with the recommendations from the Parents' Information Network (PIN).

All pupils are required to sign a contract before using the Internet at school. Parents or guardians are also asked to sign a form giving their permission for their children to use on-line resources. No pupil is allowed to access the Internet from school without parental agreement. When pupils first access EasyLink from home, they are also required to submit an agreement.

Tile Hill Wood School

Home–School Links

Conclusions: implications for policy and practice

As schools begin to experiment with and implement the use of ICT for home–school links, there is a need for policies that will support these developments directly or indirectly at school, LEA and Government levels.

Teachers' professional development

As with all ICT initiatives, there is a need for professional expertise. In one case, there was parental concern about over-reliance on ICT-capable pupils supporting teachers and peers. NOF training appeared not yet to have made a significant impact. This appears to be related to lack of teachers' time (in one secondary school, where teachers objected to doing NOF training in their own time, it was only being taken up at the end of the summer term 2001).

From September 2001, linked to current NOF training, all staff will be expected to create at least two lesson presentations or activities to support pupils' learning each term and this target will be closely monitored. Recognising that access is crucial and offering an incentive to support changes in current practice, each member of staff will be provided with a school-owned laptop. All electronic resources that are created will be published on the school's web site to facilitate home access. This is perceived to be an achievable and realistic target, working towards a vision of a fully interactive curriculum. Redruth Community School and Technology College

Senior managers will continue to commit to regular staff development and the provision of portables between home and school for staff. In the short term, there is a commitment to 'skilling up' new members of staff (due to recent promotions) as well as sharing and developing the school's ongoing vision. "We have come so far and we go so far every year, I can't imagine what will be achievable."
Teacher at Whitchurch Middle School

In those schools where all staff have been provided with laptops for their own use this has reportedly made a very significant impact on capability, with evidence of growing use for professional purposes and also for teaching. This kind of personal ownership of a PC or laptop appears to

be a necessary if insufficient condition for getting all staff to use ICT in their teaching.

The most successful schools in terms of using ICT for home–school links are those where staff are being given in-house support, particularly through collaborative involvement in ICT-related project work or in developing on-line materials. When all staff are required to undertake small amounts of ICT use on a daily basis (to complete electronic registers, for example) this seems to help to establish patterns of use.

Expert knowledge on choosing an infrastructure to support home–school links

Expert advice on technology and infrastructures, as well as good procurement practice, is essential if schools are not to waste time and money as a result of poor decisions. At the present time this is not available within the formal education system. However the Independent ICT Procurement Advisory Service (Ipas) (<http://ipas.ngfl.gov.uk/index.html>) is a pilot project which aims to provide advice to schools on purchasing ICT equipment and services. Funded by the DfES and set up by Becta, the pilot service will initially run in five local education authorities over eighteen months. The LEAs taking part in the initial phase are Leicestershire, Northamptonshire, Staffordshire, Blackburn with Darwen and Doncaster. The information gained and the processes developed will inform a possible national roll-out of the service.

Evidence suggests that case study schools have made good decisions where they have been fortunate enough to be able to call on expert advice through informal networks among parents, governors and the local community. Without it, many schools have fallen back upon the help and support of commercial providers who, while often doing an excellent job, have necessarily been led by the need to promote their own products.

Parrs Wood Technology College was fortunate that it could turn for expert advice to a small group drawn from staff, governors, parents and friends, and that it was able to take radical decisions to develop its own customised, in-house intranet architecture.

At Whitchurch Middle, there is no single ICT specialist. Roles and responsibilities are shared within the team with the aim that no one teacher becomes unduly over-burdened and everyone develops skills.

Technical support in the day-to-day running of systems

The need for expert technical advice, put forward in the previous section, is ongoing, rather than one-off. Schools need support in setting up new systems, integrating them with everyday practice and trying to deal with day-to-day technical problems. This is where some commercial companies are proving of great assistance to schools through formal maintenance and support agreements entered into at the time of purchase. LEAs are also able to provide some support of this nature.

Long-term sustainability

In relation to long-term planning, the school is fully aware of the importance of sustainability and is investigating different approaches to achieving this for laptops and the creation of on-line learning resources. School purchase of laptops for pupils is currently not considered to be sustainable. The school has now set up an E-Learning Foundation, which has tax breaks. Some parents with financial difficulties are subsidised to a greater extent by the school.

Sandwich Technology College

In the majority of cases the evaluators found no evidence of schools undertaking long-term planning for sustainability. Replacement/upgrading costs are likely to be high. While technology continues to develop rapidly there is going to be a continuing need for Government funding. However, in one case, where a case study school is using the Linux operating system, with 'thin clients' rather than full PCs, a cost-effective infrastructure will greatly reduce the long-term costs of upgrading equipment.

Where initiatives have been implemented without proper regard to the time needed to maintain them, it has often not been possible to develop them properly. This has been particularly true in the case of web sites where schools have often assumed that teachers will develop and maintain these without additional support staff. In some cases, there has been a diminishing use of expensive resources, often as a result of initial *ad hoc* implementation without the benefit of expert knowledge and advice. These initiatives have been costly with regard to teachers' time, enthusiasm and goodwill. These are costs which will be ongoing but which are associated with the many benefits outlined in previous sections. Key factors in sustainability are therefore time, funding and the perceived value of projects.

Equity of provision to schools: funding

The study suggests that, across England, there is inequity in the resources available to schools to establish ICT links between home and school. First, their provision requires not only technical know-how but also funding for its instigation and instalment, upkeep and development. Some schools have received large amounts of money and have made very good use of it. The impact of the NGfL initiative is clear and very positive. However, it is those schools that have been in receipt of special funds, for example through Technology College status or commercial sponsorship, that have made the biggest advances.

A pro-active approach to seeking funding is essential; the school considers that communication with external funders should be short, punchy and sell a vision. Offering something in exchange such as ICT training has reaped rewards from local commercial enterprises. Half of all hardware is purchased outright, using funds from the school reserve, and the other half is purchased through leasing finance.

Redruth Community School and Technology College

In this school investment in technological equipment is largely dependent on commercial contributions and donations from voluntary organisations and parents. Sponsorship is sought when staff recognise potential in new technologies or can see something working well and wish to expand it.

James Brindley School

Equity of provision to schools: regional infrastructures

The cost, quality and reliability of ICT links between home and school are dependent upon the regional provision of Internet access. More schools were recommended to us for their work in ICT and home-school links from the south and midlands than from the north. Very few were recommended from the more remote rural areas. This appears to be partly the result of inequalities in opportunities for commercial sponsorship in different regions, but is probably also related to variability in the national technology infrastructure. Broadband is either not available in some areas or connectivity is available only at lower bandwidths.

Home–School Links

With an increasing focus on on-line and digital resources, both created in-house and externally provided, a move from ISDN to broadband connectivity was considered to be essential. This will also facilitate the future use of video broadcasting between classrooms.
Redruth Community School and Technology College

Broadband versus ISDN provision

In questionnaire data, ISDN connectivity was about twice as common as broadband. Of the 81 schools with ISDN or modem access to the Internet, 33 of these indicated that they were involved in initiatives to support home–school links. In the remaining 34 schools with broadband, cable, satellite or wireless connectivity, 19 of them were involved in similar initiatives. Some schools with broadband or equivalent provision appeared to be involved in more innovative projects than those schools without but there is no evidence to suggest that this form of connectivity is a pre-requisite. For example:

- Five schools referred to on-line homework and virtual classrooms
- Two schools were involved in web-based administration systems
- One was investigating the use of digital and satellite services
- One described parent and governor forum discussion areas
- One described a learning network involving other schools and the local library.

Thus, case study evidence suggests that schools, particularly secondary schools, that are making significant progress in the use of ICT to support home–school links have connectivity faster than ISDN, i.e. broadband or low broadband. Whilst having no implications for home access, this kind of connectivity enables technical and teaching staff to access on-line resources, such as web sites that support the development of interactive resources, more quickly and reliably than staff at schools with ISDN connectivity.

In schools that are investigating the potential benefits of externally provided secure intranets, speed is important as teachers may wish to upload documents, audio and video resources. Accessing externally provided learning

resources in school, such as the Thomas Telford on-line GNVQ IT course, also demands fast and reliable access.

A 56k modem and an ordinary phone line are what are commonly used in homes. An ISDN line is more than adequate where there is likely to be only one user on-line at a time.

Taking action to combat the digital divide

As outlined in an earlier section, there is evidence that differences in access to ICT, resulting from socio-economic inequalities and differences in attitudes, values and 'choices' made in the home, are a barrier to using ICT to link home and school. Until the time comes when all pupils own their own portable computer, schools need to decide on a set of integrated strategies that will enable all pupils to reap at least some of the benefits of using ICT for learning in both home and school. Over and above any external access to the web site or intranet, schools should consider:

- carrying out an audit of home ownership of computers (make, model and capacity), software and Internet access, as well as pupils' personal access to this equipment in the home
- producing a Personal Access to ICT Plan (PACT) for each pupil, agreed with parents, which identifies how and where ICT can be accessed outside lesson times (in the local library or City Learning Centre, for example)
- developing a system, within the school, for accessing disks and/or CD-ROMs produced on a range of home/external computers using a range of software (overcoming problems of incompatibility between PCs and Apples is particularly important here)
- requiring a proportion of homework to be undertaken using ICT.

Tile Hill Wood School endeavours to support students without home access to ICT by providing access before and after the school day, as well as at lunchtimes and during free periods, library computers often being in demand.

The case studies provide strong evidence that, until such strategies are in place, teachers will continue to be unwilling to make use of the extensive ICT skills that many pupils have already developed and all appear to be capable of developing, given access to technology.

Planning for future developments in technologies

It is likely that the price of portable ICT resources will continue to fall. Hand-held, powerful 'learning companions' – extensions of today's pocket calculators, mobile phones and 'palm tops' rolled into one – will have the potential to make the kind of home-school links explored in this research commonplace in the near future. To capitalise on these opportunities, the medium-term aim should be for such resources to become essential equipment for every pupil to own. To achieve this, the education system will need to be able to rely upon commercial provision of inexpensive, light, robust hand-held devices which are capable of running multimedia software and connecting to the Internet. Since many families are likely to provide their children with their own portable technologies, the education system may be able to concentrate resources on those pupils who are not so provided, much as calculators are provided by some schools today.

There is likely to be increasing provision of closed intranets for the education sector and on-line interfaces to management systems such as SIMS (facilitating password-protected access to pupil achievement and attendance records) which also have the potential to enrich home-school links. The case studies of Tile Hill Wood School and Parrs Wood Technology College show that these on-line services, which are device independent, can offer easy but secure access from any location, thus increasing communication between school and home for parents, pupils and teachers.

It is likely that connectivity in the home will also be greatly enhanced by the advent of digital technologies, facilitating faster and more reliable access to on-line materials and making it possible to access digital learning resources and educational video broadcasting services.

The vision for the future at Sandwich Technology College is that all pupils in the school will have a portable device providing easy access to the Internet. This, together with the development of on-line resources to support curriculum delivery, will mean that role of the school may change, becoming 'more social and interpersonal' with children for at least some of the time 'working at home on-line'.

Home–School Links

Annex: Products and Services

As part of this evaluation, the evaluators approached five commercial companies known to provide a range of different ICT products and services to support home–school links in the education sector. Details of the services and products that they offer are included below.

ABK, <http://www.educationrewards.co.uk/>: low-cost laptop rental provision for the education market

Anytime Anywhere Learning (Microsoft), <http://www.microsoft.com/uk/aal/>: laptop programme with support from Microsoft, guidance on how to finance schemes and mentoring from experienced teachers

Cisco, <http://cisco.com>: networking solutions for both the education market and commercial market, including closed intranet services

NTL Community Intranet (NTL), <http://www.ntl.co.uk/locales/gb/en/education/community.asp>: provision of broadband Internet access via cable technologies and a closed educational community with educational content, tools and services. Also provides dial-up access from home.

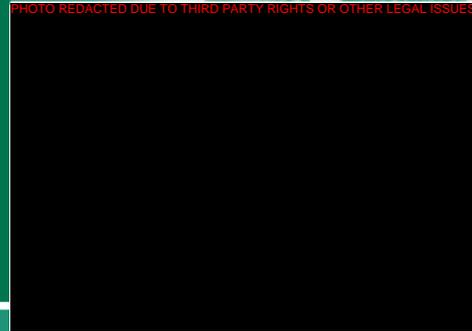
Sam Learning, www.samlearning.co.uk: on-line curriculum resources for all key stages designed to support revision; for use at school and at home through subscription

Think.com (Oracle), www.think.com: a closed educational community with tools to facilitate communication and file access; for use at home and at school, and free but registration must be through schools

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- The Cornwallis School
<http://www.cornwallis.kent.sch.uk/index.htm>
- James Brindley School
<http://www.jamesbrindley.bham.sch.uk/>
- Parrs Wood Technology College
<http://www.parrswood.manchester.sch.uk/>
- Redruth Community School and Technology College
<http://www.redruth.cornwall.sch.uk/>
- Sandwich Technology College
<http://www.sandwich-tech.kent.sch.uk/>
- Tile Hill Wood School and Language College
<http://www.thw.coventry.sch.uk/>
- Whitchurch Middle School
<http://www.whitchurchmiddle.harrow.sch.uk/>



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*All URLs were correct at the time that they were accessed by the researcher, however, due to the changing nature of the Internet, they may be liable to change over time.

Home-School Links

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