


Education Departments' Superhighways Initiative

Group A: Curriculum Projects in England and Wales

Final Report

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The evaluation

1. This evaluation concerns seven curriculum-focused projects that were based mainly in the primary and secondary sectors in England and Wales. Two further projects in the group were located in Scotland, and were the subject of a separate report produced by the Scottish Council for Research in Education (SCRE). The projects were extremely diverse in scale, ranging from a single infants school with two machines to a group of around 30 secondary schools and sixth-form colleges exploring a range of technology. Projects also varied greatly in their organisational and technological structure, and their aims and objectives. What united the group was a classroom focus, with teachers and pupils exploring the potential of a range of ICT technologies to enhance teaching and learning.

4. BIRMINGHAM KNOWLEDGE SUPERHIGHWAYS PROJECT (BKS)

4.1 Following an initial round of visits to the participating schools, and meetings with representatives from the partner organisations, three rounds of data-collecting visits to each school were planned for the Summer and Autumn terms of 1996 and the Spring term of 1997. Difficulties of various kinds in three of the schools during the Autumn term meant project activity was suspended and therefore only two full visits were possible in some schools.

Description of project

4.2 The Birmingham Knowledge Superhighways Project (BKS) involved six LEA-maintained comprehensive schools located in the south of the city. Five of the schools were 11-16, the remaining one 11-18. Three of the schools were single-sex institutions, two boys-only and one girls-only. One of the mixed schools was Roman Catholic. A Birmingham junior school, though not officially part of the project group, worked closely with one of the schools, and to some extent became adopted by the project. The school had a reputation for innovative uses of Information and Communications Technology (ICT).

4.3 The schools, although very different, had a history of collaboration. Following BETT 95, discussions among the five 11-16 schools about a joint superhighways initiative were given impetus following the announcement of EDSI. As a result, the schools developed ideas about using video conferencing between schools to enhance pupils' learning and for professional development.

4.4 The project sought to explore the potential of broadband and medium-band communications technology, in particular video conferencing, for raising pupil achievement, enhancing the curriculum, and for improving the quality of teaching. In doing so, the schools aimed to build on existing links between the schools in a number of areas, which included IT.

4.5 The project began with ISDN connectivity to the schools which were in negotiation with the local cable company for the setting up of an intranet across the six schools. The cable approach was seen as having a number of advantages, not only greater speed and capacity, but connectivity would be free of charge to schools in return for its use for telephone calls. It would also enable the development of home-school links, as a considerable proportion of homes in Birmingham were already cabled. However, these negotiations never reached completion, so that the schools remained with ISDN connectivity throughout the trial.

4.6 Two specific curriculum areas, religious education (RE) and geography, were identified for early video-conference projects, but it was anticipated that the technology would eventually be used across the curriculum. The project also aimed to explore the potential of the Internet to support research and, as a further means of communicating between schools and other agencies, via e-mail and the creation of school Web sites. In four of the schools, the trial of the Open Integrated Learning Systems (OILS) software aimed to examine its potential to help raise motivation and achievement, to enable cross-curricular assessment, and to support teachers. A further aim of the project was to establish home-school links via the local cable network, to support out-of-school learning and use of Integrated Learning Systems (ILS). The overarching objective was to build on the existing ties between the schools to further collaboration at both pupil and teacher level, including the development of joint INSET and the production of shared teaching materials. Developing support for pupils with special educational needs (SEN) was seen as a priority for all of the schools.

Sponsors and other parties involved

4.7 The main partners were Systems Integrated Research (SIR) for provision of Open Integrated Learning Systems, and ICL for video-conferencing equipment. The partners provided technical rather than financial support. The schools were also in discussion with other commercial organisations, notably Birmingham Cable Ltd, with regard to future developments of the project. The LEA IT Advisory Unit provided some support and advice.

Size and type of institution

4.8 All of the schools could be said to be in economically and socially-disadvantaged areas of the city, although there was considerable variation among them. In general, the percentage of pupils receiving free school meals was high, with an average of around 40%, compared with national and local figures of 18% and 30% respectively, but this ranged from over 60% at one extreme to around 1% at the other. The size of the schools also varied, with an average of around 600 pupils on roll in the 11-16 schools, ranging from 530 to 630. The largest school was the 11-18 school, with some 1,500 pupils, around 250 of whom comprised the Sixth Form. Across the schools, there was an average of around one full-time equivalent teacher for every 16 children on roll.

4.9 The ethnic mix of the schools also varied. Over 70% of the pupils in the girls-only school were from ethnic-minority, predominantly Muslim, backgrounds. In the other schools, the proportion of children who were from ethnic-minority origins, mainly Afro-Caribbean or Asian sub-continent, ranged between around 10% to around 40%. Although, generally speaking, the ability range in the schools was lower than average, there was a broad range of ability both between and within the six schools. In two of the mixed schools, there were roughly equal numbers of boys and girls, but in one there were almost twice as many boys as girls.

4.10 The group represented a mix of better- and poorer-off institutions. Two of the schools, the girls-only school, and one of the boys-only schools, had been granted Technology College status. One of these, the girls-only school, emerged clearly as the lead institution, and was responsible for initiating and co-ordinating many of the project activities. The Project Co-ordinator, who was part of the management team in the school, had a broad knowledge of educational uses of IT and was very much the driving force behind the project. The school has in recent years been turned around from being near to closure as a failing school, and the achievement of Technology College status was a milestone in that process. The expansion of IT provision was and continues to be a high priority in the school's development plan. Accordingly IT and ICT were seen as an integral part of curriculum development, not only for pupils but also for the professional development of staff. The use of OILS programmes was greater in this school than in any of the others in the group.

4.11 The boys-only school had only recently become a Technology College at the beginning of the project and was, therefore, in the early stages of upgrading and expanding provision. If the girls-only school was the lead institution, then this could be said at the start to have been 'second-in-command', and most of the inter-school projects which were planned or occurred during the trial initially involved one or both of these two schools.

Hardware and software used

4.12 The schools used a range of existing and new hardware. One PC in each school was upgraded to enable point-to-point desktop video conferencing, comprising a colour camera, in-built microphone and, in four of the schools, ICL Team Vision connection software. As well as audio/visual communication, application sharing

was also possible using this package. In the remaining two schools, focus video-conferencing equipment was purchased as a result of an arrangement with GPT Video Systems, in which the City Education Department agreed to pay for two systems, while GPT provided four. Two of these systems went to project schools. The decision to go ahead with this was mainly financial, as it provided these schools with a relatively inexpensive facility. There was a degree of misunderstanding, however, of the technical implications, which resulted in incompatibility between the system and that of the other four schools, affecting communication throughout the project.

External connectivity

4.13 Connectivity for video conferencing was via BT ISDN2. The girls-only school had installed ISDN some 12 months earlier, while another two schools had theirs shortly before the initiative began. The remaining three installed their lines specifically for the project. In addition, three of the schools had dial-up Internet access via a commercial Internet Service Provider (ISP). In all but the girls-only school, access was limited to one or two machines. An extra, but in one school, the only, point of Internet access was also available for those schools which were also participants in the Multimedia Portables for Teachers Project (see Report F2-3), although this was not necessarily made available to the pupils. As described earlier (see paragraph 4.5), the schools were also in negotiation with Birmingham Cable Company Ltd to provide high speed fibre-optic connectivity. This failed to materialise during the evaluation period. An examination of the potential of RF Cable Modem was also being undertaken by members of the project management team**.**

Background and experience of staff

4.14 The general level of experience and expertise of both teaching and managerial staff varied from school to school. On average, there were between three and five members of staff who were actively involved in the project. The exception was the girls-only school which, as described above, had an existing reputation for its commitment to IT provision and was very much seen as the lead institution in the trial. As a result, a greater proportion of its staff were IT-competent than other schools.

4.15 In most cases, the existing IT co-ordinators took on responsibility for the project within their schools and became key personnel. In one school, however, the IT technician was initially the person who mainly supported project activities. In general, the co-ordinators were both competent and confident in their understanding and use of IT, although few had much prior experience of communications technology.

Project timetable

4.16 The original timetable outlined three main phases. The first, from February-April 1995, involved the early discussions and planning, and the setting up of management structures. Phase Two, from April 1995-January 1996, involved the development of educational materials, extension of networks to civic and other agencies such as libraries and career centres, and pilot trials of home-school links in selected sites. The setting up of these out-of-school links was dependent on developing the cable solution with local cable company, Birmingham Cable. The third phase, from January-December 1996, was the trial proper.

Aims and objectives of the project

4.17 The stated aim of the project was to pioneer, test and develop ways of using broadband communications technology, IT, broadcasting and telecommunications and had a number of specific objectives:

- to raise standards of pupil achievement
- to enhance curriculum entitlement for pupils in the six institutions
- to improve the quality of teaching and learning in the schools
- to build on existing collaborative curricular/organisational structures between the schools.

4.18 These objectives were to be achieved primarily via video-conferencing links between the schools, but also through the use of e-mail and access to Internet resources and on-line databases. Whole-school assessment using Open Integrated Learning Systems (OILS) for maths, English and modern foreign languages (MFL) was also a feature of the project, although this was to be located on school-based servers rather than broadband delivery. Four of the six schools used the OILS software during the trial.

Evaluation

Project initiation

4.19 The project has suffered from a catalogue of setbacks and was only beginning to resolve these problems at the conclusion of the evaluation period, the end of the Spring term 1997. Although a number of important lessons have been learned, in many respects the project was still at the initiation stage at this point.

4.20 As a project report produced by the schools at the end of 1996 pointed out, there were a number of successful initiatives and positive gains as a result of the project, and examples of these are discussed later in this report (see paragraphs 4.39-4.58). However, many of these activities centred on one or two schools rather than the group. The girls-only school in particular continued with a wide range of activities, although many of them were relatively independent of the project schools. In a number of key areas, the project experienced considerable problems, and it is pertinent at this stage of the report to discuss these difficulties and their general effects, both on the project and on the process of evaluation.

4.21 Schools had, at the outset, different levels of commitment and enthusiasm for the project. Three of the schools in particular were much less involved than the others. A primary aim of the project was to further develop existing collaboration between the schools. Although a number of joint activities and projects went ahead or were planned, many failed to develop to their full potential.

4.22 The management team met fairly regularly up until the end of the Spring term 1996, but during the Summer term, meetings became much less frequent. A number of technical and organisational difficulties hampered the first phase of the project, such that activity was much lower than anticipated. By the beginning of the Summer term 1996, the BKS Project Co-ordinator predicted that greater activity would commence in the Autumn term of that year and develop during the Spring term of 1997.

4.23 Early planned activities were not helped by delays in installing equipment, and this was made significantly worse by the fact that, in two schools, the video-conferencing systems were not T120 compatible. This meant that, while audio-visual links were possible, application sharing and data transfer were not possible

for these schools, which consequently affected other schools in the project which had planned to link with them.

4.24 Because of these and other developments, the anticipated development of activities in the Autumn term largely failed to materialise, such that inter-school communication was greatly reduced. These and a number of other events also severely restricted the evaluation:

- In one school, the discovery of asbestos in the computer room rendered the system inoperable for the whole of the Autumn term.
- In another, the IT technician who had been chiefly responsible for supporting activities left the school. The headteacher effectively withdrew from the project shortly afterwards. Teacher-to-teacher contact with other schools did continue but, without a central reference point, communication became difficult.
- Minimal project activity occurred in a third school, where the headteacher accepted that the school had failed to drive the project forward and that other issues such as school improvement had taken priority. By the end of the trial, the school was still more or less inactive.
- A fourth school had an OFSTED inspection in November and therefore devoted most of its time and effort to preparing for this, meaning that little project activity took place until after the inspection.

4.25 In general, then, most joint activity during the Autumn term was between the two remaining schools, or between the girls-only school and the junior school, although links with schools outside the project group continued or were being developed during this period. This process included some of the inactive schools who sought to establish contact for future exchanges, once their various difficulties were resolved.

4.26 One of the more general effects of this lack of progress was that the impetus of the project was lost, and the enthusiasm to get it going again was much more difficult than at the beginning of the project when optimism and enthusiasm were high. Towards the end of the evaluation, some of these problems had been resolved, and the schools were looking forward to recommencing some of the activities which they had been forced to postpone.

Initial training

Technical and educational training

4.27 Relatively little training or support was forthcoming from any of the commercial partners involved. One co-ordinator said that this was limited to showing him how to 'press a few buttons' when the machine was installed. Follow-up technical support for the ILS systems was regarded as less than adequate by most of the schools. In the Roman Catholic school, some general IT training was funded by the Catholic Partnership, but in the main, project co-ordinators within each school trained themselves on the equipment, or worked with other schools, notably the lead school in the project. The LEA IT Advisory Unit provided general advice, but not technical support. Three of the schools had a full-time technician, but the remaining three had, in the words of one headteacher 'to beg, borrow and steal' for technical help. Some schools had an arrangement to buy in the services of the technician at the girls-only school on an hourly basis. Schools praised the involvement and efforts of the Project Co-ordinator who also gave support and time.

4.28 Training programmes in the Superhighways' elements were not generally co-ordinated across the group of schools, although a moderate amount of inter-school INSET via video conferencing, one of the original aims of the project, was conducted. This took the form of remote training of some staff in using video conferencing itself. A manufacturing company also used this model in training teachers in the use of computer numerically controlled (CNC) milling software. While this demonstrated the positive potential of this approach, the original objective, of sharing expertise via video-conference amongst project schools, was never fully realised.

4.29 Within schools, staff were trained to use the facilities, in most cases, on a needs basis, that is when and if they were planning to use the facilities, rather than in response to any formal training programme, although this was not true of all schools, and some training was included in the regular programmes of IT INSET. For example, one school organised a series of 10 training sessions for staff on exploring the World Wide Web (WWW) and HTML in collaboration with South Birmingham College. A common comment, however, even in some of the more advanced schools, was the difficulty of getting staff enthused about the project.

4.30 Training for pupils was generally given by the project co-ordinator and/or subject teacher as part of the planning for video conferencing. However, to a large extent, since video conferencing was a completely new experience for the majority of participants, a trial-and-error approach was the most appropriate way to learn the techniques necessary for a successful conference. These included learning to take turns, to speak clearly, to be clear about who a question or statement is being addressed to, accounting for the delay, addressing the camera rather than the screen and so on. A practice session between two schools, supported by the IT co-ordinator, was a useful vehicle for pupils, and indeed teachers, to try out the system in this way.

4.31 There was some evidence of peer tutoring in some of the schools. For example, one school encouraged more able pupils to help the less able, but in most cases such help was informal rather than structured.

Management strategies

External

4.32 The external management of the project was organised on two levels, a Management Board and a Management Team:

- The Project Management Board consisted of the headteacher from each of the participating schools, the overall Project Co-ordinator and a senior representative from the commercial partners. The function of the group was to oversee the project and to make major policy decisions.

- The Project Management Team managed the project at an inter-school level, and was made up of the overall Project Co-ordinator and appointed representatives from each school. The role of this group was to steer the project and to ensure that each institution within the project was meeting its individual and collective objectives.

4.33 Despite this structure, neither group met with any frequency after the initial stages of the project. As mentioned earlier (see paragraph 4.22), the Management Board met fairly regularly up until the end of the Spring term 1996, but as project activity failed to reach expected levels, the Board met much less often. As one headteacher put it, there was 'no use having meetings without anything to talk about'. However, the resulting loss of communication almost certainly led to increasing isolationism.

The process was thus self-reinforcing. The lack of information sharing was evident in another headteacher's remark that his school was 'probably a lot further behind than the others', when in fact it had been one of the more active in the group.

4.34 The Management Team suffered a similar fate, so that the plan for regular meetings between co-ordinators was not sustained. In addition, they reported that, when meetings were called, some schools sent representatives who were not co-ordinators, and who often had little knowledge of the role of their school in the project. This led to a lack of continuity, and to a detailed grasp of the overall direction of the project resting with only a handful of people.

Internal

4.35 At the individual school level, the school project co-ordinator's role was to manage the day-to-day running of the project and to represent the school on the project Management Team. This role was, in most cases, taken on by the existing IT co-ordinator although, in one school, activities were, initially at least, mainly co-ordinated by a non-teaching member of staff, the IT technician. Each project co-ordinator was also chiefly responsible for establishing or enabling links with other schools, and made considerable efforts to keep the project alive, despite the various difficulties encountered.

4.36 In general, then, managerial and staff commitment to the project varied across the schools, and this was exacerbated by difficulties encountered during the trial. The resulting loss of communication and a lack of continuity had a negative effect on the progress of the project, originally envisaged as involving a collaborative group of schools. Despite efforts on the part of the overall Project Co-ordinator to drive things forward, schools felt that the project lacked a central point of reference or support. Some schools were beginning to look beyond the group, making national and international links with other schools. Despite the problems, there were, at the end of 1996, a number of joint projects planned or in progress, some of which were quite ambitious in scope.

Obtaining and installing equipment

4.37 There was no direct financial support for equipment in the project in the sense of a dedicated project budget. Equipment was donated by ICL to the girls-only school as part of the Technology College sponsorship. An arrangement with GPT Video Systems ensured that two of the schools received video-conferencing equipment at half-cost, although as reported elsewhere (see paragraph 4.12), this resulted in incompatibility with systems in the other project schools. In one school, the line and equipment was financed by the Economic Development Unit of Birmingham City Council which was looking for support for a teleworking initiative. In return, the school agreed to provide the venue for the project and some basic training. One school purchased the facility out of a short-term loan from another project school to enable it to participate from the outset. ICL and SIR provided technical support in the form of installation of hardware and software. Each school, therefore, had to find the means from within their own budgets. This included purchase from IT budgets and loan arrangements. Schools additionally made bids for various funds for equipment and support. Towards the end of the trial, one school was successful in being accepted on to Birmingham initiative for using the Internet to support pupils with special educational needs.

Implementation at project and institutional levels

Creating cross-institutional relationships and support

4.38 The project was based on existing links between the schools and aimed to build on them. The headteachers had worked together previously on a range of initiatives,

for example school improvement, which had generally been successful. The fact that this collaborative approach appeared to break down for this project, therefore, was particularly disappointing to the group of headteachers. Despite various attempts to foster greater collaboration between teachers and pupils, many of the inter-school initiatives failed to materialise, or were not completed. However, there were a number of activities where schools did manage to get some way towards achieving some of their objectives. Such activities were a pointer to approaches which might have borne greater fruit had communication between the schools been better. Some examples are given below.

Video-conferencing activities

RE and geography projects

4.39 These were two of the first activities which had been discussed among the headteacher's group, and were seen, along with an English project, as vehicles for getting the Superhighways project off the ground. The RE project focused on comparative religion and took advantage of the considerable cultural diversity between the different schools, in particular the fact that, in the girls-only school, the pupils were predominantly of Muslim origin. This provided other schools with an opportunity to learn directly from pupils from another religious background. In the first of these exchanges, the girls communicated with pupils from one of the boys-only schools, described by the headteacher as mainly white Christian. The exchange began with informal e-mails, followed by specific questions about each other's religion. The culmination of the process was a video conference during which pupils took it in turns to read out their question on air and have it answered in return.

4.40 The geography project was planned around the fact that the same river ran close to two schools. Again, groups of pupils exchanged information via e-mail about particular aspects of the river in their area and video conferenced during the latter stages of the project.

4.41 These early conferences revealed some of the limitations of the desktop video-conferencing system, particularly as a medium for group work. The hands-off sound quality was poor, sometimes necessitating the use of the handset. While this made communication possible between individuals, it was an impoverished experience for other participants, who heard only one end of the conversation. Lessons were also learned about the need for thorough preparation for such events. Communication was often stilted and awkward for much of the time, and there were often long silences as pupils were uncertain about who was to speak next, as well as the natural diffidence of some. The siting of the facility was also crucial for successful conferencing. One school, for example, found conferences difficult because of the location of the Personal Communications Computer (PCC) in a computer suite which was in constant use for IT and other classes. This was as part of the agreement with ICL, after whom the room was named, to finance equipment as part of a teleworking project, so that the school was obliged to site the machines there.

4.42 There were positive outcomes from the conferences, in particular the potential of such links to increase cultural awareness between children from different backgrounds. Some of the pupils in the boys-only school, for example, confessed to never having spoken to a Muslim person before. The boys were amazed to find that they shared common interests with the girls, such as pop music and the local football team. The stereotypes that some of the boys had previously held about Islamic culture were evident in some of their questions, for example 'What is it like having to pray all the time?'.

English

4.43 The 'Newspaper Project' was another early exercise, devised by the English departments in the schools with the aim of jointly producing a newspaper. The project involved Year 9 children, who formed editors' groups at each school, which were to communicate with one another via video conferencing to discuss content and exchange data. Each group took on responsibility for different aspects of the paper, and one of the schools acted as overall co-ordinator responsible for collating and producing it.

4.44 Despite some successes, the problem of incompatibility meant that two of the schools could not transfer data, so that they had to revert to sending disks through the post. Much less video conferencing took place than was originally anticipated, although teachers generally felt that they and the children involved had learned something of the process. Ultimately, however, the lack of interactivity, and the loss of immediacy proved to be demotivating for pupils, and the project was never fully completed.

4.45 A second, much later project started out as an English initiative, but had the potential to become cross-curricular. The topic, environmental pollution was selected by Year 10 pupils after some discussion. The teachers also discussed possibilities of making the project multimedia, including the use of school studio facilities, using radio, video clips, displays and so on, all organised jointly via the video-conference link. However, at the time of writing, the project was still at the planning stage, and other faculties had not yet become involved.

4.46 A third project was the setting up of regular debating sessions between two schools, one of them a boys-only school. The first of these was on the motion 'A Woman's Place is in the Home', which was opposed by the boys-only school, a deliberate strategy to encourage them to think about the issue from a female point of view. Initially, this involved small groups of fairly confident and able pupils, but teachers were excited about the potential for lower-ability groups. The anticipated outcomes were numerous, including improved speaking and listening skills, confidence and social skills. The first phase was seen very much as a pilot, but it was hoped that teachers could develop common schemes of work if successful. Progress in the project was hindered by the difficulty in arranging common timetables, but the two schools were seriously considering the possibility of harmonising timetables in the following year.

Communications Studies

4.47 This was an example of a project which arose naturally out of the common interest of two of the co-educational schools. The two offered Communications Studies at GCSE and so video conferencing was an obvious choice to fulfil syllabus requirements. The two schools set up a joint design and technology task, and pupils gave a presentation to the other school describing the process of their design. The teachers saw this as an exciting opportunity to develop joint schemes of work and as a great motivator for the pupils. Improved oral and presentation skills had already developed simply as a result of preparing for the conference.

4.48 The project was delayed for some time because of the asbestos problem in the partner school, so pupils spent the intervening time rehearsing their material. The first conference, due in January 1997, was postponed twice because of continuing difficulties in one of the schools, but these were finally resolved and the schools had conducted several conferences by the end of the Spring term 1997. While these were fairly limited exchanges between pairs of pupils discussing their work, and hampered by poor sound, the pupils generally enjoyed the experience. One boy was observed to volunteer, in the place of an absent pupil, for his third conference.

According to his teacher, he had strongly resisted participating in the first session, but was now an 'old hand' able to show others.

Citizenship/Art

4.49 One of the schools, after a term's delay, quickly became involved in several activities once problems were resolved. One exciting project with a Year 7 group involved participating in the Young People's Parliament Project, set up by BT, involving schools from all over the country. The children had the chance to video conference with other schools and with local politicians. This had a number of spin-off activities, including pupils acting as school representatives at an inter-school debate in City Hall. The pupils who participated displayed considerable knowledge, and confidently debated issues such as environmental concerns and crime with other pupils and adults. In addition, the school has played host to an artist in residence and held video conferences with an Art department in another school.

Design and Technology

4.50 The girls-only school had established links with the junior school and set up a joint project focused on designing a program for the school's CNC milling machine. Using video conferencing and e-mail, pupils from the secondary school taught the junior pupils about how to write a program. The completed design was sent electronically to the secondary school, which then manufactured it. A similar arrangement existed between the secondary school and the manufacturer of the milling machines, Denford, in Brighouse, Yorkshire. Using design software, pupils sent their program to a technician at the company. The completed work was later sent back to the school by post. This initiative has since spread to 13 schools in Yorkshire, which have purchased software, video-conferencing facilities, and a share in a milling machine and technician in the factory.

Peer mediation

4.51 This was a Year 7 project initiated by one school in co-operation with a non-project school in Birmingham and with support from a peer-mediation consultant. This involved 24 children drawn from each class in the yeargroup. Children underwent two days' training in mediation techniques, before exchanging ideas and experiences of their peer-mediation work with students in another school in the city. The project, which involved lunch-time sessions, grew quickly, and there were plans to extend it to other yeargroups. The project involved discussions about, and sharing of experiences of, peer mediation, rather than remote mediation itself. The children involved became extremely confident in using the technology, and developed social and communication skills. The project was regarded as a particular success.

4.52 What was mainly demonstrated by these various curriculum projects was the potential of video conferencing for collaborative activities, rather than their unqualified success. Despite the delays and set-backs, those teachers and pupils involved in relatively successful exercises were, in the main, optimistic. Teachers understood the powerful effects that using the video conferencing in particular had on pupils' motivation and self-confidence, and this was revealed in the level of planning still going on for future activities.

Other ICT activities

4.53 Those schools which did have Internet access had made some progress to explore Internet resources, and in two cases had created materials for their school Web site. In one school, numerous examples of the work produced by pupils from all yeargroups, some 60 children in all, were put up on the site, which could be accessed via the WWW, and which had proved to be very motivating not only for the pupils involved, but also for those who strove to have their work selected. In

addition, interesting and useful sites for different curriculum areas, identified by the librarian/resources manager in response to teachers' requests, had been down-loaded on to the school server so that they were available via 'Netscape Off-line' across the school network of some 70 or so workstations. Accessing the site brought up the school's homepage, and pupils were able to explore down-loaded sites in this way. The sites were also catalogued by subject and by keystage appropriateness in a directory available to staff. The teacher who took on the task of downloading the sites on to the school network, with the support of the systems manager, gave considerably of his own time to set up the system. Although both teacher and technician left the school during the project, the IT co-ordinator and newly-appointed systems manager planned to further develop both the site and the intranet resources.

4.54 The librarian/resources manager referred to in paragraph 4.53 above also had a considerable role in working directly with pupils on their projects. For example, less-able Year 8 pupils accessed a publisher's site which allowed them to interact with the authors of books that they were reading. The fact that book reviews written by children were published on the site was very motivating for the pupils. Another group of pupils had also made contact with a New York school and had developed regular e-mail contacts. There were plans for a video conference between the two institutions. The same member of staff also identified sites for different curriculum areas in response to teachers' requests, and produced a directory of Websites catalogued by subject and keystage.

The girls-only school

4.55 As already explained, the girls-only school was very much the lead institution in the project, and some way ahead in terms of its commitment to and facilities for ICT. Not surprisingly, therefore, the school was involved in a variety of activities, both national and international, which, though involving communications technology, were not directly related to the Knowledge Superhighways Project. A good example of this was the World Canals Conference project, which linked the school to another in Lancashire, exchanging still-video images and materials about the development of their local canal systems. The school was also part of the Technology Enhancement Programme, which is developing video linkups with company employees as part of their GNVQ Manufacturing course.

4.56 Internationally, the girls were establishing a six-country exchange to produce an on-line magazine, co-ordinated by a school in Australia. Finally, as a result of a visit by the Project Co-ordinator to the Far East, the school had also established a linkup between themselves, the junior school and two partner schools in Singapore. The initiative, Operation Oceanwave, involved the creation by all four schools of Webpages, which can be found on the British Council Website (www.britcoun.org).

4.57 The above describes a considerable range of activities undertaken or planned by the schools during the evaluation period, and a number of others were just beginning or were in the planning stage. Despite the breadth of these initiatives, however, aggregated over the year, they amounted to fairly sporadic and isolated exchanges, and clearly some schools, the girls-only school in particular, were more advanced than others. Furthermore, many of the initiatives went beyond the specific focus of the Knowledge Superhighways Project, that is to develop exchanges between the six participating schools. In the more narrowly-defined context of the original Project, therefore, the number of inter-school activities over the period of the trial was very low. For example, the log of video conferences for one of the schools records just 16 exchanges during a 15-month period, only six of which were with schools within the Birmingham project, and all but one of those in the Spring term of 1997.

4.58 The most successful activities were those which arose from a genuine school or curricular need, which were thoroughly thought through and structured, and which captured the imagination and interest of the pupils. One of the chief reasons why the initial projects, such as the RE and English initiatives, failed to fully take root may be because teachers saw them as being imposed in what one called a top-down approach, rather than growing naturally from ground level. There was, as a result, a lack of ownership of these projects, and a feeling of having to communicate rather than wanting or needing to. While they were seen as workable ideas in the planning stage, they failed to fire the imagination of the schools, and had to be shoe-horned into timetables rather than fitting comfortably. When technical or organisational problems made exchanges difficult or unsatisfactory, any enthusiasm quickly waned for many of those involved.

Maintaining equipment

4.59 There was little or no support from the commercial organisations involved. The suppliers of the OILS software, for example, failed to offer an adequate after-care service for a system. In most instances, the responsibility for maintenance mainly fell to individual school co-ordinators or technicians in those schools which could afford it. Schools which had no technician looked to the others for support. One school had appointed a systems manager, but this was not possible for the smaller schools. Birmingham City Council were discussing the possibility of offering a package deal for training and technical support, but nothing had materialised by the end of the evaluation period.

Teaching and learning issues

Raised standards, value added and improved quality of work

4.60 It is difficult to quantify with any assurance any learning or achievement gains which can be directly attributed to the technology. Most teachers saw the video conferencing as an additional tool for teaching and learning, rather than an integral part of classroom practice, but one which was highly motivating, and allowed pupils to develop a range of skills, including technical, personal and social. It is likely that these gains will, in time, have an effect on achievement, but the relatively low level of activity in most of the schools makes any judgement about this very unreliable. As with other aspects of the project, it is easier to talk of potential than of achievement.

4.61 Exploring the potential of the OILS software to raise achievement was cited as one of the aims of the project. However, the program was not accessed remotely and, with the exception of the girls-only school, was not seen as part of the Superhighways project by the schools. The general opinion of the programs was poor, with most criticism levelled at the maths programs. One school said that staff who were already lacking in confidence with IT had become demotivated by problems with the system and the negative experience with the suppliers. Another school, however, took a very different view, citing a high level of use and satisfaction, good relations with the company and improved grades in mathematics. It is difficult to reconcile these two viewpoints**.** A maths teacher in a third school was about to introduce ILS, on a trial basis, at the end of the evaluation. After a review of available programs, the school had decided to opt for a different system to that operating in the other schools.

4.62 The English OILS programme was seen as having a role for pupils with special educational needs, and this was especially the case in one school which had a special unit for pupils with severe learning difficulties. This is discussed below (see paragraph 4.65).

Evidence of increased motivation and confidence

4.63 Where pupils had access or experience, using communications technologies was a powerful motivator. Those who had successfully used the Internet, or had been involved in e-mail projects, had found the experience exciting. Group experiences of video conferencing were, however, less stimulating. Being a passive member of a group watching a small jerky image with poor sound was the experience of many, and was a short-lived novelty. Despite these setbacks, some successes demonstrated the potential to involve and enthuse pupils, and schools were only just beginning to identify the optimum conditions for successful conferencing, not only in terms of structure, but also content and focus. The peer mediation project, which was much less formal than many of the other exchanges, was very successful in raising confidence, partly because pupils had a greater sense of control and involvement, and because it had direct relevance for them. Similarly, the Young People's Parliament initiative was exciting and challenging for those involved, and was located in an immediate context.

Changed teaching styles

4.64 There was little evidence that activities so far had seriously affected classroom practice.

Learners with special educational needs

4.65 One of the schools had a special unit for children with severe learning difficulties, catering for over 50 statemented children. The unit was also taking part in NCET's ILS evaluations. The head of the unit had worked for some time in exploring the system's capabilities and found that, by using parts of the program in a very targeted way to address specific deficits, children were making dramatic and rapid gains. This was a very different approach to that seen in other schools, and in other projects, which tended to take a more blanket approach to the use of OILS. The teacher felt that this latter approach was inappropriate, which may go some way to explaining the disappointment experienced by many teachers using such programs.

4.66 Another school in the project had a unit for the hearing impaired, which took pupils from all over the South Birmingham area. The school had located a Signed University on the Internet and was planning to set up e-mail and video-conferencing links in the Spring term. The conference had not taken place by the end of the evaluation, however.

Development of skills

4.67 As reported elsewhere, the limited exposure for most of the pupils and teachers in the schools (see paragraphs 4.19-4.26) makes it difficult to cite a great deal of evidence of skill development. Those pupils who had regular access did develop their ability in a number of areas: video conferencing, communicating via e-mail and effective searching for and editing of WWW resources. However, such advances were limited to a minority of children across the six schools. The exception was the girls-only school, where IT was already very high-profile, and pupils here demonstrated a high level of IT and ICT skills and information-handling skills and, to a lesser extent, the 11-18 school, which was developing a number of ICT initiatives during the trial.

4.68 One of the most impressive examples was at the junior school. Although not officially part of the trial, the school had established links with the girls-only school, as well as numerous others around the country, including several in EDSI projects. By the end of the evaluation period, both schools were also beginning to develop significant international links. Pupils as young as Years 1 and 2 showed astonishing proficiency, developing their own multimedia presentations and using video conferencing and the Internet with great assurance. This contrasted sharply

with Year 8 children in one of the more active project schools who were sending e-mails to authors, but hardly got to touch the mouse or keyboard, and sat passively as the teacher did most of this for them.

4.69 Recognising and accepting that children are extremely able at learning to use ICT is a key to the success of introducing it into curriculum activities. However, some teachers, particularly in the secondary sector, have difficulty in coming to terms with the fact that pupils have more expertise and knowledge than themselves. As has been demonstrated in other projects, notably BEON and Kent Broadband (see Reports A2.1 and A2.3), this can be turned to considerable advantage, not only for the teacher, who has a ready bank of experts, but also for the children in terms of raised confidence and responsibility.

Access and equity issues

4.70 From our observations and interviews with staff, we have no indication of inequitable use or access, although, as a result of the problems encountered throughout the project in most of the schools, the majority of the pupils had little or no exposure to the communications technologies. Where access was possible, however, boys and girls of all backgrounds and abilities and age-groups appeared to have equal opportunities to use them.

4.71 Most of the schools had higher than average numbers of pupils with special educational needs and our experience of other Superhighways projects suggests that regular access to ICT has considerable social and academic benefits for such children. We would predict, therefore, that the same will be true once the projects in the schools get fully off the ground, and the evidence from the most active schools largely confirms this.

Services and applications

Use of facilities

4.72 Again, the sporadic nature of activity across most of the schools makes any judgement of this problematic. It has already been documented (see paragraph 4.57) that the total level of video-conferencing activity in one school over the lifetime of the project was a matter of hours, and this was not untypical. However, the pattern of use of the most active school may give an indication of the likely level of activity once schools become fully operational, although the number of workstations per pupil will clearly have an impact on such forecasts. The lowest level of video-conferencing activity here was just over one hour per school week, with a maximum of some 10 hours' use. This fluctuation was to a large extent dictated by the curriculum calendar and external events. For example, there were periods of intense activity during particular projects and other times when the system was little used. The increasing number of links to other schools, the move towards greater curriculum integration of the technology and, in this case, the setting-up of a school intranet will greatly increase pupil use in the near future.

Data speed

4.73 The exploration of the potential of cable modem for high-speed access has carried on throughout the project, and the general conclusion is that it is a viable and cost-effective technology. Reports from other countries, for example Singapore, where its use is extensive, are very positive. The difficulty in making further progress here was the reluctance of the cable company to invest in what they perceived to be outmoded technology.

4.74 The inability to reach a negotiated agreement with the cable company was a major setback for the project and was partly responsible for the difficulties encountered.

Part of the difficulty in reaching an agreement was, in the view of one of the headteachers, a 'lack of vision' on the part of the cable company, whose focus was on the provision of entertainment, with little consideration of the potential for educational use, for example linking schools and homes. The progress of the project was dependent on developing the cable-based intranet, and the loss of this element certainly affected the morale of those who began the project with high hopes. This, coupled with various technical problems, and the limited amount of access, made it difficult for headteachers and/or co-ordinators to bring other staff on board.

4.75 Achieving critical mass is an important element in the success of projects such as this, and this is as likely to be achieved by pupils' involvement as teachers', but for all of the reasons documented above (see paragraphs 4.19-4.26), this was sadly never reached for the group of schools. More optimistically, however, Birmingham LEA has now taken over negotiations on behalf of all Authority-maintained schools, with a view to operating a city-wide intranet. Calls will be free under these arrangements, although the cost of WWW access is still to be determined.

Meeting the aims

4.76 A number of key points emerge from the project. It was generally conceded by the headteachers that the project, as originally conceived, had not succeeded in meeting its aims and objectives. While the potential was clearly there, and this can be demonstrated by pockets of successful activity, these were not sufficient or regular enough to warrant calling the project a success in its own terms. Furthermore, much of the activity that was generated was by one or two schools, and much of that was not directly related to the BKS project *per se*.

4.77 In retrospect, the decision to launch the project with predetermined projects may have been a mistake. It would have been better for each school to identify, perhaps, two or three possible projects which arose out of a genuine interest or need, from which the schools could have developed collaborative initiatives. Instead, activities were imposed in a top-down fashion, which worked against a feeling of ownership. Too much consideration was given to the mechanics of exchanges and too little to the purpose. Where activities did develop in a 'bottom up' way, in many cases through contacts outside the project group, there was greater success.

4.78 The decision to centre activities around video conferencing may also, with hindsight, have been unfortunate. Leaving aside issues of technical reliability, a single workstation inevitably limited activity, and the desktop model proved to be unsuitable for groups much larger than four or five. In one or two schools, the inappropriate siting of the PCC also created difficulties. Finding compatible times when schools could communicate was also problematic and imposed severe restrictions on the organisation of joint sessions. E-mail communication is not subject to the same constraints and, while this was much less explored, it did generate some interesting exchanges between pupils and paved the way for follow-up video conferences. The potential of the Internet for research purposes, and for the creation of materials, was also under-exploited in most of the schools which had access, and could have also served as a basis for joint projects.

4.79 A clearer understanding of technical issues at the outset would have helped to avoid many of the difficulties, in particular the incompatibility problem. Addressing such problems quickly may also have 'saved' the project, but the introduction of common software across the six schools was never completed during the evaluation period, leaving equipment still incompatible at the end of the project. While success may breed success, failure is highly demotivating.

4.80 A number of ICT initiatives are founded on the idea of creating or enhancing inter-school collaboration. The experience of this group of schools is salutary in that, despite their history of working together very successfully in a number of other areas, this was not sufficient to drive the Knowledge Superhighway Project forward. Part of the problem here may have been the relative status, technologically speaking, of the partner schools. While some schools were effectively novices, others were much further advanced, with one school clearly leading the field. This created disparity among the schools on the one hand and a dependence on the lead school on the other.

4.81 Video-conferencing technology is designed for communication and yet little was made of it to further the aims of the project. We heard on numerous occasions from teachers that they had heard nothing from other schools, or that meetings were not called or were poorly attended, while at the same time one solution to this situation remained largely unexploited. Just as there were some early examples of teaching the use of video conferencing *via* video conferencing, organising a communications project using the technology, for example for exchanges between project co-ordinators, was an obvious, but missed opportunity.

Costs and cost effectiveness

4.82 The situations of the participating schools was very varied, not only in terms of their relative financial situations, but also in terms of IT provision, teacher expertise and available technical support. As such, the schools progressed at different rates, so that the project represents potential rather than realised benefits for most of the schools. Whether or not the schools move closer together, or move forward independently, or as a smaller group, remains to be seen. The lead school had very clearly set its course as a high-tech institution, in which Superhighways play an increasing part, and had very much been the architect of this project. It had forged links with numerous commercial providers for technical and financial support. However, such support did not, as originally anticipated, extend to the other schools in the project. As a result, other issues, such as school improvement, took priority for most. The schools were, therefore, reluctant to fund ICT provision without clear evidence that it would be of educational benefit. While this may represent something of a circular argument, it is likely to be the way in which many schools, particularly those without a history of strong commitment to IT, will view the prospect of investing in an ICT future.

Conclusion

4.83 While some of the difficulties encountered by the schools could have been anticipated, many simply could not have been foreseen. Despite the best efforts of project participants, and of the overall Project Co-ordinator in particular, the project seemed ill-fated. As one headteacher told us, ‘I have no problems with the vision’, but admitted that realising it had so far been somewhat more elusive.

4.84 In some ways, the project is still in the initial phase, with some useful experiences gained, and a considerable number of plans for future developments. The schools have achieved much by working together in the past and optimism remains high that a re-launched Knowledge Superhighways Project has a good chance of succeeding in the future.