Education Departments' Superhighways Initiative

Group A: Curriculum Projects in England and Wales

Final Report

University of Leicester School of Education

Maurice Galton, Chris Comber, Linda Hargreaves, Tony Lawson, Ken Fogelman

University College of Wales, Aberystwyth - School of Education

Richard Thorpe, Dilwyn Roberts-Young

External Consultants

Tony Eldridge, Mike Rumble

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.

The Projects

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) - see Appendix 2. 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 in their aims and objectives. What united the group was a classroom focus, with teachers and pupils exploring the potential of a range of information and communications technology (ICT) to enhance teaching and learning.

Project A2.1: Bristol Education 0n-Line Project (BEON)

Description of the project

2.   The project involved a group of primary schools, one secondary school and one special school, and was a trial of a managed network that enabled schools to have remote access to on-line interactive education services and applications, a 'walled garden' Internet environment and point-to-point video conferencing.

3.   The special and primary schools each received 30 networked workstations; the secondary school received 200, as well as various peripherals such as colour printers. A PC in each school, three in the secondary school, were enhanced for desktop video conferencing. These were connected on a local area network (LAN), linked via BT ISDN2 lines to three remote servers which provided network management, access to the Internet and video conferencing. Schools also had remote access to an open integrated learning system (OILS) for English, mathematics and modern languages, a variety of standard applications, clip-art files and multimedia objects. For technical reasons, an original proposal for remote access to a CD-ROM library was never operational.

4.   The main commercial sponsors in the project were BT and International Computers Ltd (ICL). ICL installed the school networks, while BT was responsible for the wide area components that position BEON as a true information superhighway project. BT installed high-bandwidth connections to the servers, ISDN lines for the video conferencing, and 2-megabit bearers to provide access to the network services such as CampusWorld, the Internet and e-mail. ICL provided remote on-line service management and also provided the CD-ROMs and local applications such as the integrated learning system (ILS). ICL undertook the initial training and also commissioned a team from the Education Department at Exeter University to provide remote and on-site INSET.

Aims and outcomes

5. The aims of the project were to explore the value, for both educational development of pupils and the professional development of teachers, of the curriculum materials and support services provided, and to weigh any added value in educational/professional terms against the real costs of such a service at full commercial rates. The measure of added value in educational terms focused mainly on the degree to which the technology enhanced the learning of the pupils, but consideration was also given to improvements in individual and social areas such as self-confidence and communication.

6. The project had a major impact on the culture of the schools and the motivation and confidence of children. Some schools reported gains in literacy, oracy and communication skills, as well as improved social skills. The proportion of pupils with special educational needs (SEN) in the schools was well above the national average and although, with the exception of the special school, little targeted project-related work was conducted with these pupils, the majority clearly benefited.

7. In general, pupils made intelligent use of Internet materials, and became adept at moving and manipulating information between different applications. There were, however, criticisms from teachers about the operation and content of the 'walled garden' World Wide Web (WWW) environment. OILS formed a major feature of their project activity in the secondary school. While, overall, the software failed to have the impact upon learning that was anticipated, schools were looking at ways in which to improve the technology and to identify optimum conditions for its use.

8. The role of the remote helpdesk, which provided rapid and reliable on-line technical support, was highly commended by the schools and was a central feature of the managed service. Much praise was also given to the Exeter University team who provided remote and on-site INSET for both teachers and pupils in particular applications, and one-to-one tuition with curriculum experts. Inter-school collaboration developed during the project, although, for a number of reasons, this diminished towards the end of the trial.

9. The special school for pupils with emotional and behavioural difficulties (EBD) was, in more ways than one, relatively isolated from the other schools in the project. The pupils came from extremely deprived social and economic backgrounds, and generally expressed very low levels of self-esteem, short attention spans and poor reading and writing ability. Nevertheless, the technology had a major impact in the school, and proved to be a highly motivating facility, was in constant use, and considerably increased the confidence of these pupils.

10. A variety of different 'visions' of the future are being discussed by teachers and managers, who are in the main hopeful of being able to build on the lessons learned so far. One area where there was unanimity was the desire for the schools

to continue with a managed service, but to have greater 'ownership' over the project's direction.

11.   The project had a considerable effect on the culture of the schools. The majority of both pupils and teachers became highly computer- and network-literate, and for pupils these gains were made regardless of age or ability. Most schools were, at the end of the trial, exploring ways of incorporating the technologies into schemes of work across the curriculum.

12.   In a project of this scale and complexity, there were inevitably some difficulties, and these included management and technical issues as well as differences in the ways in which the different technologies were introduced and used in the classroom. In general, however, the project succeeded in enhancing teaching and learning through the use of ICT. Although it is difficult to quantify achievement gains in the relatively short time-scale of the trial, the majority of the staff and pupils had moved from novice status to expert in their understanding, competence and sophistication in the use of ICT; in particular, there were clear gains in self-esteem, motivation, confidence, and IT and networking skills. The commitment of the sponsors, school managers, teachers and particularly project co-ordinators was a key factor in bringing this about.

13.   The model of a managed service was particularly effective, eventually allowing teachers to concentrate on curriculum, rather than technical, concerns. Teachers also praised the role of the team from Exeter University, who provided expertise and support for schools to develop purposeful curriculum-focused activities. Although the project represented a potentially costly model of delivering ICT, the combination of the managed approach, a broad range of networked services and the availability of curriculum support and development provided schools with highly valuable experience and a model of practice on which to build.

Costs and cost benefits

14.   Despite some residual tension between the educational and commercial partners, the project achieved much, and demonstrated the viability of a managed service. However, at the end of the trial, it became clear that the true costs of a project of this scale and complexity were beyond the budgets of the schools. While the managed service was positively received by the schools, they were actively seeking alternative, lower-cost solutions towards the end of the project. However, last-minute negotiations resulted in a new phase, whereby the schools agreed to continue to act as a 'test-bed' in return for an extension to the trial.

Project A2.2: Project ConnectEd (also known as Project IntraNet)

Description of the project

15.   ConnectEd involved three commercial organisations, 20 schools and colleges, and Guildford College. The initial aims of the project emphasised the exploration of

the educational benefits of the Internet; the development of curriculum support materials and their availability via a network; sharing of resources via a network; encouraging the use of IT by teachers, pupils and parents; and the development of presentation skills. Thus the main project activities were to be the use of a dedicated Web site; the use of e-mail and video conferencing as means of communication between participants and others; and the use of the Internet as a source of information for students.

16.   Microsoft was the lead commercial participant and provided software tools; Education Exchange (Edex) provided the network and Internet connectivity; Mast Learning Systems (MLS) were initially the project managers and were to maintain the ConnectEd Web site; and Guildford College provided the initial training.

Aims and outcomes

17.   The aims of the project were to explore the educational benefits of using the Internet; to encourage the development of curriculum-support materials and make them available to others via a network; to explore best-practice examples for sharing resources and curriculum-support materials via a network; to encourage the use of IT as a learning aid by teachers, pupils and parents; and to develop key information-presentation skills in teachers and pupils.

18.   The early months of the project were characterised by problems in establishing connectivity. Most schools were not active until the autumn term. While there were some developments in individual schools, there was little communication among them and no sense of a collective project. Consequently, in November 1996, Microsoft called a meeting to re-launch the project. Edex extended free connectivity to the end of March 1997. Focus groups were established, which met in December and identified the main general aim for the remaining period as being the sharing of curriculum materials, particularly in science, though specific activities such as using the Internet as a resource, video conferencing and e-mail communication would continue to be pursued by individual schools. Also in this period, MLS withdrew from the project and Guildford College took over the maintenance of the ConnectEd Web site as well as a leading role in moving the project forward.

19.   By the end of the project, connectivity had still not been achieved in two schools, mainly because of incompatibility between their LANs and the requirements for connectivity. The majority of the remainder have 64Kbps access; seven active schools or colleges have 2Mbps access. Networked hardware and its locations are extremely variable, ranging from one Archimedes in an IT classroom to 40 486s and Pentiums dispersed across curriculum areas. More typical is between 10 and 20 machines, the majority located in a library, open-access area, learning resource area or IT suite.

20.   Initial training for teachers was provided by Guildford College early in 1996. Although teachers were very positive about the training, most were then frustrated by their inability to practise and develop their skills back in their

schools. As indicated above, the subsequent months, which the original timetable had envisaged as being the period of major activity, were dominated by connectivity issues. Thus, the cross-institutional activities which had been at the core of the original aims had not been achieved by the end of the project. Nevertheless, there have been interesting and impressive developments in several individual schools as they have developed their own aims. There is beginning to be evidence of the appeal of the Internet to both teachers and pupils as a major information resource. Across the schools, all age ranges and ability levels were represented. All National Curriculum subjects were involved in project activities and, post-16, most A Levels and GNVQs were also active. The most notable achievement is the increase in motivation, reported by teachers, confirmed by the evaluators' observations, and most clearly evidenced by the constant use of the facilities, during the school day and also early in the morning and after school. Many co-ordinators also reported increased motivation among staff, including those with little previous IT involvement.

21. This can best be expressed in terms of the widespread enthusiasm shown by staff and pupils for Internet activity. Most schools are still in the early stages of learning about the possibilities of the Internet and e-mail. Video conferencing is as yet even less explored. Nevertheless, the majority of schools and colleges involved in the project are very keen to continue with the technology, and some have made considerable progress towards integrating ICT into their curriculum programmes.

Costs and cost benefits

22. By the end of the project, nearly all the schools and colleges were exploring ways in which to maintain connectivity at a cost which was bearable. The initial reaction to the high costs quoted by the commercial sponsors for maintaining connectivity at their current levels was to search for alternative strategies. While several participants were able to take part in local consortia of various types to keep costs down, others were considering a reduced connectivity and lower-cost package being marketed by Edex. With only one exception, all the participating schools and colleges were committed to continuing with ICT, within their budget constraints.

Project A2.3: Kent Broadband Learning Project

Description of the project

23. The project involved three schools in the Medway area of Kent. Because of changes in the local cabling plan, the two original schools in the project, an 11-18 secondary comprehensive girls' school and a junior school which was a feeder to the secondary school, did not, as anticipated, have broadband connectivity. The schools were limited initially to dial-up connectivity to the Internet, but later upgraded to ISDN2, which enabled video conferencing. Because of this, a third

school, a girls' grammar, was brought into the project at a later stage in the planning cycle. This school initially had a 64Kbps link, later upgraded to 2Mbps, which gave access to a central server for Internet, cable TV and interactive CD-ROM multimedia learning and teaching materials.

24.   The project partners were Kent Education Forum, consisting of representatives from Kent Training and Enterprise Council (TEC) and Kent Local Education Authority (LEA), United Artists Communications, now Telewest Communications, Research Machines (RM), and BBC Education.

Aims and outcomes

25.   The broad aim of the project was to explore the role of ICT in the enhancement of learning. These technologies included broad, intermediate and narrowband access to the Internet and a remote CD-ROM library, as well as video conferencing and cable TV. Further initial aims were to develop links between school and home in order to extend learning opportunities.

26.   E-mail links were developed and used highly effectively to support learning in humanities at primary level, and modern languages and English at secondary level. During the lifetime of the project, integration of communications technology into classroom practice and schemes of work was extended across different curriculum areas, and included all age groups. Existing curricular links between the two local schools as part of their transfer arrangements were considerably enhanced by e-mail and video-conferencing exchanges.

27.   The girls' grammar school used e-mail to enhance pupils' modern-language skills through an existing multilateral European educational exchange with schools in Holland, Italy, Germany and Finland. Fast Internet access from 16 networked machines catered for class groups to carry out research for coursework within the timetable in sociology and English, thus overcoming the potential inequities of a more common arrangement witnessed elsewhere where pupils only have access to the Net for research purposes outside lesson times.

28.   Together, the secondary schools provided a model of how superhighways resources were integrated into pupils' curriculum tasks through careful planning within schemes of work in English, modern languages, media studies and sociology, which ensured progression in ICT and study skills.

29.   The success of this project stems from its foundation within already functional educational links, and its continued survival was heavily dependent on the commitment of the schools' project co-ordinators. Many of the junior school's achievements were the result of teachers and pupils working together in learning and developing ICT skills.

30.   The project is continuing, and there will be further curricular permeation within the secondary schools and extension of international links. In one of the secondary schools, certain staff have been given specific responsibility for developing ICT within their curriculum area. In the other, a research group has

been set up to encourage further staff involvement and extension into other curriculum areas.

31.   The project demonstrated that schools can develop their facilities with limited external resources and enterprising use of school budgets, combined with funds from, for example, European projects, bid for on the strength of the schools' communications capabilities. Its success results from the determination and commitment of the schools' project co-ordinators, and its foundation within the schools' pre-existing educational links, such as the cross-phase liaison between two of the schools, and the European modern languages exchange in the third.

32.   The Kent Broadband Learning project represents a very successful project which has met its primary aim to explore the role of broad, intermediate and narrow band access to ICT. Despite early difficulties and delays, and, in two of the schools, narrowband access for the first half of the project, a great deal was learned and achieved through the variety of uses explored with each of the communications technologies. A second aim, to develop relationships between educational and commercial partners, was partially achieved, in that existing links between two of the schools were strengthened. At a managerial level, collaboration between all three schools worked well, and their relationship with the Kent LEA developed positively during the project. All of the various players are very keen to develop and extend the project.

33.   A third aim, to develop links between school and home in order to extend the opportunities for learning and for staff development, had not been fully explored by the end of the project. Some senior managers had been provided with laptops and modems enabling them to link from home to the school, and a number of pupils with special educational needs were also being provided with computers with Internet and e-mail access. While these initiatives looked likely to develop, it was too early to identify specific outcomes.

Costs and cost benefits

34.   Beyond a small setting-up fund, no external funding was made available for the project. Supplemented by sponsorship and/or 'gifts' from commercial providers and manufacturers, the schools themselves invested considerably in extending and upgrading their ICT facilities. One secondary school matched Government funding as a result of achieving Technology College status and was consequently able to expand networked access.

35.   The project showed that small-scale beginnings with dial-up access can represent a relatively cheap and viable option for schools who wish to make the first steps in getting on line. However, where this may be a strategy for start-up initiatives, it is not a feasible solution for integration of ICT across a school or group of schools. Following initial successes, once schools had identified the benefits of faster connectivity and/or increased access, they were committed to seek funds to expand and upgrade their facilities.

Project A2.4: Birmingham Knowledge Superhighways Project

Description of the project

36.   The project involved six secondary schools in south Birmingham, three of which were single-sex institutions, two boys-only and one girls-only.

37.   Each school had one PC upgraded to enable point-to-point desktop video conferencing. In addition, three of the schools had modem Internet access via a commercial Internet service provider (ISP). Connectivity for video conferencing was via BT ISDN2, supplemented by dial-up/telephone line Internet access.

38.   The main focus of the project was video conferencing, although some of the schools also had access to the Internet to support research. A trial of open integrated learning systems (OILS) software in English, maths and modern languages aimed to examine its potential to help raise motivation and achievement. A further aim of the project was to establish home-school links via the local cable network to support out-of-school learning and out-of-school use of ILS.

39.   The main partners were Systems Integrated Research (SIR) and ICL, who provided technical rather than financial, support. The project management team was in negotiation with the local cable company to initiate the setting up of a schools' intranet. These discussions were not concluded during the period of the trial and schools continued to use ISDN connectivity.

Aims and outcomes

40.   The project sought to explore the potential of intermediate and broadband communications technology for raising pupil achievement, for enhancing the curriculum, and for improving the quality of teaching. An overall objective was to further develop existing collaboration between the schools.

41.   The project was subject to technical and organisational problems for the duration of most of the trial. These difficulties seriously hampered progress for four of the six schools, and one of the schools effectively pulled out midway through the trial. Initial inter-school activities designed to get the project started were only partially successful. Although a number of inter-school projects were achieved during the trial, these were, in the main, limited in both number and scope. Further activities were in the planning stage, or were just beginning, at the end of the trial.

42.   In addition to video conferencing, two schools developed various initiatives using e-mail and Internet resources, and created school Web sites. Existing video-conferencing links between the girls-only school and a local junior school, which has a reputation for highly innovative ICT work, have been strengthened during the project, and new contacts with international schools established.

43.   The most successful activities arose from a school need, rather than being created specifically for the project. Teachers clearly felt that such school-based initiatives were essential if the project was to move forward. The more active schools also sought links with schools outside the project group. One school in particular remained very active throughout the trial, although many of its activities were not directly related to the project. With the exception of this school, the OILS systems did not feature greatly in the schools' activities and, in general, were not very highly regarded. However, in one school with a Special Learning Unit, the targeted use of specific elements of the English program was reported to have a significant impact on the progress of pupils.

44.   The project cannot be said to have fully met any of its aims and objectives. Despite existing links between the schools, there was little collaboration between them during the trial, although there were pockets of successful activity. A single video-conferencing facility seemed to be insufficient to fully involve or enthuse other staff and, in retrospect, a stronger emphasis on the use of the Internet might have been more successful. Because of the failure to reach agreement with the cable company, home-school links were not achieved.

45.   The project is still, in effect, in the initial phase, with some useful experiences gained, and a considerable range of projects planned or recently started following the resolution of the various problems. The overall feeling of the headteachers and teachers was one of disappointment at a lost, rather than a wasted, opportunity and optimism remains fairly high in at least four of the six schools that the project can be re-launched.

Costs and cost benefits

46.   Little financial or technical support was available for the project, and it was clear that this situation was not anticipated by some of the schools. The lack of such support clearly contributed to the inability of the schools to resolve the various technical and/or organisational difficulties. For those schools where these dominated, project activity, and thus educational benefits, were negligible, and over the group of schools as a whole, gains were more potential than actual. With one or two exceptions, the schools were reluctant to fund ICT provision without clear evidence that it would be of educational benefit.

Project A2.5: Journeys through Space and Time, now the Rosendale Odyssey

Description of the project

47.   Journeys Through Space and Time was a collaboration between Rosendale Infants School, south London, three artists in residence and staff from the Photographers' Gallery. The project was funded by the Sir John Cass Foundation, the Gulbenkian Foundation and the Walcott Educational Charity.

Additional sponsorship in the form of equipment and technical help was provided by Kodak and the Arts Technology Centre (Artec).

Aims and outcomes

48.   The main aims of the project were to create the opportunity for young children to produce an interactive multimedia program for distribution across the Internet and thereby to establish direct links with other primary school children both nationally and internationally.

49.   The main software used was Photoshop, an image manipulation program, and HyperStudio, a multimedia authoring tool specifically designed for use by young children.

50.   The project has met most of its aims in full. To date, over half the school's pupils have gained hands-on experience and the work with Year 2 pupils has now been extended into the reception class. Pupils' work done during the school year 1995-96 has been mounted on the school's Web site and has been publicly exhibited at the Photographers' Gallery.

51.   Parents and teachers reported that improvements in basic literacy have resulted from the project, and levels of motivation and time on task were observed to have increased.

52.   Although there were some initial tensions between teachers and the artists over ways of working, these were speedily resolved and the confidence of the teachers rapidly improved with in-house training to the point where the school's IT co-ordinator now has full responsibility for implementing the programme, including training. The main constraints on further progress have been the limited number of computers, which are housed in the library area. Future plans include having a networked computer in every classroom.

53.   The most effective use of the software has been within the context of cross-curricular activity, although the reception class is creating its own literacy project. As pupils have gained in confidence, the teacher's scope for whole-class teaching has decreased, since pupil motivation appears highest when children are encouraged to pursue their own lines of enquiry. This results in an increasing degree of differentiation, requiring individual or group responses from the teacher.

54.   The school will amalgamate with the Juniors in the autumn of 1997 and plans are in hand to deploy the new technology to all pupils in both schools. E-mail links with other schools will be extended so that, in the headteacher's words, 'children will learn there is a life beyond the school gates'.

Costs and cost benefits

55.   Major capital funding is required to meet the objective of placing one Apple Macintosh computer in each classroom. The pupils include those of African, Caribbean, Asian, Chinese and European descent, and 22 different languages are

spoken in the school. In these circumstances, reductions in staff to provide funds to buy more computers are neither educationally desirable nor politically feasible at a time when reductions of at least one member of staff are required to balance the existing budget. No provision has been made for future maintenance.

Project A2.6: Dyfed Satellite Project: Opening the Door to Satellite Remote Sensing

Description of the project

56.   The project involved 16 secondary schools, with eventual plans to expand provision to all secondary schools in Carmarthenshire by the end of the 1996-97 academic year. Schools in Ceredigion were to be connected as funds became available. The technology consisted of a network of video-conferencing terminals set up by the Satellite Centre, which also provided Internet access to schools. By spring 1997, a total of 23 schools (16 in Carmarthenshire, 4 in Ceredigion and 3 in Pembrokeshire) were on line. Four teachers' centres and three administration centres were also involved.

Aims and outcomes

57.   The basic project aim was to make the facilities of the Dyfed Satellite Remote Sensing Centre more accessible to teachers and pupils through the use of personal video-conferencing facilities to enhance the IT skills of all staff and some pupils; to meet specific curriculum objectives in A-Level geography; and to develop communication skills and help to increase the social skills of pupils with special needs. Connectivity was via ISDN, installed free of charge by West Wales TEC.

58.   The schools have made different rates of progress. This ranged from the least advanced, which experienced considerable technical problems that sapped teachers' initial enthusiasm, to the most advanced which extended the project into curriculum areas other than geography, employed a network manager and produced a development plan which specifically addressed the expansion of ICT.

59.   The A-Level geography objectives were met through a series of modules in which small groups of students received remote tutoring from an expert based at the Satellite Centre. The link facilitated shared drawing of diagrams, maps and satellite images, and access to live and archived satellite images. The Centre provided remote INSET for teachers using both point-to-point and multi-point video conferencing. The link has also been used successfully to supplement or to provide teaching in modern languages, GNVQ IT and electronics, and A-Level psychology and sociology, where staff expertise in some subjects was not available, a factor which potentially limits curriculum breadth in isolated rural secondary schools.

60.   The most developed use has been the special needs inter-school video conferences in which pupils with special needs regularly interact with

counterparts in other project schools. Pupils progressively developed their conversational skills such as listening, turn-taking and speaking. They gained in social competence and were articulate about the use and value of the exchanges. The success of these links resulted in part from the greater flexibility of their timetables, since a major difficulty in developing video conferencing is the need to pre-arrange conference times within the constraints of secondary school timetables.

61.   Internet use was developed further in some schools than others. Access tended to be restricted to sixth-form pupils, and was available at lunch-times for personal research, as opposed to being integral to lessons.

62.   The development of staff IT skills has been more successful in the target curriculum areas and with special needs staff, but permeation to staff in other curriculum areas is limited in most schools. The critical factor here, apart from technical problems, is teachers' lack of time for hands-on practice and opportunity to discover resources relevant to their disciplines.

63.   There is awareness of the potential of the video link, which can permit multi-point conferencing for headteachers' and co-ordinators' meetings, but this has not been implemented, partly because of technical difficulties. In this rural area with long inter-school distances, the potential exists to use video conferencing for initial teacher training and continuing professional development group sessions, and for remote support and guidance from their university-based tutors. Cross-phase contact for pupils in small rural feeder primary schools with their secondary schools has been demonstrated through a geography link-up involving the Satellite Centre, and this has considerable potential to ease cross-phase transition when the planned access for primary schools is implemented.

64.   The project was generally successful in meeting the aims of enhancing curriculum activity, chiefly in geography, via remote tutoring and access to satellite images, identifying and training senior personnel and providing technical support. It further succeeded in another aim, to provide Internet access to schools. Additional objectives identified by the schools themselves were also being achieved, particularly in special needs education, but also in other curriculum areas such as social sciences, modern languages and business studies. Cross-phase interaction between schools was being explored.

65.   The project also fulfilled its aim to be cost effective, and there was considerable potential for the expansion of the Centre's services for schools in both the primary and secondary sectors. A key feature contributing to the success of the project was the role of the project director, whose initiation of the project anticipated the need for senior management involvement, curriculum-based objectives and training, and the need for continuing consultation with project co-ordinators.

Costs and cost benefits

66.   Participating schools paid 50% of the costs of equipment and software, and for on-line charges and rental. The remainder was met through a mix of locally and centrally-provided education grants. The Centre acted as an Internet service provider (ISP) for schools within their full service-level agreements and, although costs of INSET modules were extra, they were at an affordable rate. For this group of small, rural secondary schools, the opportunities to enhance and broaden the curriculum via remote tutoring was a considerable incentive. The costs to schools, already relatively low, were thus offset by savings of travel and supply cover costs. The project was therefore extremely cost effective.

Project A2.7: Powys Access for Schools Project (PACCS)

Description of the project

67.   The project provided on-line access to locally created resources through the Rural Wales Wide Area Network (known as RWN). These included geographical, archaeological, archival and fine art materials which were supplied by the Powys Archives Service (PAS), the Clwyd-Powys Archaeological Trust (CPAT) and the 'Artists in Wales' project under the guidance of the Powys Education Authority's Art and Technical Advisor. The co-ordinator of the project was the Powys Education Authority's IT Advisory Officer.

68.   Five schools participated in the project, three primary, one secondary and a residential special school, which were all located in sparsely-populated rural areas. The primary schools varied in size between 71 and 285 pupils. One of the schools was bilingual, while the other two taught solely through the medium of English. Each catered for Key Stage 1 and 2 pupils. The secondary school was also bilingual and had 270 students on roll, spanning KS3 and 4. The special school took its 50 pupils from a wide catchment area and covered KS2 to 4.

Aims and outcomes

69.   The main aims of the project were to gather information about harnessing the potential of the Web for converting public resources into educational resources. In pursuit of this aim, it was hoped to promote co-operation between participants and to allow schools increasing access to on-line information. These aims were to be achieved by encouraging public sector bodies to become quality information providers and by enabling pupils themselves to become information providers as well as consumers.

70.   Three of the five schools were linked to the RWN via BT ISDN2 lines. Internet access was available through the server based at County Hall. The smallest primary school and the special school had dial-up access to the Internet via BT CampusWorld.

71.   Most of the aims of the project were not met because of persistent technical difficulties which occurred throughout the lifetime of the initiative. The limited resources required the project co-ordinator to use most of his available time in remedying faults in the system, with a consequence that there has been little opportunity to follow up initial training with in-school sessions, nor to bring the partners together to share ideas and engage in forward planning. As a result, many of the teachers and the information providers were unclear about the project's aims and were unaware of the identity or activities of the other partners.

72.   Despite a lack of collaborative activity among the partner schools, some have taken part in projects originating in other parts of the United Kingdom or abroad. These provided valuable insights into the potential benefits of the technology for learners, particularly those with special needs, and alerted other less committed teachers to the capacity of the medium to improve levels of pupil motivation.

73.   Schools and providers have retained their enthusiasm for the project despite the difficulties they have experienced. The new technology is seen as a key element in broadening the learning experiences of pupils in isolated rural areas and it also has possibilities as an administrative tool. This latter use is dependent on the local authority fostering an 'administrative climate' which encourages the use of electronic communication.

74.   The project suffered from a lack of co-ordination, even given the difficulties encountered. If the project is to succeed in the future, there is an urgent need to address the concerns of schools that they lacked any sense of belonging to a project, by establishing a steering group. This group would arrange meetings of representatives, inform schools of any likely developments and be a forum for sharing ideas through newsletters and by use of the telecommunication facilities.

Costs and cost benefits

75.   Funding for the project was limited to a relatively small amount of GEST funding. All participants in the project expressed concern about the lack of financial support. Although the schools received free Internet facilities during the trial, it was not possible to judge whether the level of their commitment would remain as high if the project became fully self-funding. Given the local nature of the initiative, and the isolated situation of the schools, it has somewhat restricted relevance in commercial terms, and sponsorship would not appear to be a viable option. The education authority was committed to the project's continuation but found difficulty in providing support in the face of other financial priorities.

Cross-Project Observations and Recommendations

Value of educationally-defined objectives

76.   Initiatives were most successful where schools identified curriculum/professional development objectives and sought technological solutions, rather than introducing the technology and seeking 'problems to solve'.

Teachers' professional development

77.   At the time of writing, the Teacher Training Agency (TTA) is undertaking a national survey examining the role of IT in initial teacher training and a consultation exercise on the future of INSET funding. Account should be taken within these TTA initiatives of the likely impact on teaching of ICT. For example, ICT has the potential to facilitate initial teacher training, particularly during school placements. In two projects, effective use was made of video conferencing for remote tutoring of student teachers, and although we saw no specific instances of e-mail being used in this way, there are clear opportunities here also. Such developments may be particularly important for teachers in rural areas.

78.   Although the projects in Group A were not specifically concerned with initial teacher training, there was some evidence that many student teachers' levels of IT skills and understanding were weak, and that this was of concern to many schools. The current consultation documents for a National Curriculum for Teacher Training do not address the issue of new technology beyond the specific requirements of basic IT competence, neither do they examine the wider educational implications of communications technology. It is vital, therefore, that the potential of ICT, both for teaching and as a means of delivering teacher-training programmes, is fully recognised and incorporated into the finalised version of the initial teacher-training curriculum.

79.   For practising teachers, effective use was also made of video conferencing, for example for the remote delivery of INSET, often on a on-to-one basis and tailored to an individual teacher's need. Teachers were also able to gain access, and in some cases contribute, to materials on the WWW and on dedicated teachers' resource sites, and to use e-mail and shared areas, such as bulletin boards, to exchange ideas and experiences. Some teachers were beginning to investigate the potential of portable computers, which gave them home-based access to such facilities.

80.   While many of these initiatives were at the exploratory stage, communications technology clearly offers tremendous potential for enhancing teachers' professional development, both on an informal, teacher-to-teacher basis, and within more structured programmes. In this, we accord with the conclusions of the recently published Stevenson Report (Stevenson, D., Information and Communications Technology in UK Schools: An Independent Inquiry, The

Independent ICT in Schools Commission 1996-97) that full account of ICT should be taken within both in-service and initial teacher-training programmes.

Inter-school support

81.   ICT offers clear potential for local schools to communicate and work together. However, the contemporary culture of schools is not conducive to co-operation, so that schools with expertise in the use of broadband technology may be unlikely to share their experience with nearby schools. There were notable exceptions, however, particularly where schools already had a history of working collaboratively. This was especially, although not exclusively, true of schools in rural areas.

Administration and inter-school exchanges

82.   The projects in Group A were mainly concerned with aspects of curriculum use rather than easing administrative procedures, and the evaluation period was not sufficiently long for the emergence of major developments in this area. An interesting development, however, was the use of ICT to facilitate transfer procedures, for example by the electronic exchange of documentation such as records of achievement, for the monitoring of particular pupils or groups of pupils (including those with special educational needs) between feeder and transfer schools, and to support greater curriculum continuity within transfer (see paragraph 96). There were also numerous examples of exchanges between primary and secondary pupils, and between secondary teachers and primary children, and there is clearly considerable potential in this area.

Careful planning before implementation

83.   This points to a need for a thorough consultation and planning phase prior to the initiation of a project. This process should include:

- the clear identification of curricular and/or professional developmental objectives

- careful consideration of the type, level and location of ICT required to meet those objectives

- consideration of the training requirements of staff, including relevant support staff, and pupils

- the setting up of a well-defined and accountable management/co-ordination structure

- the identification and allocation of adequate technical support

- the development of a medium-term plan to carry the initiative beyond the start-up phase.

Avoiding educational and commercial culture clash

84.   In some projects, particularly those which were large scale, there was evidence of tension between the educational and commercial partners. To avoid this conflict of cultures, there is a need for a partnership approach, each recognising the distinct contribution the other has to make.

Role of intermediaries

85.   This process was enhanced in some projects by the involvement of an intermediary or 'honest broker' with expertise in the educational applications of ICT and a sound knowledge of the culture of schools.

Value of context-based training

86.   Similarly, training procedures were most useful where the focus was on context-based exploration of the technology, rather than just skill acquisition. The involvement, in some projects, of experts in the educational as well as technical application of ICT was very effective.

Role of project co-ordinators

87.   The role of the project co-ordinator within the school is crucial. Teachers who took on this role experienced a considerable shift in responsibility and status, particularly in the larger-scale projects. Co-ordinators were most effective where they had a clearly-defined function, and at least the explicit support and involvement of senior management.

Effects on teaching styles

88.   While, in general, teachers reported little direct impact on teaching style as a result of the introduction of ICT, the use of the Internet, in particular, has the potential to shift the role of the teacher from instructor to facilitator, helping pupils to search efficiently, critically review the information obtained, and support and develop pupils' problem-solving strategies. While most teachers welcomed this development, and this included previously technophobic teachers who were converted to the use of IT through exposure to the superhighways, some found it threatening.

Cross-curricularity

89.   Use of ICT as a learning resource can challenge the traditional discrete subject organisation of the curriculum. Information from the Net, or 'live' information through e-mail, is not always packaged into 'geography' or 'science' parcels but is cross-curricular in content. Whilst primary schools are used to working with cross-curricular topics, the National Curriculum encourages subject compartmentalisation. This is not to say, however, that the existence of subject-based departments in secondary schools necessarily limits the learning potential of the resource, but that ICT offers the potential to work in new ways.

Effects on learners

90.   Access to the resources available via the WWW, and the ability to work directly with other schools and agencies via e-mail and video conferencing has considerably enhanced the educational experience of many pupils. In exploring these facilities, pupils have developed high levels of computer and networking skills.

91.   There were numerous examples of improvement in pupils' work. This occurred both in structured situations, where the pupils were directed towards materials and activities by the teacher, and in individual access to the technology.

92.   A major impact of the projects on pupils was increased motivation and confidence. The 'levelling effect' of ICT was also marked. In many schools, both boys and girls of all ages, academic abilities and backgrounds displayed equal and high levels of expertise, and willingly and confidently shared and discussed their skills and knowledge with others, including their teachers.

93.   Equally important was the ability of the new technology to expose pupils to a wider world and, therefore, to develop greater awareness of other cultures. This is particularly timely in the light of the concern currently being expressed about the role of schools in transmitting moral values and good citizenship.

Learners with special educational needs

94.   One of the key successes has been the benefits ICT has brought to disenfranchised learners, both pupils with learning difficulties and also the gifted. For pupils with special educational needs, emotional and behavioural difficulties or poor social skills, confidence and self-esteem were raised, communication skills developed and engagement with their studies increased. For gifted pupils, the opportunities opened up by the Internet have allowed them to explore ideas in ways which would have been very difficult within the classroom context.

Peer tutoring

95.   The introduction of peer tutoring, mainly, but not exclusively observed in primary schools, is an exciting development, and has had many direct and positive effects. The 'computer tutors' gained in confidence and self-esteem, children enjoyed being taught by their peers 'in their own language', and teachers were released from much of the routine and repetitive instruction in basic skills.

Cross-phase liaison for easing school transfer

96.   Exchanges between schools in different districts or countries has helped to raise pupils' cultural awareness. There have been a number of examples of primary/secondary exchanges for peer-peer tutoring and for joint curriculum projects. The potential for easing the transition between the two when pupils move up to secondary school is considerable.

97.   There was a concern in some projects about continuity and progression for highly computer-literate primary school children, who transfer to a secondary school where IT provision is limited, and low levels of skill on entry are assumed.

Raising awareness of primary pupils' IT capabilities

98.   The rapid development of expertise in many of the primary schools undermines the view that, in the words of one IT advisory teacher, 'primary schools don't need networks'. Policy makers should give particular consideration to the different, but equally important, needs of the primary sector in planning ICT initiatives.

Distribution and number of workstations

99.   During the evaluation, as teachers began to integrate ICT resources into their teaching and learning, the need to provide training for whole classes in basic IT skills was seen as no longer appropriate or necessary. The centralised computer-suite approach is, in our view, less effective than having fewer computers in a greater number of areas, for example in each classroom or subject area. There was evidence that, in schools with a large number of networked workstations, there was a shift towards this more diffused model of distribution.

Protection against exposure to undesirable applications

100.   Three major approaches emerged to deal with this issue:

- Protected or 'walled garden' environments were seen as particularly suitable for younger pupils. In some cases, however, 'protection' became increasingly to be seen as 'limitation'.

- Filtered access allowed for access to a wider range of sites, but with some element of control over unsuitable materials. This was regarded as a much more flexible approach, but still caused concern for some teachers since it was possible for young learners to access inappropriate sites.

- While screening mechanisms were generally regarded as appropriate for younger learners, teachers were also concerned to encourage pupils to develop responsible attitudes coupled with sanctions if trust was breached. The preferred solution here was to provide open access to networks, but to operate close supervision. This approach is, however, potentially time consuming for teachers. What might be called 'virtual surveillance', that is the possibility that searches or e-mails might be monitored, acted as a powerful deterrent.

Technical reliability

101.   Technical problems, particularly unreliable connectivity or lack of compatibility, were responsible for a loss of commitment and enthusiasm in some initiatives. Technical systems require technical experts to ensure their proper installation and continuing maintenance and, in many of the projects, this was simply unavailable

or beyond the means of school budgets. The role of technical support would normally be assumed by the LEA but, in the present climate, this is often no longer financially feasible.

102.   Some schools were considering the possibility of sharing technical support personnel, for example between a secondary school and its primary feeder. The joint financing of such support through a local federation of schools or through partnerships with the LEA, TECs or local businesses, is suggested as a possible way forward.

Creating productive networks

103.   There is clear potential for creating productive networks at a local level, although the contemporary culture of schools is not conducive to co-operation. The strongest links were forged between schools which were not in competition for pupils. In particular, relationships between primary feeder schools and their related secondary schools were enhanced by a sharing of the technology. Some schools and colleges also forged links with local groups, such as TECs, businesses, universities and LEAs, to generate the funds to continue connectivity.

104.   While there is a real concern about the issue of competition, it is also recognised that ICT enables communication with institutions that are outside a school's immediate area. There were a number of examples of productive co-operation at national and international level. These tended to build on existing links, however, and, in the absence of any kind of directory, there were difficulties in developing new relationships.

Data speed

105.   Schools with narrowband access rather than faster connectivity experienced considerable delays which proved to be frustrating and off-putting. However, many of the main delays occurred as the result of heavy traffic elsewhere so that, for example, schools were often frustrated in the afternoon when attempting to use the Internet, irrespective of the nature of their connectivity.

106.   The importance of speed is directly related to the importance of the technology required to meet the curriculum or professional development needs of the school. Some schools were convinced that 'starting small' with narrowband access was a viable option. Nevertheless, these schools understood the value of wider-band access, and progressed towards higher-capacity connectivity as far and as quickly as resources allowed.

107.   In general, therefore, the aim should be to achieve connectivity at the broadest width possible, budgeting for costs to anticipate future developments in superhighways technology.

Costs and cost benefits

108.   Difficulties arose in arriving at accurate costings because of the complex ways in which the various projects were funded, and in some cases subsidised. At its simplest, a school with available cabling and a willingness to transfer its telephone account to the cabling company has almost no start-up costs other than the staff time required for implementation, assuming that the cost of technical support and maintenance and of appropriate hardware and software can be met within existing budgets.

109.   The projects in Group A were very varied, allowing for comparisons between different models of implementation, from a fully-managed networked service across a group of schools, for example BEON, to a single school working with just two stand-alone computers at Rosendale. These are discussed in the main body of the cross-project report (see Report A3).

110.   In general, our observations indicate that large-scale funded projects benefited considerably from guaranteed commercial expertise and expert technical support. However, the real costs of such services, once sponsorship was removed from the equation, were beyond most schools. Nevertheless, even in the smaller-scale initiatives, once the potentiality of the system had been demonstrated, demand for additional ICT resources increased rapidly. Most primary schools argued for at least one networked machine per classroom. At secondary schools, the equivalent would be at least one fully-equipped laboratory within the major curriculum areas. The educational potential of ICT has been clearly demonstrated in all of the projects, regardless of scale.

111.   The need for accessible technical expertise was revealed in most of the Group A projects, not only after installation but from the planning stage, given that most schools will have to achieve compatibility between an existing and any new facility, for example as in Project ConnectEd. Secondary schools, therefore, may be able to budget for a network manager. For primary schools, the possibility of forming consortia with other primary schools and/or a local secondary school should be considered as a means of making such essential support affordable, if LEA services cannot be used.

112.   Currently, the lowest quoted commercial costs for a basic managed service varied between the cost of one-and-a-half teachers' salaries per annum in the primary school, and four-and-a-half in the secondary schools. In the present climate, where schools are already facing the possibility of severe cuts in staffing, no school in the project was able to contemplate such additional expenditure without outside sponsorship. Since, clearly, not all schools could secure this, a nationally-funded initiative will be necessary if widespread connectivity is to be achieved.