


Education Departments' Superhighways Initiative

Group B: Vocationally-Focused Projects

Final Report

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Evaluation Methodology and Procedures

1. The evaluation procedures for the projects in Group B necessarily varied according to the context of individual projects, however the following general methodology was employed for all projects.

2. All educational institutions involved in the ten projects were visited by members of the evaluation team, though where a large number of institutions was involved (e.g. London Colleges Multimedia Initiative) a large representative sample was visited.

3. Data was obtained through the use of observation of teaching and learning, through semi-structured interviews with participants at all levels, and through the use of questionnaires using fixed and open-ended response items. Emphasis was placed on eliciting and representing the views of a range of those involved in each project, from learners to teachers and managers.

4. In addition, the evaluation teams analysed project documentation, students' work and minutes of management meetings and, where possible, a member of the team attended project management and steering group meetings.

5. Regular evaluation team meetings were held to ensure a commonality of approach and to inform and refine the methodology adopted and the evaluation foci as findings emerged.

Section 3

Cross-Project Observations and Recommendations

Models of management, representation and responsibilities

1. In this section, we draw together and elaborate on some of the central themes arising from the evaluation of the Group B projects. It should be noted that the Group B projects provide a wide variety of applications of technology, both in schools and FE institutions. This is reflected in the reports and in the observations which follow. There are many prerequisites to a successful project, but one of the most important lies in the management infrastructure. The project-management group should have representation from all major contributors, including sponsors and the institutions which are involved in the project. Representation also carries with it responsibilities and the necessary acceptance of responsibility. We have seen how an effective management model can operate to the benefit of the project, as with the Students Across Europe Project. Albeit a small project based in a single UK school, the management structure involved not just personnel from the school, but also representation from the sponsors and local universities. This ensured that there was always a sound educational and financial basis for the development of the project. In contrast, another project, Salford GEMISIS, whilst having a clear representational structure to its management and administration, suffered initially, to some extent, from problems which arose over sponsorship responsibilities.

2. Management also concerns monitoring, the setting of goals and taking decisions. With new technology, very few people are experts and, consequently, there is no fund of expertise upon which to draw and which will provide guidelines for making decisions. Many of the projects which were evaluated were pilot projects and, thus, by their very nature, were experimental, being designed as forerunners to future activities. When this is the case, it is important that appropriate feedback mechanisms are in place so that experiences are disseminated through meetings and also through newsletters. This also helps to develop a feeling of being involved and, even for small projects, it is important to inform everyone concerned about developments and initiatives which have been undertaken. In this way, we learn and benefit from what others have tried. It was surprising that this aspect of management was so lacking in several of the projects which were evaluated and, indeed, only two projects, Hertfordshire 'Students as Writers' and Burnley LIFE, produced regular newsletters which were concerned with pedagogic issues. The processes involved in the introduction of new technology into schools is well-documented in the research literature, and it is an important part of management that appropriate dissemination structures are available so that developments occur within an appropriate framework which will allow for their evaluation and possible replication.

3. Generally, the local project management in the schools has been devolved to the Head of IT in a school who, together with his/her other responsibilities, has been given that of managing a project, and trying to provide some form of

overview and enthusiasm for developing innovative curriculum applications for a technology which is completely new (and new to them as individuals). It has been noted on numerous occasions, for example with Furness Highway, Carlisle Video Conferencing, Burnley LIFE and Salford GEMISIS, that staff cannot easily undertake such responsibilities without being provided with additional help or with an adequate time allowance for the extra work which is involved. With the emphasis on examinations, league tables, OFSTED, etc., staff will prioritise their work accordingly and, although it is good for the standing of the school (particularly with parents and governors) to be involved in such high profile technology projects, it is not surprising that the outcomes in terms of curriculum applications are often so modest. In addition, project staff also need the support of the senior-management team, as, unless this is actively present, the sought-after experiences and innovations will occur only when there is a significant level of enthusiasm and IT flair already present in the school. In brief, local management is important. Project teachers need support to the extent that the whole school is involved in the project, and it is not just the IT teacher who has the responsibility of generating interest and enthusiasm amongst staff. We have seen the marked effects in the Carlisle Schools Video-Conferencing Project of how a project has developed very significantly at one school, but only modestly at others and, whilst this is in part due to the contacts made by an ex-deputy head, the whole-school policy on IT has had a significant effect on the dissemination into the curriculum.

Sponsorship and funding issues

4. All projects have relied upon sponsorship funding. This has come from many sources, for example Competitiveness Funding for the London Colleges, SRB funding for the Burnley LIFE project, and Nynex for the Salford GEMISIS project. Normally, funding has been in terms of financial assistance for the purchase of equipment, software, or to help defray the costs of training and management or even the ISDN telephone charges. However, in three projects, the sponsorship has not provided direct finance, but rather equipment, software and connectivity (Salford GEMISIS and Queens' School Link Project) and software (Virtual Workplace).

5. Although it would be incautious to draw conclusions from such a small sample as this, there are interesting observations to be made about the different funding and sponsorship arrangements which have been seen. The Competitiveness Funding (CF) arrangements have been responsible for the initiatives which have occurred in the London Colleges Project and, indeed, it is through this fund that many thousands of pounds have been spent. However, the Colleges do not know how much they will receive for their projects from one year to the next. They each have to bid for finance, with each bid carefully evaluated, before funds are ultimately allocated on decisions made by the CF board. Thus, colleges may receive only a small proportion of the funds they wish to spend and, whilst this procedure may make sound financial sense in terms of supporting approved bids only on a yearly basis, it does not help with long-term planning since there is no guarantee that an initiative, once started, will be subsequently supported. This procedure encourages a short-term attitude to project development as has been exemplified in the London Colleges project. Indeed, many of the staff who were interviewed, whilst acknowledging the need for financial constraints, felt that such a method of funding often led to decisions being made on a 'quick-win' basis, and precluded longer-term strategies being employed.

6. In the projects where financial help has been provided by the sponsors, there has been little to no concern expressed over such arrangements. Provided the

initial costings were done effectively, all such projects have been adequately funded. However, it must be noted that such funding often expected project managers to undertake their additional tasks without any form of extra remuneration, for example the director of the Burnley LIFE project continued in her existing post without any allowance made for her own time which was used to both manage the project and to produce the termly newsletter.

7. The effects on the projects of sponsors providing the equipment and software have been mixed. At Queens' School, this procedure has worked well, thanks to the excellent interpersonal skills of the sponsor's representative, who is always in the school, and the careful delineation and acceptance of contractual responsibilities by both school and sponsor. With the Salford GEMISIS project, this form of sponsorship has been less successful, chiefly since it has depended entirely on the prioritisation given to the project by a large multinational organisation. With the Virtual Workplace Project, a sponsor has been responsible for the production of the project software and, to date, this arrangement appears to have been successful but, once again, the project outcomes are vulnerable and dependent upon the efforts of a sponsor whose current interests and priorities may lie elsewhere. This form of sponsorship can work very effectively and, in the process, develop strong links between organisations, but when it is applied there must be clear and accepted responsibilities, so that the project outcomes are realisable within the time-scale of the project, together with an assurance that the sponsor will continue to be involved throughout the lifetime of the project.

Projects with community links

8. Several of the Group B projects have specifically targeted the local communities for the development of IT skills. For FE institutions, this is the traditional way in which their recruitment is obtained, and it is not surprising that many of the London colleges have shown commendable initiative in providing courses for the local community, which range from the development of specific IT skills for local-industry employees to IT courses for the unemployed, for example those of City and Islington College, and Kingsway College. For schools, it is a more novel venture and, in the projects where this has occurred, it has been particularly successful.

9. Another project which has developed strong community links is the one located at Queens' School, where it is the sponsor of the project who, essentially as a method of generating finance, has run IT courses for the local community and industry.

Project links with industry and commerce for the development and delivery of courseware

10. As with establishing links with the local community, one would expect the FE institutions to be at the forefront in developing courseware for local industrial and commercial organisations. The extent of these activities is indicated especially in the reports on the London Colleges, where there has been extensive software development, primarily CD-ROM based, but specifically targeted at industry and Small and Medium-sized Enterprises (SMEs), for example by Carshalton College and Woolwich College. Such courseware production cannot be undertaken without a comprehensive staff-development programme because it is the academic staff, assisted by the technical experts, who are ultimately responsible for the learning materials.

11. The Virtual Workplace Project provides an interesting example of where it is the industrial partner, Royal Mail, rather than the academic institution which is providing the learning materials. Such partnerships can help to strengthen the links between industry, commerce and training; a vocational partnership which is so necessary in a rapidly-changing world where the relevance and context of the courseware is so important.

12. The production of good, computer-based learning materials should not be undertaken without significant thought being given to the dissemination and maintenance of the software once the trialling and evaluation is complete. It is a conservative estimate that there is a 300:1 ratio in terms of production time to usage time for CD-ROM software and that occurs when the materials are being developed by professional programmers. The economic viability of this activity is uncertain and it would be a considerable waste of resources if the expertise gained by many of the institutions involved in the London Colleges Initiative was not disseminated to a wider public.

13. The production and dissemination of software also raises the issue of copyright, and the payment of royalties to the software producers, for example the distribution of software from a central server, from the Internet and from a software library to other institutions which do not possess a licence for the software which is being used.

Connectivity and technical issues

14. The majority of the projects involved in the Group B evaluation have been affected by connectivity problems which have caused disruption to varying degrees.

15. Perhaps the least affected project has been that at Monkseaton School, the Students Across Europe Project. Here, there were no compatibility problems with hardware, since the schools in Lille and Hamburg had been provided with identical equipment to that used at Monkseaton School. Consequently, the full range of video-conferencing facilities was always available to the schools. The only difficulty arose when the fault count on the ISDN line exceeded the default setting and caused the line to be dropped, a matter which was soon rectified by BT.

16. Many problems were experienced in the other projects and we highlight a selection of these below:

    a) The four Hertfordshire schools had been provided with ISDN connectivity as part of their Internet project. Three of the schools reported problems over connectivity with their Internet provider, BT Campus World, through the trial ISDN connection and particularly when, in the case of the secondary schools, connectivity via the school's existing network was attempted. There were prolonged periods when connectivity was not possible and, indeed, during the course of the evaluation visits there was only one school at which the Internet connection was seen to be fully operational. Difficulties such as these preclude many interesting applications of IT in the curriculum and often serve to reduce the enthusiam of staff to embrace the technology, as well as providing the reluctant teacher with justifiable reasons for not becoming involved with proposed initiatives.

b) The schools in the Furness Highway project used 14.4Kbps modems for their connectivity to the Internet. This, coupled with relatively slow serial-port speeds on their PCs, made the process of downloading information from the Internet a tedious activity.

c) The two Salford schools involved in the GEMISIS project were able to video conference only with each other since there was no connectivity beyond the NYNEX cable network.

17. The projects which used video-conferencing equipment could video conference fully only with others who had identical equipment since there was, as yet, no universal adherence to the video-conferencing standards. All equipment was compatible with the H320 standard for visual telephony and, consequently, speech and visual images were transmitted, but the difficulties arose with the other standards, such as T120, whereby, unless both sets of equipment adhered to this standard, other facilities, such as text-talk, whiteboarding and shared applications, were not available.

18. Discussion so far on this topic has indicated the many problems which have arisen. However, it should be noted, in all fairness, that this was not a major issue for several projects and there were examples, particularly with the London colleges, where excellent connectivity had been achieved and from which significant developments had taken place. One such example is with the colleges in the Central London Consortium, which, with the co-operation of the University of London Computing Centre, BT and cable providers, had established a 2Mbps LAN with connectivity to JANET. This had meant that the colleges in this consortium could enjoy many of the benefits associated with more prestigious academic institutions. Also of significant and unique interest, as far as this evaluation is concerned, is the use of radio for establishing connectivity, as described in the report for the College of North East London (see Report B2.5.72).

Use of the superhighways for pupils with special needs

19. There have been several instances in the Group B projects where the requirements of pupils with special needs have been of particular importance. At Kingsway College, an EU-funded programme enables 14 adults with various severe disabilities (cerebral palsy, spinal injury, etc.) to be provided with a PC and to work from home, accessing learning materials provided by the college on the Internet, and to communicate with each other and their tutors via e-mail.

20. The George Hastwell School (Furness Highway Project) is a special school on Walney Island, off the Furness coast of Cumbria, which uses e-mail to communicate with many other schools all over the world. They have found that communication via e-mail is non-threatening. For a disabled pupil it is particularly important that the contents of the communication can be produced off line so no one is aware of the length of time or the difficulties which have been experienced in the production process.

21. At Burnley College, video conferencing has been used by a deaf student to communicate with deaf students at other colleges. Communication through sign language, whiteboarding and text-talk is a particular strength of this medium and helps to broaden the horizons of people with disabilities such as profound deafness.

22. At both schools involved in the Salford GEMISIS project, OILS materials, delivered from a central server housed at Salford University, were being used extensively for pupils with special needs. These four examples of usage give an indication of the benefits that the use of Superhighways technology can bring to support the learning of pupils who have special educational needs. The term 'special educational needs' includes learners with a wide variety of requirements, and the very nature of communications technology can assist in meeting these individual needs by giving greater access to human and material resources.

Staff-development models

23. The overall emphasis on staff development has been variable. Generally, the FE colleges had all set up programmes to develop the experience and expertise of their staff in IT. At Southgate College, training targets had been set and the whole process carefully monitored. At City of Westminster College, there was staff training available on the Internet and for those colleges (particularly in the North London Consortium) involved in the production of CD-ROM learning materials, a very comprehensive staff-development programme had been instigated.

24. The picture from schools was less clear. Although in all projects there was some measure of staff development, the content of the courses was, in several cases, disappointing in that the emphasis had been placed on a mastery of the technical aspects of the hardware, rather than on examining the curriculum applications. To some extent this is understandable, since at the time of the projects there was very little informed opinion as to what should be appropriate curriculum applications, but, when this is the case, there should be mechanisms in place so that experiences can be shared and, more importantly, developments monitored. The most effective staff development programmes encompass four elements: familiarity with hardware, general use of the software, examination of the potential curricular uses of the new technology, and practical support during the use of these curriculum applications with pupils. Too often, a staff development programme would focus on the first two elements, or merely touch upon the curricular applications and not provide the strong curricular focus required both to alert teachers and tutors to the potential in their area of specialism, and to assist in supporting such use in the initial stages. Any programme of staff development needs to cover not only curriculum uses and integration into the course but also the pedagogical or methodological approaches involved. The actual timing of the staff development is also important, since there is little to be gained from stimulating enthusiasm and developing the expertise of teachers by courses only for a long time-lag before the hardware or reliable connectivity is present, thus preventing or delaying initiatives in the classroom. Staff development programmes should ideally feed directly and immediately into the practical use of the skills acquired in order to consolidate the progress made. Staff development is crucial to the success of projects, and when they are conceived, appropriate time should be budgeted and allocated to this aspect of a project programme. The careful scheduling, provision and monitoring of suitable staff development with a curriculum focus must be regarded as a key management issue. Ongoing curricular support should also be available to maintain and develop progress.

Equipment location, access and availability

25. This is an issue which is more appropriate to the school-based projects than to the FE ones, since FE institutions appeared to have networked access to CD-ROM libraries and also to the Internet.

26. The locations chosen by the schools were of three types:

    a) a resource centre, such as the school library

    b) a classroom

    c) a specially-designed area in, or close to, a particular curriculum suite of classrooms.

    Schools generally had between one and three items of equipment connected to the broadband/intermediate-band communication network and, consequently, any usage was restricted to individual or small-group working. This forced particular organisational frameworks on the teaching, as, to provide appropriate access, pupils would be withdrawn from class, and would work at the machines either individually or in a small groups of two to three. Alternatively, pupils would be allowed access during their free periods or lunch-times. Withdrawing pupils from class produced supervision problems, unless the equipment was already in the same room as the lesson was taking place. Thus, placing the hardware in the library, whilst overcoming the problem of room booking, did require a member of staff (or ancillary staff) to be present, in addition to the teacher of the class. When the hardware was located in an existing heavily-used classroom, normally an IT room, then arrangements had to be made for pupils to enter the room whilst another lesson was under way, consequently there would be the inevitable disruption to a lesson caused by a succession of pupils coming to work on the computers. One solution, which was noted at Little Hulton School in the Salford GEMISIS Project, was for an existing classroom to be modestly refurbished and then to act as a classroom dedicated to IT, housing the video-conferencing and Internet hardware. This classroom was little-used for other curriculum purposes and, consequently, there were no problems over disruptive room changes. However, it did mean that supervision was always necessary. At Northgate JMI School in the Hertfordshire Students as Writers Project, parent helpers had been recruited and trained to help pupils with their IT work, and particularly with the use of the Internet. The arrangements at Monkseaton School (Students Across Europe Project) were particularly effective. The video-conferencing equipment was located close to the Modern Languages area and was available at all times by the students who, being sixth formers, were allowed unsupervised access.

27. Of course, any of the above arrangements will not suit all teachers since, ideally, video-conferencing and Internet access should be readily available to all staff who require it and, whilst many staff were prepared to entertain the necessary inconvenience of effecting room changes and accommodating their colleagues' requests for help, others were less inclined, with a consequent impact on the use of the equipment. Schools were not designed to be responsive to the demands of the new technology and existing accommodation had to be adapted for this purpose; the dilemma appeared to be whether to prioritise access or supervision within the existing constraints of the buildings. The experiences of the different schools involved in the Group B projects indicate the degrees of success of the decisions made and the consequences to the cross-curricular applications.

Cost issues

28. Rigorous cost-benefit analysis has not been easy to apply to the Group B projects since, for all of them, there were no clear indications of any cost savings which have occurred. Benefits have been largely in terms of curriculum enhancement: improvement of access for students (for example disabled students at Kingsway College London; improvement in attitudes and enthusiasm (Hertfordshire projects), development of technical skills (Telematics Certificate, Burnley LIFE Project) and improved performance levels (Modern Foreign Languages, Students Across Europe project). It is difficult to quantify in strictly financial terms such individual benefits, let alone the vast developments which have occurred in terms of IT skills amongst the staff, students and pupils who have been involved.

29. What is of concern is the running costs of a project when it has been fully integrated into the curriculum, as is the case at Monkseaton Community High School (Students Across Europe Project). Here the telephone charges and ISDN line rentals amount to over £6,000 per year for video conferencing between the school and its partner schools in Lille and Hamburg. These are costs which are incurred for a relatively modest operation by one department at the school for the benefit of a small group of pupils who are studying modern languages. The benefits, in terms of motivation, language development, cultural understanding and raised profile of the school, are clear, but Monkseaton School has received financial help from sponsors. Many schools would not be so fortunate and would then face a difficult decision concerning the cost/benefits (not counting the initial start-up expenditure) of supporting a similar project, when compared with the costs of employing a language assistant.

30. In the Burnley LIFE Project, only modest benefits have occurred at the schools, and there has been little curriculum enhancement through video conferencing to report, but the initiative of providing a Telematics Certificate as an indication of competency in the use of the broadband technology has been a tremendous success. The College is now able to franchise its Telematics course to many other institutions, as well as offering it to almost all of the students who enrol at the College. All of this has had a significant effect on raising the profile of the College and on enrolment, particularly from students who have previously attended the schools involved in the project.

31. The arguments illustrated by the above examples apply to all projects and there is no clear-cut answer to the cost/benefit equation. Indeed, the actual benefits which have arisen from the projects are often difficult to quantify. All of the projects, to a greater or lesser degree, have shown measurable benefits, but whether or not these justify the costs incurred is essentially a matter of individual opinion. What is notable, though, is that some teaching staff are clearly so convinced of the benefits to learning that they are prepared to commit much additional energy and time to the development of the use of the technology.

Teaching and learning

32. Perhaps the greatest impact of the projects has been on the teaching and learning which has resulted from the applications of the technology, and it is difficult to do adequate justice in this section to the wealth of classroom and workshop activities which have been observed during the course of the evaluation.

33. Of particular note is the way in which video conferencing has been integrated into the curriculum at Monkseaton School (Students Across Europe Project). It is the only school project in Group B where video conferencing has developed to become a regular timetabled activity. Its effect on the pupils has been marked, in that, through video conferencing, the pupils' self-confidence in communication, motivation, linguistic and cultural understanding of other countries, as well as their actual examination performance in language, has improved. This project has not involved the development of innovative teaching skills, since it was a pupil-pupil activity which did not directly involve teachers; however, it has demanded of the pupils a new way of working and learning. This is a very carefully-organised curriculum innovation and the preparatory planning needed to ensure success should not be under-estimated, both from the viewpoint of the technology and organisation involved, as well as the selection and monitoring of discussion topics.

34. The impact of video conferencing on the curriculum of other project schools has been less marked and, generally, has been of an ad-hoc nature. Apart from the organisational difficulties resulting from the location of equipment within a school, schools have reported that they have no access to a video-conferencing directory and consequently do not know whom to contact. Timetable mismatches between institutions often preclude projects from being undertaken and there is a perceived lack of understanding as to the purposes of this technology. Video conferencing (with the equipment used in the projects) is essentially an activity for individuals or small groups of pupils, and the experiments which were undertaken in the two GEMISIS project schools have highlighted the difficulties which are encountered when larger class groups are involved. The teaching and learning styles are effectively determined by the technology available, and this has resulted in small-group usage where pupils are withdrawn from a class. Consequently, the activity has to be organised on a rota basis to ensure that all pupils are involved. This form of lesson organisation has not prevented interesting applications occurring, for example Design and Build projects using video conferencing between North Cumbria Technology College and a technology equipment manufacturer; and collaboration between two Cumbria schools on a technology project and collaboration between schools for a geography project in the Carlisle Schools Video-Conferencing Project.

35. Apart from the Students Across Europe and the GEMISIS projects, no attempts have been made to measure learning/performance gains which have resulted from video-conferencing activities. The other projects in which it has occurred have reported increased enthusiasm and the development of technical skills amongst the pupils. Video conferencing is an activity which appears to have quite significant potential in many curriculum areas, as well as for assessment purposes, for example Assessment of the NVQ Tourism Course at Burnley College. We have seen from the projects which are currently under way, along with those which are proposed, for example for History and Law at North Cumbria Technical College, that it can help to develop many different skills amongst our pupils. However, it is not an activity which can be undertaken without careful planning and co-operation.

36. Some of the issues which have determined the modes of usage of video conferencing have also been present in the use of the Internet, where similarly-placed equipment has precluded anything other than individual or small-scale usage. Teachers have responded to these constraints by adopting project-based groupwork, or even utilising free time for the pupils to download the results of their searches. Generally, integration of Internet

resources into the curriculum has been more successful than with video conferencing as WWW is asynchronous and does not necessarily involve a partner institution. There does not, therefore, have to be the same degree of organisational forward planning with the matching of timetables and synchronizing of curricular topics. The Internet can be readily accessed, providing that the connectivity is reliable. Teachers have responded in different ways to using Internet-based materials in their lessons. Some have used supervised on-line access, with the pupils conducting their own searches, others have downloaded information for their pupils. Many schools have designed their own WWW pages and this has become an accepted activity linking different curriculum areas of a school. In some cases, the pupils themselves have been involved in all stages of the development, acquiring a wide range of technical skills in the process, whereas other schools have left Web-page construction to a member of staff. Applications involving the Internet have been particularly emphasised in the FE Colleges, and some have placed aspects of their courses on the Internet, for example Burnley College for the Telematics Certificate, and Kingsway College for work with disabled students. The City of Westminster College has used the Internet to provide up-to-date training for students studying for their Advanced level GNVQ in Travel and Tourism, and several colleges have developed courses specifically targeted at Web-site production for SMEs and local industry, thus showing an admirably quick response to perceived needs of industry and commerce.

37. It is to be noted that FE Colleges do not suffer the accessibility problems experienced by the schools, since all have networked access to the Internet and, consequently, integration of such facilities is relatively easy when compared with the difficulties found in the schools.

38. Schools with broadband connectivity (that is cable) to the Internet have used the facility on line and have experienced few problems related to speed of access except, of course, difficulties associated with the volume of traffic on the Internet; however, schools with modem access have been particularly disappointed with search and download speeds, and so have attempted to circumvent the problems by downloading materials outside lesson times or, in some cases, have ceased to use the facility. The Internet does offer tremendous resources for a school, as there is a wealth of material which is directly relevant to the curriculum which can be used. It is, however, important that appropriate accessibility is made available within schools and that technological problems which are experienced are soon eradicated. To some extent, this will happen as usage becomes more widespread and the technology becomes more reliable.

39. Issues concerned with accessing undesirable Internet pages have not been a significant problem with the Group B projects. There has been only one reported instance of this occurring in a school and the supervisory arrangements were immediately tightened to prevent any further occurrences. Generally, schools have either used proprietary firewalls to help prevent access to these sites, or permitted only supervised access to the Internet.

40. In terms of curriculum applications, e-mail has featured in only one of the Group B projects at George Hastwell Special School (Furness Highways Project). Here, it has been a particularly valuable curriculum resource with pupils with special needs able to produce their work off line, often taking many hours over the process, before sending their messages to other schools all over the world. This has added quite significantly to the pupils' experiences, as well as to their motivation. The effect on their own curriculum

from receiving messages and information from other countries has been particularly welcome.

41. The use of CD-ROMs has been a feature of the work of the London FE Colleges, as well as at Queens' School, which is described in the Link Project report. In the Salford GEMISIS project, the CD-ROMs are held on a central server at Salford University and distributed to the school over the broadband cable. This has been a successful operation in terms of overcoming the technological difficulties, and both schools involved in the project have been quick to use OILS materials with their pupils as a result. Once again, restrictions on the availability of hardware have prevented whole-class usage, and usage has been restricted to small groups, thus forcing a particular classroom management style to be adopted. Although the materials were developed for whole-class usage, staff at the schools have welcomed the opportunity to use the materials in this way, by withdrawing pupils from the classes, and feel that, even if more access were provided, this would be their preferred mode of use, ideally with access being provided in the subject areas rather than in a designated room.

Future developments

Future developments in the Group B projects

42. Only two of the Group B projects (Furness Highway and Queens' School Link Project) have reached the final stage of development. Others have been extended or are in the process of developing into new projects, often depending extensively on the experiences gained during the course of the evaluation. Of particular interest for the future will be to see how the Students Across Europe Project develops the use of video conferencing across the curriculum and into the pre-sixth-form work. The Carlisle Schools project at NCTC has some particularly interesting ideas for the use of video conferencing with local SMEs and collaborative projects with the USA and Dixons CTC in Bradford. The mixture of primary and secondary schools in the Hertfordshire 'Students as Writers' project should soon be producing resource materials for the Internet. The schools in the Salford GEMISIS project will have reliable broadband connectivity and, hopefully, video conferencing beyond the confines of the NYNEX cable network and, consequently, there should be many exciting curriculum developments in that project before it is extended to include other Salford schools. The Virtual Workplace Project should start the trialling of its materials and, with the collaboration of other industrial sponsors, the widening of its materials base so that eventually there will be a substantial resource of relevant material for use on the GNVQ A-Level IT course. The London Colleges initiatives has already produced significant applications of IT in courses and it is now appropriate that the work should be shared amongst a wider community, particularly within other consortia, which will then benefit from the expertise of colleagues in the pilot institutions.

Directions for suppliers/sponsors

43. It is important to note that the technology does not come free-of-charge, that every project in this evaluation has received financial support from sponsors in one form or another and that, to ensure continued applications, appropriate funding is required. Sponsors have become an essential feature of our educational system and, whilst there are possible inherent difficulties associated with sponsorship (see the National Consumer Council publication *Sponsorship in Schools*), nevertheless, the use of sponsors in providing initiative funding has helped considerably with all the Group B projects. That

sponsor funding of education continues is vital, since it provides finance which enables initiatives to take place and, consequently, helps to develop the IT skills of the pupils in schools and the students in the FE colleges, as well as those of the local community. All this is beneficial to the country as a whole and, at the same time, helps to forge links between aspects of the academic world and the world of work. There have been several instances in the evaluation, particularly at FE institutions, where there have been commendable links with industry, both with producing courses and involving industry in the development of course materials, a method of courseware design which ensures up-to-date, relevant, contextualised learning - so essential in a rapidly-changing world.

Directions for Education Services

44. The success and impact of the Link Centre at Queens' school has been marked and indicates what can be achieved in a short time through the use of sponsorship and the provision of a managed resource within a school. The model used at this school, whilst not replicable throughout the country, does have aspects which clearly are replicable, such as the provision of a resource manager who, whilst having no direct responsibilities for the pedagogical uses of the resources within the school curriculum, does provide continual staff support and also the opportunity for the school to make its resources available to the community.

45. The new technology has benefited not only the schools and institutions which have been involved in the projects but has, in several cases, also benefited the local community, and there are now many examples of where access to learning, which may previously have been denied or at the very least difficult to obtain, has been developed through applications of the new technology. Thus, the new technology (chiefly video conferencing and the Internet) has been the vehicle for developing new ways of teaching and learning, many of which have been seen within these projects.

46. The potential of the information superhighway for learning is clear from the Group B projects which have been evaluated. The full realisation of this potential is, however, dependent upon the reliability and accessibility of the technology at the point of contact, that is the learner, since we have seen how, given appropriate support and enthusiasm, new resources such as video conferencing and the Internet can be integrated into the curriculum.

47. In order to make the best use of the technology, there should be clear aims and purposes behind the activities that are based on suitable curriculum applications, that is curriculum rather than technology-led. The utilisation of the technology is in the hands of the educators, many of whom, as we have noted, have been reluctant, often for good reasons (particularly concerning accessibility and reliability), to become involved. Thus, although the potential of the superhighways in teaching and learning has been demonstrated, the benefits will depend, particularly in schools, on effective staff-development programmes being in place.