Education Departments' Superhighways Initiative

Group S: Curriculum Projects in Scotland

Final Report

Scottish Council for Research in Education

John Hall, Joanna McPake, Bridget Somekh

THE EVALUATION

1.   This report describes the findings of an evaluation carried out by the Scottish Council for Research in Education (SCRE) of two Scottish projects included in the four UK Education Departments' Superhighways Initiative (EDSI). The two projects were *Modern communications for teaching and learning in Argyll and Bute* and *Superhighways Teams Across Rural Schools (STARS).* The evaluation was managed by the Scottish Council for Educational Technology (SCET) for the Scottish Office Education and Industry Department (SOEID), and ran from January 1996 to March 1997.

2.   We wish to acknowledge the help and co-operation of a number of people: in particular, the project co-ordinators and all the teachers in Argyll and Bute and in the STARS project who spent a considerable amount of time answering our questions and explaining their uses of electronic communications. We would also like to thank our advisory committee for sharing their expertise and ideas with us.

3.   We are grateful to Bob Munro of Strathclyde University, consultant to the project, who provided technical expertise and also undertook some of the fieldwork. We also thank our secretary, Kay Young, for her support and expertise.

Section 2

Project Information

1. MODERN COMMUNICATIONS FOR TEACHING AND LEARNING IN ARGYLL AND BUTE

Description of project

1.1 Modern communications for teaching and learning in Argyll and Bute is an authority-wide project designed to take advantage of modern communications technologies to enhance opportunities for teaching and learning. There is continuous extension and expansion of the use of modern communications through a clear strategy of research and development by the Educational Development and Support Unit (EDSU) prior to its introduction in to the educational system. Teachers and pupils are active users of a wide range of communications systems, including video conferencing, electronic mail, and conferencing via Argyll Online, a FirstClass™ based conference system. They also make extensive use of fax machines and telephones. The project has explored the use of electronic communications in three areas: curriculum development, staff development, and school management. It represents the integrated development and use of an electronic communications network throughout an education authority.

1.2 The project involves all primary and secondary schools in Argyll and Bute in a variety of ways. Because of the size and complexity of the project, the evaluation focused on a range of initiatives in two co-operatives, formed by networks of primary schools within a defined geographical area, linked for the purpose of staff and curriculum development, school management and more cost-effective resourcing through group purchasing. The two co-operatives chosen to participate in the evaluation, North Lorn, and Mull and Iona, were identified by the project co-ordinator as being in the vanguard of development.

1.3 The project has been running for four years. Much initially experimental work has now become established practice. For example, the telephone, fax machine and e-mail are now standard classroom tools for both teachers and pupils in many primary schools. Other initiatives have followed and are at varying stages of trial, implementation, evaluation and adoption (or rejection).

1.4 As schools and co-operatives become more confident in the tools available, they are independently exploring new initiatives. The best practice is recorded by EDSU and incorporated either through staff development or user groups via Argyll Online.

1.5 These independent initiatives are regarded by the Authority as examples of modern communications used as effective educational tools. The growth of peer-group interaction between distant schools is also recognised as overcoming the problems of isolation experienced in such schools.

1.6 The Authority has a clear vision of integrating modern communications within the educational system both for teaching and learning and for management of the education system. Their strategy follows the pattern of research and development of

new modern communications initiatives within pilot co-operatives before introducing new elements to others. Co-operatives are not forced to take part, but have to bid to join any new initiative or development. A pre-requisite for acceptance is commitment to essential staff development and resourcing.

1.7   This report focuses on the principal initiatives under way during the evaluation period. Some of these are basic, ongoing activities. These include:

- integration of electronic communications into the curriculum

- development of pupil skills in the use of electronic communications

- development of teacher skills in the use of electronic communications.

1.8   Experimental work exploring new applications or developing expertise includes:

- electronic conferencing for headteachers, using the range of equipment, including video-conferencing

- distant specialist art teaching, using video conferencing and Argyll Online.

1.9   There are parallel initiatives which impinge on the use of electronic communications. These relate principally to development strategies within schools or across the Authority and include:

- pupil-determined target-setting and support for pupil autonomy

- the continuing refinement of the co-operative concept.

1.10   Examples will be referred to in this report. These are not discrete developments but form part of a well co-ordinated strategy to ensure effective communications within an authority with a large number of small and isolated schools and to overcome the problems of remoteness. This is particularly relevant to staff development. There are no universities or colleges of education in Argyll and Bute, and there has been little local opportunity for further academic development for teachers. It is therefore seen as essential that all staff have access to authority-based provision for professional development. Individual elements in the overall strategy need to be understood as part of this whole.

Sponsors

1.11   British Telecom (BT) has supported the introduction of video conferencing in Argyll and Bute and the development of software appropriate for children to use with the video-conferencing unit. The company has also supported experimental practices such as headteachers' electronic conferencing, and the integration of electronic communications across the curriculum. Teachers in Argyll and Bute, along with Strathclyde University Faculty of Education, are currently funded by British Telecom to develop materials exploiting electronic communications for core curricular areas in the context of the two current major curriculum initiatives in Scotland, *5-14* and *Higher Still*. The basis of BT's sponsorship is that ideas and practice developed by the Authority are transferable to other authorities and may have the potential for marketing in an education and business context.

Size and type of institution

1.12   The project covers all primary and secondary schools in Argyll and Bute. There are in all 88 primary schools in the Authority, comprising 7835 pupils and 491 teachers. These schools are grouped in 22 co-operatives. There are 10 secondary schools, with 5670 pupils and 449 teachers. Because of the scope of the project, it was not possible for the evaluators to explore all aspects of the work in detail, and the evaluation has therefore focused on two primary co-operatives, North Lorn, and Mull and Iona. There are five primary schools in the North Lorn co-operative, with

14.6 (FTE) teachers and 201 pupils; and seven schools in Mull and Iona, with 19.9 (FTE) teachers and 228 pupils.

Hardware and software

1.13   All schools in Argyll and Bute were supplied with Macintosh equipment in 1992, and ClarisWorks was chosen as the standard 'content free' software tool. Currently, all schools have a range of Macintosh equipment, with a minimum standard of Apple Macintosh LC475 running System 7.1, with external CD-ROM, LaserWriter and modem.

1.14   E-mail has been in use since 1993, originally through Campus 2000, but subsequently through Argyll Online. Schools also have access to the Internet via Campus World.

1.15   For video conferencing, the project co-ordinators concluded that, at that time, IBM PC based solutions were more widely available and cost-effective than those available for Macintosh. It was also decided that having both computer platforms within classes would not compromise learning. Consequently, they adopted the PC-based VC8000 system for Argyll and Bute schools. Introduction of the VC8000s to schools is following BT's ISDN2 roll out. There are currently 40 VC8000 machines across the Authority.

1.16   In addition, 69 of the 88 primary schools have fax machines.

External connectivity

1.17   The principal focus of the project has been to develop a communications network for the Authority and thus a closed conference system was thought to be the most appropriate system to adopt. The evaluators believe it is significant that Argyll and Bute schools make little or no use of the Internet despite access through Campus World. The view of the Authority's education and development officers is that conventional dial-up access is slow and erratic, and consequently expensive. Access is, however, under constant review. Faster access could be provided through ISDN2 and the Authority is currently exploring this. Development of higher speed modems, lowering on-line times and costs might also increase the practical use of the Net. Schools in the area are thus doubly disadvantaged in terms of access to information because, as small schools, they have limited library budgets and there are few public libraries in rural areas. Lack of access to the Internet consequently compounds the already disadvantaged position of rural schools in relation to access to information.

Participants in the evaluation

1.18   The evaluation has been based largely on work in two primary co-operatives in Argyll and Bute, North Lorn, and Mull and Iona. Each co-operative has a co-ordinator with responsibility for liaison between schools and the development service/Education Department. Co-ordinators are also headteachers in their own schools and have a teaching role as well, therefore they understand what can be achieved and what is impractical. There is a co-operative management committee comprised of the headteachers from each school, responsible for management issues affecting all the schools in the co-operative, and, consequently, for decisions relating to the ways in which electronic communications will be used.

1.19   Experience of staff in the use of electronic communications varies, but those who have been working in the Authority since introduction of the technology have had

both training and considerable 'hands-on' experience. Currently, the Authority is exploring the particular needs of specialist teachers and the potential benefits of involving them in distance learning using electronic communications.

Aims of the project

1.20   The overall aim of the project is to develop an electronic network to which all schools in Argyll and Bute will have access.

1.21   The specific aims are:

- development of an effective communications policy and strategy within an educational context
- curriculum enhancement
- staff development in technology
- interactive teaching and learning
- enhanced personal and social development.

Outcomes

1.22   The project is long term and it is not expected that these goals will be fully achieved in the course of the evaluation. Nevertheless, the evaluators have noted considerable development in all of the areas listed above over the past year. Developments under each heading are summarised below.

Development of an effective communications policy and strategy

1.23   An effective communications policy is now well established in Argyll and Bute. The principal focus of the policy is to develop and maintain an electronic communications network which will have a wide range of educational benefits for schools across the Authority and particularly those in isolated rural areas (the majority of the LEA's schools). Such benefits are expected to include enhancement of the curriculum and of teaching and learning, specific gains in IT skills, increased opportunities for staff development, efficiency gains in relation to school management, and increased contact with the wider community beyond Argyll and Bute.

1.24   A range of strategies has been devised to implement the policy. There is strong support at senior management level, and control of the development of the network by EDSU officers. An experimental approach whereby initiatives are introduced gradually, to one area at a time, enables officers to plan, monitor and evaluate developments effectively and ensure that changes affect a limited number of people at a time. Training is also delivered in stages, corresponding to the introduction of new technologies or applications. This staggered approach has considerable scope for adaptations of the technology to suit local needs and interests. A key feature of the implementation strategy is support for independent initiatives generated by users, at the same time as maintaining forward planning for the network as a whole.

Curriculum enhancement

1.25   The electronic communications network in Argyll and Bute has increased pupils' access to information and ideas beyond their own schools, and extended opportunities for learning. It has enabled teachers to share methods and materials on both an informal and a formal basis and has led to joint initiatives which would have been difficult or impossible to undertake in the past. In particular, it has facilitated a co-ordinated approach to national curricular developments and the involvement of

external expertise which would previously have been extremely difficult to co-ordinate and sustain over time.

Staff development in technology

1.26   Most staff are confident in using the equipment available and make frequent use of it. There are variations in individual teachers' skills but a common standard of competence has been established by ensuring basic training for all. A particular focus of recent work has been in exploring appropriate use of the technology in the context of daily work and establishing how and where to integrate electronic communications across the curriculum.

Interactive teaching and learning

1.27   A large number of collaborative initiatives have been set up, involving specialist teachers, and teachers and pupils from several schools working together. Some of these have been developed formally as discrete curricular initiatives. Others operate informally. In some schools, collaboration is now a way of life rather than a special event. Recent work in the North Lorn co-operative has focused on strengthening mechanisms which make this possible, such as the devising of an agreed video-conferencing timetable across the co-operative, and there are currently moves to develop a common timetable for all North Lorn primary schools in order to facilitate pupils' collaborative work. The fundamental importance of the co-operative as an 'electronic community' should be noted here.

Enhanced personal and social development

1.28   This aspect of the project permeates all initiatives rather than being a specific focus. Increasing pupils' opportunities to communicate with others has beneficial effects on their personal and social development; as well as the specific educational benefits, pupils also become more competent in expressing themselves orally or in writing and more confident in discussing their ideas with others. Lack of opportunities for pupils to do this has been a particular concern of teachers in rural and isolated schools, as children in these schools can have a limited group of acquaintances and rarely meet outsiders. Teachers have also suffered from isolation, particularly those working in one-teacher schools in remote areas, and the project is also seen as providing opportunities for personal and social contact among teachers.

Evaluation

Project initiation

1.29   The project began in 1993. An intranet service, Argyll Online, was established using FirstClass™. This became part of the schools' Service Level Agreement contract. All schools also have a Campus World account. This is seen as complementary to Argyll Online, though it has not been as successful in engaging teachers' interest.

1.30   Video communication was added in 1994, using Olivetti VC8000 systems. Thanks to sponsorship from British Telecom, EDSU together with Academy Computers, were able to develop a software interface, called SchoolLink, which enabled primary age pupils to use the equipment independently. Sponsors also provided free installation, technical assistance and free line use for an initial period. All schools in the Authority were invited to participate in the video-communication programme. Two co-operatives joined in the first instance (1994): North Lorn, and Mull and Iona. More recently, four other co-operatives have joined the programme.

1.31   A number of initiatives have been devised to support and extend the use of the network, and these are discussed in later paragraphs (see paragraphs 1.50–1.59). While initially teachers appeared to be relatively dependent on such initiatives to promote use of the equipment, they are increasingly developing their own practice.

Training for teachers

Technical training

1.32   Technology has been introduced gradually, one co-operative at a time, with in-service courses in the basic technological skills arranged for all teachers within each co-operative by EDSU. Officers then monitor practice, making adjustments to the equipment and devising additional training as required. Co-operatives which subsequently become involved thus benefit from earlier teachers' experiences.

1.33   Training cards cover everything from how to format disks upwards. Teachers in the North Lorn co-operative perceived a need for written guides explaining how to use the equipment. They have produced training cards for use by staff and pupils, to be distributed to schools in other co-operatives as they become involved.

1.34   The Authority believes that it is undesirable for some teachers to become 'experts' in the use of electronic communications while others fail to become engaged in the work at all. Training ensures that all teachers have reached a level of competence which allows them to use the equipment in a variety of ways in the course of their daily work in the classroom. Some teachers in each co-operative have received additional training to enable them to offer a first line of support if problems arise.

Educational training

1.35   Classroom applications, curriculum support and approaches to teaching and learning have been supported through a series of initiatives. Materials on a range of topics were distributed to schools via Argyll Online. These materials encouraged teachers to consider the value of sharing resources, and to determine the most appropriate ways of doing so. Similarly, an initiative to provide art teaching for pupils via the VC8000 has as its aim not only provision for pupils but also the development of an effective approach to distance learning involving specialist teachers (see paragraphs 1.50–1.59).

1.36   As teachers have become more experienced in using the equipment and in identifying appropriate contexts in which to use it, they have also become more autonomous and less reliant on the stimulus of externally-organised initiatives. While the Authority will continue to promote developments, such as integrating technology into core areas of the *5-14* curriculum, it seems likely that teachers will increasingly make independent use of the technology in the course of their daily work.

Training for Pupils

Technical training

1.37   Technical training for pupils has been carefully integrated with the *5-14* Information Technology curriculum, so that pupils develop skills appropriate to their abilities and understanding over their primary school careers.

1.38   In one co-operative, pupils are first introduced to video communications in Primary 4 (i.e. 8-9 year olds). By this stage, they are already familiar with basic IT skills such as creating and saving documents on disks. Initial sessions focus on familiarising pupils with the experience of talking to pupils in other schools. Two or

more schools in a co-operative agree to work on a similar topic and, in the course of this work, pupils from the various schools talk to each other over the VC8000 about their work, and show drawings and diagrams. In addition to developing the necessary speaking and listening skills, pupils are shown how to handle the camera and how to move between the 'you' and 'me' screens to check that their interlocutors have a good view, either of the speaker or of the drawing or diagram under discussion. Later on, pupils are taught how to work simultaneously on a shared document, so that they can work collaboratively with their counterparts in other schools.

1.39   It is a fundamental tenet that no pupils should come to be technological 'experts' while others fail to use the equipment independently. Pupil use is monitored by teachers to ensure that all have completed the basic training and subsequently, that they build the use of the equipment into their work.

Educational training

1.40   The aim of making electronic communications equipment accessible to pupils is so that they can use it in the course of their work. Pupils are encouraged to consider the appropriateness of different types of equipment for making contact with others outside the school, gathering information and working collaboratively. Schools have a variety of ways of doing this. In one school, where pupils are expected to set their own learning targets, integrating the use of electronic communications technology is a feature of the target setting process. Some projects require pupils from different schools to collaborate extensively and to explore in considerable detail how this can be achieved with the equipment available (see paragraphs 1.50–1.59).

Management strategies

1.41   What is particularly significant about the Argyll and Bute project is the model it offers of an authority-wide integrated communications network. In this section, we highlight the most important factors in its success. These include:

- long-term vision and strong support from the directorate
- centralised control of resources and development
- support of the co-operative structure and consequent sensitivity to local concerns
- high level of commitment from staff.

Support at directorate level

1.42   An important factor in the development of the project has been the role of the former Assistant Director of Education, under whom it was initiated, and of the present incumbent, under whom it continues. Their philosophy has been that it is important for teachers in Argyll and Bute schools, and particularly in small and isolated schools, to feel that they have both the autonomy and the support to make their own decisions and that their views are known and respected. The development of an electronic communications network has been seen as an important element supporting the achievement of this ethos in the Division (subsequently the Authority) as was the establishment of co-operative groups of primary schools for curriculum and staff development and school management.

Central control of development

1.43   Central control of development under EDSU has been a key strategy. EDSU officers have been responsible for investigating the technology available and making decisions about what should be acquired.

1.44   EDSU officers have also instigated a rolling programme of implementation whereby trials of experimental technologies or applications are carried out in a limited number of schools. This ensures that major problems are rectified before large numbers of people are inconvenienced and lessons from initial experiences benefit those who join later.

Interlinking of the co-operative structure with electronic communications network

1.45   Although the establishment of the co-operatives pre-dates the introduction of the electronic communications network, the two are now closely linked. The success of the network would undoubtedly have been more difficult to achieve without a pre-existing structure and clear and specific purposes for communication. Conversely, it is questionable whether it would have been possible to sustain the level of joint planning and collaboration which currently exists within co-operatives without the support of electronic communications. Examples of interaction between the two initiatives include:

- co-operative headteachers' meetings via video conferencing

- shared development of curricular materials, principally via Argyll Online

- widespread collaboration on a daily basis among pupils across co-operative schools, using telephone, fax, Argyll Online and video communications as appropriate

- facilitation of co-operative management, principally via Argyll Online and also fax

- collaborative 'bridging' projects designed to support the transference of Primary 7 pupils to secondary school (in most cases, primary schools within one co-operative feed into the same secondary school).

1.46   Co-operative co-ordinators have a key role to play in supporting development within the co-operative, although decisions are usually taken collectively by the headteachers of all the co-operative schools. This structure ensures that there is considerable scope for the use of the network to be tailored to local needs and interests.

Staff commitment

1.47   There is a high level of commitment to the project throughout the Authority, from class teachers and pupils to the Directorate. A measure of this commitment may be gauged from the fact that the originator of both the co-operative concept and of modern electronic communications, a Senior Adviser with the Division, now retired, continues, at no cost, to advise on forward planning and appropriate implementation strategies, as well as to work with EDSU officers in searching the partnership to maintain the momentum of this development.

1.48   The contribution of heads and class teachers to the success of the project has also been considerable. Many initiatives have originated in teachers' recognition of the potential of the network and in their willingness to experiment with new techniques and to evaluate them.

1.49   Teacher-initiated developments include:

- devising approaches for training pupils in the use of equipment

- instigating a monitoring programme to determine the most appropriate and cost-effective equipment to use for communicating in different contexts

- establishing procedures to be followed when equipment breaks down

- devising a co-operative timetable indicating when pupils in each school would be available to work collaboratively.

Implementation at project and institutional levels

1.50   In this section, we describe the initiatives which have contributed to successful outcomes in relation to curriculum enhancement and interactive teaching and learning.

1.51   The communication network is used to support the daily work of the classroom, enhancing the quality of teaching materials and of pupils' work, and improving efficiency. One major initiative is described below. Ongoing classroom work is described later (see paragraphs 1.60–1.77).

Integration of the use of electronic communications in core subject areas

1.52   This work explores the use of electronic communications in the language and maths curricula, identifying points at which pupil collaboration would be beneficial and devising materials to exploit the network. This work is closely tied in with the initiative on the *5-14* curriculum and the post-16 initiative *Higher Still,* and is being developed by primary co-operatives and secondary schools in collaboration with Strathclyde University and British Telecom. The initiative will promote both curriculum and staff development as it will enable staff involved to gain credit for a higher degree through Strathclyde University. Such an opportunity was previously difficult as there is no tertiary education provider based in the Authority.

Interactive teaching and learning

1.53   Three major initiatives explored ways in which the network might support interactive teaching and learning.

Argyll Online curricular activities

1.54   A series of discrete activities were devised by a teacher on secondment. Teachers could choose whether or not to use these. While these activities satisfied their main objective of accelerating use of Argyll Online and engaging pupils and teachers in the kind of activities which might be appropriate in the interactive context, they highlighted the need for a facilitator to make this kind of work successful.

'Bridging' topics

1.55   At least three separate 'bridging' projects designed to support Primary 7 pupils as they make the transition from primary to secondary school have been developed specifically to make use of the possibilities offered by the network. All three projects require pupils to collaborate, initially using the network and subsequently meeting face to face.

1.56   The aim of the projects is to reduce tensions associated with transition to secondary school for pupils unused to large classes and to being part of a relatively anonymous mass. Often, the children go to school some distance from home. 'Bridging' projects aim to enable all Primary 7 pupils within a co-operative to make contact with each other and to work together on a shared task, thus ensuring that they know some of the other pupils when they start at secondary school.

Video-based teaching and learning

1.57   A number of exploratory attempts to develop the potential of the VC8000 for interactive teaching and learning were made in the early years of the project. In the course of the evaluation, a more substantial initiative involving a specialist art

teacher has been developing. This work is aimed at delivering provision to pupils who have had little or no access to specialist art teaching in the past, for geographical reasons, and also at exploring the scope of the equipment and considering ways in which other subject specialists might develop their own interactive approaches.

1.58   The art specialist's early work was experimental. One of the principal findings of the first phase was that the involvement of the class teacher, detailed planning, and a structured approach to consultation, was essential. This has now been incorporated into the programme. The Argyll and Bute project co-ordinator and the art specialist are currently producing a detailed discussion document which will set out the steps which any specialist contemplating this type of work needs to follow.

1.59   This initiative has led to a number of technical developments to enable the art teacher to talk to pupils and look at their work, and at the same time demonstrate techniques. Teachers' and pupils' reactions have been extremely positive, in most cases. Both groups appreciate the quality of the input and the enthusiasm which this generates.

Implementation at classroom level

1.60   The initiative is aiming for long-term, holistic benefits. Evidence of change comes primarily from the perceptions of those involved in the initiative. It was not possible to measure quantitatively such changes in the course of a relatively short evaluation.

Raised standards

1.61   The curriculum has benefited from the introduction of electronic communications, and this may have led to higher standards of knowledge and skills. For example, schools which previously had no access to specialist art teaching now do, and this will undoubtedly have a beneficial effect on children's work.

1.62   Clearly, children's skills in using the technology are also likely to have improved, both because of specific training programmes and because of regular practice.

1.63   The introduction of electronic communications has had an important role to play in supporting pupil autonomy by enabling children to collaborate and to seek information without necessarily involving the teacher.

Increased motivation

1.64   Pupils appear to be highly motivated. However, increasing pupil motivation was not a goal which teachers identified as being a high priority, thus leading the evaluators to assume that it was not perceived as a problem. Teachers did, on occasion, identify individual pupils whose attitudes to learning had changed as a result of their involvement with electronic communications.

1.65   Similarly, schools involved in the distance-learning art project noted a high level of enthusiasm and enjoyment amongst their pupils for the work in which they were engaged. In addition to developing artistic abilities, teachers also saw additional benefits in terms of pupils developing oral skills and confidence in their ability to discuss their ideas with outsiders.

Productivity gains

1.66   The most obvious productivity gains relate to the speed of communication, for both pupils and teachers. The feasibility of collaborative work across schools was low

before the introduction of the electronic communications network because distance and geography meant that face-to-face meetings could occur only rarely. Collaboration was rarely proposed and frustrating to attempt. Yet collaboration with peers is particularly important, as we have noted, for pupils in isolated schools where they may be the only one, or one of a handful of pupils in a particular age group.

1.67   For similar reasons, collaboration among teachers was difficult to achieve. Before the introduction of video conferencing as one of the principal means by which co-operative business was discussed, headteachers in Mull and Iona had to meet face to face on a regular basis, although there were a number of difficulties with travel. The impact of electronic communications in these circumstances should not be underestimated. The opportunity to deal with routine business by fax or e-mail, and the need for strict time-keeping in video conferencing has produced considerable efficiency gains.

Changed teaching styles

1.68   Technology has been integrated into existing practice rather than changing practice to accommodate the technology.

1.69   Nevertheless, there have been developments in teaching and learning. The North Lorn co-operative has been interested in developing autonomous learning and target-setting by pupils. Electronic communications have both benefited from existing practice and strengthened the trend towards pupil autonomy. Opportunities to work collaboratively with pupils from other schools and to seek information from outside sources facilitate pupil autonomy.

Enfranchisement of previously disaffected learners

1.70   Teachers participating in this initiative did not identify poor pupil motivation as a particular problem and pupil disaffection similarly does not appear to have been a major concern.

Learners with special educational needs

1.71   The network has increased access to previously hard-to-track support staff such as educational psychologists, based at Council offices in Dunoon. Video communications can be used both to discuss pupil needs and to put the educational psychologist in touch directly with the pupil concerned. E-mail is more effective than the telephone in ensuring that information or requests reach peripatetic staff, and it enables messages to be sent and dealt with at times convenient to both parties.

1.72   Recently, there has been a move to formalise electronic links with learning support teachers, and it seems likely that they will make use of the approach developed by the art specialist to develop a support programme which makes use of the VC8000. A pilot project is currently under way.

Development of information-handling skills

1.73   Pupils are becoming particularly adept at devising questionnaires and at phrasing requests for information sent to people outside the school. Interpretation of information and presentation is also addressed explicitly through materials developed to support IT in the classroom.

Fundamental new skills

1.74   The specific skills which pupils require are primarily IT-related skills. They need to be relatively proficient at word processing and to be able to complete basic procedures such as saving work on to disk. These skills would, in any case, be developed in the context of the IT curriculum, although it is likely that extensive use of electronic communications in the classroom speeds up their acquisition.

1.75   Video communications require pupils to develop sophisticated skills, both in operating the equipment and in using the conventions of the medium.

1.76   Children and teachers need to become confident in teaching and learning at a distance in relation to each of the available electronic communications media.

Use and relevance of information to the 5-14 initiative

1.77   The development of technical skills required to make use of electronic communications technology has been planned in relation to the *5-14* IT curriculum. A number of initiatives have been developed specifically in relation to core subject areas of *5-14*, such as maths and language. In all cases, teachers' forward planning identifies the links between work which involves electronic communications and the *5-14* curriculum.

Access and equity issues

Benefits and disadvantages for small schools and schools in rural areas

1.78   The goals of the initiative have included:

- ensuring that schools in remote or isolated locations have increased access to information and services, for both academic and administrative purposes

- increasing opportunities for schools to work with specialist teachers

- breaking down isolation by enabling pupils and teachers to collaborate more easily with nearby schools

- supporting contact between pupils in the last year of their primary schools who will be joining the same secondary school and, in cases where island pupils have to attend mainland secondary schools, often boarding together

- enhancing teachers' professional development, in a context where there are no higher education providers of teacher education and where access to teacher centres is limited by distance and geography.

1.79   While all of these goals have, in our view, been achieved, it is important to recognise that the cost of setting up and maintaining the network has been a constant concern for the Authority. Funding is now determined on a per capita basis and this has sharply reduced the funds which small schools have at their disposal once essential costs have been paid.

1.80   In addition, for small schools, relatively minor costs can become prohibitive if care is not taken with decisions about how to spread costs. The Authority has a strategy of using 'co-operative cost centres'. Schools within a co-operative pay into a common IT fund, with each school paying in relative to size. Such factors are of considerable importance for schools with unallocated budgets which are, in some cases, only a few hundred pounds a year. The Authority has been particularly careful to ensure that costs are kept to a minimum by, for example, carrying out an audit of telephone lines and rationalising these so that schools are not paying unnecessary rental charges, but scope is limited and the constant concern that

schools will be forced to opt out of the network to avoid incurring minor (but in their terms crippling) expenses may be detrimental to long-term development.

1.81   The existing network makes little or no use of the Internet. There have been a number of reasons for this. Principally, it seems that EDSU officers have found the level of Internet access available to be both expensive and excessively slow. In their view, the time needed to build up sufficient expertise would be considerable and the expense high. Restrictions to the possible use of the Internet doubly affect small rural schools because their access to more traditional sources of information is similarly restricted.

Implications for learners with special educational needs

1.82   While issues affecting learners with special educational needs have not been a major focus of this initiative, cases where individual pupils have benefited have been mentioned to the evaluators. For example, a pupil with Asperger's syndrome found it difficult to communicate with other people directly as he found it difficult to look people in the eye. He found communication much easier by video as the tendency of each interlocutor is to look at the other on screen, and thus to appear to be looking elsewhere (as the camera is mounted at an angle). As a result, this pupil gained greater confidence in communicating generally.

Gender issues

1.83   Training and monitoring programmes aim to ensure that all pupils have equal access to the equipment and that none come to dominate its use. It is policy not to create 'experts' and 'technophobes' and clearly this has a positive effect on gender equity. Observations bore out the view of teachers that boys and girls make equal use of the equipment.

Services and applications

Principal services and applications in use

1.84   The principal services used by the project are the Authority's own computer-based conference system, using FirstClass™ and Argyll Online; and the VC8000s, using SchoolLink software, developed by the Authority in collaboration with BT and Academy Computers Ltd. A considerable amount of experimentation has been required in order to develop a system which fulfils the particular needs of school-based teaching and learning.

1.85   There have been technical problems both with Argyll Online and with the video-conferencing units on a number of occasions. These have led to the development of procedures for dealing with failure of the equipment. There is a series of help cards beside each machine and a troubleshooting manual which describes ways of dealing with some common problems. Problems which go beyond this manual are now automatically referred to the support service, to avoid teacher time being wasted on this work.

Usage times on and off line

1.86   It was not possible to obtain comprehensive data on usage times and these are likely to vary considerably from school to school, and in relation to the time of year and activities in which schools are involved. Some sample data sets are included here to indicate the range.

Use of e-mail in one co-operative over one year

1.87   The total number of e-mail messages sent over the Mull and Iona co-operative conference site from mid-May 1995 to mid-May 1996 was 103. These were messages to the co-operative as a body, rather than messages between individuals. There were 18 users. Messages fell into the following categories:

Administration of the co-operative	30%
Teaching and learning	15%
Technical matters	14%
Greetings	9%
Research issues	8%
Co-operative development	5%
Staff development	4%
Other	15%

Use of fax in one primary school over one week

1.88   On average, four faxes were sent per day, by pupils and teacher in approximately equal proportions.

Headteachers' use of video conferencing

1.89   Headteachers in the North Lorn and the Mull and Iona co-operatives had one electronic meeting each in the Autumn term of 1996. Meetings lasted an average of 45 minutes and were held after school hours. Strategies to ensure that meetings similar to these make efficient use of time 'on air' mean that many routine matters previously dealt with at face-to-face meetings are now circulated by fax or e-mail, and the overall number of meetings (whether face-to-face or electronic) has been reduced.

Interoperability with other networks

1.90   There has been little need for users to make contact with other networks, although this would be feasible if required. For example, all schools have a CampusWorld account and can make e-mail contact via the Internet if they wish to contact others outside the Argyll Online system. The fax machine also enables them to contact people outside Argyll and Bute, and there have been initiatives which have involved contacting outsiders via the VC8000.

Data speed

1.91   Schools use conventional telephone lines, or ISDN 2 lines where available.

Costs

1.92   In reporting the costs of establishing and developing the electronic communications network in Argyll and Bute, it needs to be borne in mind that the introduction of hardware, software and of staff development was gradual. Cost factors relating to hardware and software over the five years since Strathclyde Region originally drew

up the IT policy and implementation plan for Argyll and Bute in 1992 have decreased in line with the increase in volume and commercial competition.

1.93   Over time, schools have played a greater role in funding developments from their own budgets. As 'critical mass' in terms of users was achieved, schools have prioritised electronic communications and supplemented the hardware and software provided centrally. The implementation plan was designed to pass responsibility for funding certain items to school budgets when the educational value of these elements was recognised. This reflected national moves towards devolved school management, which meant that funding decisions should rest increasingly with individual schools.

1.94   Costs for pilot schools and co-operatives have been proportionally greater than for those who have followed in their wake. The Authority's intention has been to operate at the leading edge of new developments in electronic communications in an educational context, making use of new communications products as they become available. The prices of such products tend to be high initially and to fall as they become commercially successful.

1.95   The partnership with British Telecom led to some advantageous financial developments. The original basis of the partnership was to secure technical advice and support, and quick responses to breakdown. This eventually led to priority introduction of ISDN lines for Argyll and Bute schools. Because of the agreed implementation plan, the Argyll and Bute was able to book the installation of ISDN lines at a time when these were offered to schools at a discounted price (£200 rather than £400).

1.96   The points made above need to be borne in mind when interpreting the figures presented in Tables 1 and 2 below:

Table 1: Argyll and Bute Education Authority funding for schools' IT programme

Item	£
Desktop Macintosh computer	1000
Modem	150
ClarisWorks software	30
Telephone line	39 (quarterly)
Call costs (paid by schools)	Standard BT rate
Staff development (one day)	150

Table 2: Argyll and Bute Education Authority funding to the IT staff development centre

Item	£
FirstClass™ server (Argyll Online)	2500
FirstClass™ software	2 (per person)
Technical support	0.2 FTE

1.97   Video conferencing was introduced in 1994, when Argyll and Bute was still part of Strathclyde Regional Council. The Council committed funding to purchase 20 video-conferencing machines, based on an evaluation of various systems which Argyll and Bute's IT Development Centre had had on loan. British Telecom negotiated on behalf of Argyll and Bute with the chosen supplier (Olivetti) to donate one system for each one bought. British Telecom and Olivetti jointly provided support for the project (equivalent to 0.2 FTE). This support involved carrying out feasibility studies, liaison with hardware and software suppliers, presentations and

assistance at training events, management assistance, technical advice and troubleshooting.

1.98   The video-conferencing systems required IBM compatible PCs. These have been rented rather than purchased.

1.99   Argyll and Bute has recently entered into partnership with Strathclyde University and British Telecom to develop commercially-viable curricular material which makes use of electronic communications. Financial details of this partnership are commercially sensitive and figures cannot therefore be supplied.

Cost effectiveness

Curriculum

1.100   The use of electronic communications in Argyll and Bute schools has extended and enhanced the curriculum in a number of ways.

1.101   For example, teachers have been able to share their expertise in developing core curricular materials at a significant time, in the period in which the *5-14* curriculum is being introduced. This is likely to have cut substantially the amount of time which individual teachers would otherwise have spent on changing and developing existing materials. At the same time, by drawing on teachers' knowledge and skills collectively, the materials in use are likely to be of a higher standard than individual teachers could create on their own.

1.102   As a consequence of the skills which Argyll and Bute teachers have developed in incorporating the use of electronic communications into the core curriculum, British Telecom and Strathclyde University Faculty of Education have been keen to enter into partnership with the Authority to produce commercial materials. This is a gain for the Authority, not only in terms of additional funding but also in enabling teachers to focus on high quality materials development and to draw on the expertise and resources of University staff.

1.103   The development of distance-learning approaches by specialist teachers is extending the curriculum for pupils, particularly in primary schools, who previously did not have access to specialists for geographical reasons. Distance teaching and learning is one of the key strategies used in the Authority for introducing foreign languages (French and Gaelic) into the primary curriculum.

1.104   Comparing the costs of these developments with alternatives is difficult however, as it seems unlikely that any of these would have occurred if the electronic network had not been in existence.

Teaching and learning

1.105   Similarly, the use of electronic communications in classrooms has enabled teachers and pupils to make gains which were desirable but difficult or impossible to achieve without the technology, such as opportunities to collaborate with peers on a wide range of tasks, to collect and share information, and to experience learning environments other than the school, for example through the video link with the Museum of Science in London.

School management

1.106   The introduction of video conferencing for school management within co-operatives has produced a number of efficiency gains. Firstly, because time 'on air' is

perceived to be expensive (although headteachers appear not to have attached the same value to their own travelling time or to time spent in meetings), headteachers have been encouraged to set tight agendas and to stick to them. This appears to have reduced meeting time by 50 to 75% and, of course, to have cut travel time altogether. Furthermore, by identifying and dealing with routine matters in other ways, such as by posting notices on Argyll Online, or by sending responses by fax or e-mail, the overall number of meetings has been reduced by at least 50%.