


Education Departments' Superhighways Initiative

Group C: Teachers' Professional Development

Final Report

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Section 2

Project Information

1. THE CLASS PROJECT

Description of the project

1.1 The pilot project was initiated and managed by the CLASS (Computerised Local Administration Systems for Schools) organisation and is both strategic and operational in its focus of intended interventions. At the strategic level, it represents a collaborative exercise in utilising an existing infrastructure, including both government agencies and commercial enterprises, to deliver in-service training (INSET) to four secondary schools, using multimedia CD-ROM and supported by a tutor using intermediate band communication. It was an ambitious project requiring both the development of new multimedia learning materials and their delivery into a school-based learning environment.

1.2 The major focus of this project was the effectiveness of independent learning delivered through an interactive multimedia CD-ROM. Video conferencing was mainly used in a complementary role. However, we have given full weight to learning experiences from the CD-ROM component for two reasons. Firstly, it is likely in the near future that learning materials will be delivered both off line and on line. We see the experiences offered by the CLASS pilot as making a useful contribution to knowledge in this area. Secondly, it is important that the totality of the project is covered to ensure that the integrity and coherence of the evaluation is maintained.

1.3 The EDSI CLASS pilot project is a feasibility study in the application of educational technology to support the professional development of principals and teachers. This intention was expressed through the following seven project aims. The CLASS Project aims to:

- explore the use of educational technology in the efficient and effective delivery of teacher in-service training
- broaden learning opportunities for professional development of teaching staff, non-teaching staff and managers
- investigate the technical issues involved with its implementation
- evaluate the cultural problems that need to be overcome
- explore the implications for different patterns of training
- raise the awareness within schools and the Northern Ireland Education Service of the potential of communications technology
- help staff to acquire new and relevant skills.

Sponsors and other parties involved

1.4 The CLASS Project's partnership model is illustrated by the way that each of the necessary technical components was contributed free of charge by a participating organisation. SIMS Ltd provided the knowledge engineering component of a traditional classroom-based training package on Management Information Data Access Systems (MIDAS). This was re-engineered into an interactive multimedia open-learning format by the Northern Ireland Centre for Learning Resources (NICLR) and delivered in the form of a beta-release version of an interactive multimedia CD-ROM training module. The hardware was provided by ICL in the form of five Pentium multimedia computer systems using Vision Technology VC8000 system and Teamvision communication software. The multimedia learning system was supported by a CLASS training-centre based tutor, linked to the pilot schools through an ISDN2 video-conferencing facility. British Telecommunication plc (BT) awarded a grant of £5000 to cover the costs associated with ISDN installation and line use. Coopers and Lybrand gave advice on project management, and the Northern Ireland Regional Training Unit (RTU) offered advice on school management issues and evaluation methods. This complex but effective partnership was co-ordinated through a Liaison Group that met quarterly under the chairmanship of the Director of CLASS. The CLASS pilot project itself was managed by a CLASS organisation support manager along with a core and curriculum officer and a systems analyst.

1.5 The CLASS organisation was established in 1989 initially to provide management information systems for all post-primary schools in the province, and is funded by Department of Education for Northern Ireland (DENI). Since 1989, it has provided Local Area Networks (LANs) for all 234 secondary schools and is now implementing systems in 650 primary schools as well as upgrading software and hardware in secondary schools. Schools are supported and trained by CLASS in the use of SIMS software and in system management. Schools have modem links to their local CLASS centre and its helpdesk. CLASS centres throughout the province are linked by a wide area ISDN network. Inspection by DENI Inspectorate Branch (1994) and a Post Benefit Evaluation (1995) showed a very high level of system use and a high degree of customer satisfaction with CLASS as a provider of innovative IT solutions to schools. Significantly, a recommendation of the DENI inspection report asked the CLASS organisation to consider how CLASS might promote and facilitate approaches to management training that make use of authentic CLASS data within each school as a basis for management decision-making and development of performance indicators for school development planning.

Details of schools involved

1.6 At the operational level, four secondary schools, Antrim Grammar School, St Columb's College, St Joseph's High School and Coleraine and Strathearn Grammar School, selected for their successful track records in the use of information technology, agreed to participate in the project and provide a suitable training environment, including substitution cover of school staff where necessary. Three of the four schools decided to engage their senior management teams, principal, vice-principals and senior teachers, in the training programme. One school used the training opportunity to develop their pastoral care team, two vice-principals, three heads of school and seven heads of year. In total, 28 teachers took part in the project. Their IT-literacy levels varied widely from experienced users to non-users. Approximately 50% of the teachers considered themselves to be non-users of IT.

1.7 This pilot project represents an early stage in the DENI current overall strategy for examining ways in which computer-based management information can lead to improvements in the quality of school-based decision-making. The professional

development of teachers through effective in-service training is rightly seen as a key activity within this strategy. However, it is increasingly difficult for schools to acquire sufficient in-service training to meet these professional development needs. Cost and operational factors arising from substitution, travel and timetabling have inhibited both provision and uptake of traditional classroom-based professional development programmes. The CLASS pilot project provides a potential platform for flexible in-service provision, empowering schools to manage their own professional development needs less expensively and with minimum disruption to pupil learning.

1.8 To achieve these aims, the CLASS Project was planned in three phases:

- **Phase 1**, the initiation and preparation phase, was planned to begin in November 1995 and to be completed in March 1996.
- **Phase 2**, the implementation phase, was planned to run from April 1996 to November 1996.
- **Phase 3**, the formative evaluation and product re-design and development phase, was planned to run from November 1996 to May 1997.

The evaluation which follows examines Phases 1 and 2. In reality, Phase 3 fell outside the EDSI project time scale.

Evaluation

Project initiation: Phase 1

1.9 Phase 1 of the CLASS Project was planned to occur from November 1995 to March 1996 and was intended to achieve the range of key preparatory deliverables outlined below. The kinds of difficulties in solving unanticipated technical problems, commonly encountered in technologically rich projects, led to CLASS extending Phase 1 until October 1996. However, despite these early technical difficulties and due to the high degree of commitment of all those involved, Phase 2 was completed on schedule, as defined in the originating proposal.

Preparatory activities

1.10 During the period November to October, the CLASS project team and, in some cases, school-based project leaders, engaged in the following activities.

Training course design

1.11 At the outset, the CLASS project team identified a selection of content for the training programme as a key decision. This was confirmed by subsequent events, particularly in relation to levels of motivation shown by the teachers taking part in the project. The selection of MIDAS as the training focus of the CLASS Project was influenced by a number of considerations. Firstly, DENI had a prime interest in improving the quality of school-based decision-making through the effective use of computer-based management information systems. MIDAS was seen as a core module for facilitating collaborative self-improvement among senior management and pastoral care teams. Secondly, in school returns of questionnaires on CLASS re-training, this was the second most requested item (by 152 schools). Thirdly, MIDAS is a relatively short training course of 3 hours duration, suitable for a non-funded pilot project. Fourthly, SIMS had produced a well-documented and tested classroom-based, objectives-driven training package. This was re-engineered by NICLR into an interactive multimedia format that the project team hoped would be capable of running under a Windows '95 operating system.

Production of a multimedia learning package

1.12 The multimedia computer-based learning package was developed by NICLR under the very severe, self-imposed constraints appropriate to a non-funded project. NICLR saw the package as representing a 'proof of concept' that would lead to a fully funded product. The multimedia CD-ROM version was designed to reflect the structure of a learning objectives-driven, paper-based classroom model and was organised in five units covering the skills required for data access. From the trainee's perspective, the CD-ROM provides a direct visual representation of MIDAS software. After logging in, users are offered the five training units within a Windows interface.

1.13 The learning strategy employed is structured around the three logically developed, integrated approaches of 'Show Me', 'Let Me Try' and 'Tell it to me Again'. Units 1 and 2 demonstrate the structure of MIDAS and describe icons and features of the Windows interface. After this stage, trainees are 'taught' the functions of MIDAS through engagement in a series of information-gathering activities based on simulated practical, school-focused problems.

1.14 The 'Show Me' aspect of the learning package demonstrates to the user a specific operation within the MIDAS programme. An audio explanation accompanies a moving pointer tracing the pathway required to obtain task-related information. The tempo of the pointer is automatically varied according to new-knowledge requirements. The pace of instruction has been set to ensure that competent trainees do not become bored, and each 'Show me' activity is short enough to give the unsure the incentive to try the routine again.

1.15 The 'Let Me Try' allows users to perform the task for themselves. However, because the simulated MIDAS is not totally responsive, but designed to lead down the correct pathway, learners cannot fully interact with the data. If a user moves down an incorrect pathway, the software gives a warning message requesting the user to try an alternative route. The degree of interactivity would have been greater had there been more data available and more time for product development.

1.16 The 'Tell it to me Again' function provides the solutions that should have been obtained by the trainee during the learning procedure, offering reinforcement feedback. During this procedure, students may once again access the task question, which is frequently lengthy and detailed, in their information-gathering requirements. To do this they must operate a 'pull down' window. Interestingly, only approximately half of the trainees discovered this function, emphasising the invisibility of hidden menus.

1.17 The decision to adopt a Windows '95 operating system for the training package led to the slippage in timescale for Phase 1 of the project. The project team encountered design and operating problems when developing the MIDAS training module using an early version of Windows '95. In the face of these difficulties, it was decided to embed the MIDAS training package in Windows 3.1.

1.18 The decision by the CLASS team to adopt Windows '95 for the project should be seen in context of the future developmental plans of CLASS. They are currently engaged in a province-wide upgrade operation for their total system. During the next 4 years they intend to upgrade both hardware, initially introducing ICL Ergo-Pro X450/133 -16-850Mb computers, and software, by moving away from the relatively unfriendly DOS to Windows '95. It seemed both prudent and reasonable that the training package offered should be compatible with the projected updated system.

1.19 There were significant re-scheduling implications for the CLASS EDSI project as a result of changing from Windows '95 to Windows 3.1. The training of teachers in the use of MIDAS had to be delayed from late April to late September 1996 to allow additional time for NICLR to create the interactive multimedia CD-ROM in Windows 3.1. However, NICLR used this opportunity to expand the original concept and incorporate an improved pedagogical design for their beta-release version.

1.20 This delay was discussed with the principals of the four project schools at a meeting held at NICLR on 12 March 1996. The aspiration to try to deliver upgraded systems during the training system was maintained. However, as the EDSI CLASS pilot project and the CLASS organisation upgrading project were separate projects, each with their own timescales, coinciding the two events of training and school use could only remain an aspiration. Nevertheless, principals saw great advantages if the training and opportunity for school use could be closely aligned.

Obtaining and installing the equipment

1.21 Setting up a reliable technical system presented the CLASS team with many problems. Although the specified deliverables were met in full, within the project's time scale, technical problems led to successive re-scheduling of milestones. Initially, equipment delivery and installation were projected for completion by the end of March. In the event, this was completed during the beginning of October. The following account briefly identifies the equipment and highlights the technical problems and solutions obtained.

ISDN2 lines

1.22 An ISDN2 line was installed on time in each school and training centre by BT. During the project, there were occasions when poor video-conferencing image quality was attributed by technical support staff to low performance of the ISDN line. Confusion in schools was caused by the loss of the ISDN line when power to the ISDN2 connector unit was switched off by a teacher. BT had to be contacted for the line to be re-powered. Schools solved this problem by simply leaving the units in a powered-up state.

Hardware system

1.23 ICL provided each school and the tutor centre with a Pentium multimedia computer running Windows 3.1. ICL also installed a VC8000 card and Teamvision software on each machine. The machines were delivered in late May and installed by the CLASS Project's Systems Analyst. During this installation testing period and throughout the active training periods, a range of technical problems were encountered.

1.24 It took over 107 hours of technical support (see Table 1) to ensure that the five systems were operating correctly. The complexity of some of the problems encountered required sophisticated technical support for their successful resolution. In the opinion of the CLASS Project manager, the project would not have been able to run without the creative problem-solving abilities of the project's Systems Analyst and the NICLR technical team, who offered specialist multimedia support. The importance of qualified technical support for the success of technologically rich training programmes cannot be over emphasised. However, many of the more complex technical problems were associated with product development and would not occur in a fully developed system.

Table 1. Hardware problems and solutions

Problem	Hours	Solution
Monitor video flicker	8	Replace two monitors with ICL 14C
Support MS Office	12	Install and de-bug one school
No audio	16	Identify and install correct (MACH64) drives
Poor video-conferencing audio	20	Experiment, then fit external speakers
Poor CD-ROM quality	30	CD drive synchronisation
Corrupted Windows registry	6	Re-create registry with REGEDIT
Loss of video-conferencing icons	8	Design problem with Teamvision and WINSWITCH
Corrupted Windows O/S	5	Re-install Windows O/S

Establishment of the tutor centre

1.25 A tutor centre offering video-conference tutor support was established at the CLASS offices, based in the Western Education and Library Board at Omagh, County Tyrone. The choice of Omagh as the location for the project's tutor support was questionable. The EDSI CLASS project manager and his support staff were located 50 miles away in another Board area and had to travel to Omagh to use the video-conferencing system. This meant in practice that video-conferencing support was only available at planned times, resulting in missed opportunities for the professional development of teachers. This restriction was recognised by the CLASS team, but their location decision was determined by considerations of available space in which the system could be installed. Omagh was seen as the only CLASS centre with adequate space in which to locate the communication system.

Initial training in the use of Teamvision video conferencing

1.26 Training in the use of Teamvision appeared to identify four categories of users:

a) the CLASS project team, consisting of the project manager and technical support officers

b) the principals of the project schools

c) the teachers acting as project co-ordinators within their own schools

d) the teachers of the project schools.

1.27 Four training events were organised. The first, held at the Belfast headquarters of ICL, introduced video conferencing to the CLASS team, the principals and the four school project managers. Following a brief introduction by the ICL Belfast Business Unit Manager, two ICL staff provided a demonstration of Teamvision, using two computers located about 6 metres apart in the same room. After three attempts to make a connection, the principal ICL demonstrator quickly explained the main functions of Teamvision, using a game of solitaire to demonstrate viewing a remote screen and taking screen control. The proximity of the two video-conferencing stations in the same room did not fully reveal the audio limitations of the system to participants. This was to have significant consequences in subsequent use. Functionally, the Teamvision demonstration did not appear to equip participants with adequate operating skills. Nor did it develop insights into how video conferencing might be used, in conjunction with the CD-ROM, as part of an enhanced professional development programme. The opportunity to engage in discussion of possible developmental uses was missed. Few participants accepted the demonstrators' invitation to use the system, despite repeated encouragement from the CLASS Project manager. Only those who had a degree of technical competence felt confident enough to try the system.

1.28 This experience of introducing communication technologies to a professional audience suggests that care should be taken to ensure that, as far as possible:

- demonstration simulates operating conditions
- training is provided close to take-up time
- data and examples used should be relevant to participants' interests
- initial presentation is carefully structured with minimum technical detail
- future possible uses are illustrated and openly and freely discussed
- each participant gains personal hands-on experience
- attention is drawn to the potential value of inter-school networking.

1.29 The second Teamvision event was labelled 'staff training'. The CLASS project leader located in Omagh CLASS centre and his assistant located in the Belfast project school explored the Teamvision system with a view to producing a help guide for schools. This self-teaching training session relied heavily on intuition and exploration. The Teamvision User Guide was only occasionally referred to and did not appear to contribute to the self-training programme. The two participants worked their way through the software, using a trial-and-error strategy, while the project assistant took notes for preparation of a users' guide. Suppliers of video-conferencing equipment might consider designing a software tutor system to assist users to acquire early confidence and proficiency.

1.30 It soon became apparent that the audio quality of the conference telephone link was inadequate. Significant deterioration in sound was experienced by both parties as they moved more than 2 feet from the telephone in 'hands-free' mode. As the head was moved to the side whilst speaking, the sound became fragmented. After a number of low-cost attempted solutions, additional funding was acquired for the purchase of five Call Port® desktop audio-conferencing systems. These audio systems, which cost about £500 each, are designed to operate in conjunction with BT VC8000 videophone and ICL Teamvision, to provide hands-free audio during video conferencing. The system's built-in power amplifier and directional microphone provided a very satisfactory sound quality for three people conferencing at a distance of one metre from the video monitor.

1.31 The video output from the camera system appeared to be adequate. The local was superior to the transmitted image, which, even with adjustment, presented over-exposed and pinkish skin tones. Video images maintained satisfactory quality even at full-screen size, although sharpness diminished as picture size increased. It was possible to improve the quality of the transmitted image by placing a screen immediately behind the person, or having a wall as background.

1.32 The screen-sharing function and passing-screen control appeared to operate satisfactorily. Each user was able to operate these functions relatively quickly. It was noticeable, however, that communication was more difficult during screen sharing. This was because the size of the 'live' image must be reduced to increase screen share for an application. Visual clues are thereby diminished. The project manager saw no role for the flipchart function in the project and did not fully explore this function. Each participant quickly and successfully transferred an open word-processing file.

1.33 The third Teamvision training session was for pilot school co-ordinators. Two contact points were established; one at Coleraine, for the CLASS project manager and the school co-ordinators from Coleraine and Derry, the other at Antrim, for the assistant CLASS manager and the co-ordinators of Antrim and Belfast schools.

1.34 This session was clearly structured around a training agenda and based on the help sheet that resulted from the self-training session outlined earlier. It lasted from 10.00 a.m. to 1.00 p.m. Omitting the not fully explored flipchart function, the initial trialling of video-conferencing facilities went smoothly. The following aspects, however, were worthy of comment.

1.35 When participants affected a call through the telephone directory function, they initially felt stilted, though they were encouraged by the immediacy of the visual contact. This visual 'bridgehead' quickly put them at ease in the 'encounter'.

1.36 Participants had difficulty with poor sound quality. Deterioration of sound during fast-moving exchanges was annoying and, at times, confusing. They frequently asked the message sender for clarification. Particular problems were encountered when conducting group discussions between two groups of four. The degree of concentration required by participants was very high, leading to feelings of fatigue and a tendency towards loss of humour and lowering of goodwill.

1.37 Although screen-sharing, screen-control and file-sending activities were successfully completed, participants displayed some confusion over screen structure, for example some dialogue boxes obstructing other dialogue boxes. At times, they had difficulty differentiating between the two screens.

1.38 On completion of this 3-hour training session, three of the four pilot school co-ordinators did not feel sufficiently confident in their ability to instruct colleagues in the of use Teamvision. They made separate arrangements to contact each other in order to obtain necessary additional experience.

1.39 A fourth training event was organised for teachers of the participating schools. By this time, the CLASS project team had significantly improved audio quality by providing five Call Port® Desktop Audio-Conferencing Systems. Identical training was given to each school on different days. The CLASS Project leader explained the CLASS system briefly and its potential for improving school decision-making processes. Teachers were grouped in pairs and introduced to the Teamvision software by a member of the CLASS support team in Omagh. Teachers were shown how to make a call, share a screen using the solitaire game, and transfer a Word document. Each pair of teachers had approximately one hour of supported hands-on experience.

1.40 At the end of the training period, they reported feeling reasonably competent in the technical operation of the process. However, when asked at a later date to initiate a video-conferencing session, many teachers encountered difficulty making the connecting call, although a straightforward but unused help sheet was available at each station. Many teachers believed, mistakenly, that answering the incoming telephone call was sufficient to effect the video-conference link, overlooking the need to respond within the Teamvision software. A large number of teachers reported self-consciousness and questioned the value of displaying each other's real-time image. However, when they later became engaged with tasks, self-consciousness seemed much reduced, and they reported 'being able to see the other person' as highly beneficial, particularly for the enhanced quality of communication, which they attributed to the presence of visual cues.

Issues

1.41 The training sessions highlighted a number of issues of relevance to users and designers of video-conferencing systems:

- Successful exploitation of video-conferencing software may benefit from more systematic initial exploration. To rely on intuition and trial-and-error methods may lead to misconceptions and under-utilisation of the software. Information and technical advice should be given on effective communication techniques, but in an easily accessible and user-friendly form.

- The audio quality of the system is very important. Poor quality sound, as well as being inefficient, increases stress among users, raises demands on participants' powers of concentration and increases fatigue. Group sessions become particularly difficult to manage. While users appear to accept variable image quality, they reveal low tolerance for poor audio quality. It was also noted that different levels of acceptable audio quality seem to apply. In exchanges of familiar content between known interlocutors, lower audio quality was more acceptable than in heuristic exchanges between speakers less well known to each other. Once the audio system was improved, these unwanted effects were no longer observable.

- What kinds of interactive relationships are feasible for specific training purposes remains a question for further investigation. For example, what degree of aural/visual cueing, for example enunciation, intonation and expression, is necessary at different stages of training?

- Training should include the application of effective communication techniques to individual and group video-conferencing sessions.

- Training sessions should incorporate the use of help-guides to encourage teachers to engage in 'problem-solving' rather than attempts to memorise procedures.

- The subject matter of training sessions should have discernible practical relevance for teachers.

- Training sessions should also include advice on effective communication techniques appropriate to video conferencing.

External management strategies

1.42 The operational strategy and the management approach adopted will significantly influence outcomes. So too will the historical experience of the implementing team

and the context in which they carry out the task. But only some of the factors deriving from the context are subject to control. In the case of the CLASS Project, these were identified early on, firmly kept under control and eventually contributed significantly to the successful outcome of the project. Another important aspect of the project's management was the way in which each member of this complex partnership was able to provide high quality input in respect of the experiences and skills required for the successful realisation of the project's aims. The CLASS organisation is highly regarded for its track record in effectively managing large-scale, complex technological innovations in schools. It has developed an organisational infrastructure with a proven capability to deliver computer-based management information systems, training and support programmes on time and on budget. The CLASS organisation also benefits from being staffed with managers, all of whom have had extensive senior management experience in secondary schools and are supported by well-qualified training and technical-support teams. Over the last 6 years, the CLASS organisation has also developed productive professional relationships with SIMS and ICL, its current suppliers of software and hardware. Additionally, it has developed good working relationships with NICLR, Northern Ireland's established educational technology learning organisation, which has an international reputation for the production of multimedia learning systems, having won a number of prestigious awards for its products. Additional support was provided by Coopers and Lybrand, BT and the RTU. The four participating schools were selected because they too were believed to have the capability to deliver successful outcomes as well as potential for further development from a professional development programme.

1.43 In addition to carefully managing the project entry conditions by constructing an effective partnership, the CLASS team set up a number of mechanisms by which they could exercise effective control, based upon accurate information obtained through the careful monitoring of planned activities.

1.44 Firstly, a Liaison Group was established under the chairmanship of the CLASS Director, including the CLASS project manager, and representatives, all at a senior level, of each of the partners and a representative from one of the participating schools. The group met approximately each quarter. Their meetings were tightly focused and reviewed the project's progress. Issues for delay were identified, strategies for resolution produced and project timescales re-adjusted. Each member of the Liaison Group had the authority and resources to provide a solution from within their respective organisations. This was a key contributing factor to the role-effectiveness of this group.

1.45 Secondly, the CLASS Project manager drew up and distributed widely a detailed plan of action, in which specific milestones were identified. This plan was regularly reviewed and modified throughout the project.

1.46 Thirdly, a firm commitment of full engagement in the project was obtained from the principal of each school. A project manager with senior status, usually a vice-principal, was appointed to manage the project within each school. In two schools, the principal was fully engaged in the training programme.

1.47 Fourthly, each partner appeared to believe that successful completion of the project offered a realistic expectation of long-term rewards. For example, CLASS believed the project represented a productive future training model and accepted inclusion of a formative evaluation as well as a summative public validation of its work. NICLR saw the commercial potential of working in partnership with SIMS in the development of multimedia training materials. SIMS, ICL and BT saw the potential of a valuable future market. The schools were motivated by the project's potential to develop their organisation through the professional development of staff and to

obtain priority delivery of, and experience with the use of, the forthcoming software and upgraded hardware.

1.48 Such a strongly controlling management strategy was made possible by partners' high motivation to succeed, tightly coupled with an ability to offer the necessary resources of equipment and support. Paradoxically, the 'tight' management strategy employed, whilst unquestionably contributing to the successful realisation of the project aims, makes generalisation and prediction difficult. However, the extent to which any project represents special and unique conditions will always be an open question. This aspect is discussed in the concluding section (see paragraphs 1.82–1.84).

Internal management

1.49 The responsibility for initiating and providing primary support for training at school level resided with each school's project manager. Significantly, each project manager was a member of the senior management team; three of them were vice-principals and they attended each of the project meetings and training sessions, usually accompanied by the principal. These two factors ensured that each school had a person with the personal authority, expertise and overall knowledge of the project's aims to manage the school-based training programme.

The learning model

1.50 The teaching and learning strategies employed by the CLASS Project utilised the technologies of multimedia CD-ROM and video conferencing. The CD-ROM provided a fundamental skills-based training programme in the use of MIDAS, whilst tele-conferencing provided a skills test-based student progress monitoring facility and the potential for teacher development through on-line tutor support.

1.51 The MIDAS multimedia CD-ROM was designed to reflect the structure of a learning objectives driven, paper-based classroom training model. It was organised into five units covering the required skills for data access. From the trainee's perspective, the CD-ROM provides a direct visual representation of the MIDAS software. After logging in, the user is offered the five training units set in a Windows interface.

1.52 The learning strategy employed is structured around the three logically developed, integrated approaches of 'Show Me', 'Let Me Try' and 'Tell it to me Again'. These are described in detail (see paragraphs 1.13–1.15).

1.53 In pedagogical terms, the first aspect supports the development of knowledge, the second the acquisition of skills and the third reinforcement feedback or a suggested route for further study. The aspiration of the CD-ROM designers to produce a 'low text', 'high human interaction' visual learning environment was largely met.

1.54 The video-conferencing technology was intended to be used:

a) to provide tutor support for teachers who may encounter difficulties in using the CD-ROM training package

b) to provide a communication link between trainees and the CLASS project manager

c) to allow testing of teachers to take place on completion of the training programme through the use of the screen-sharing function

d) to support the CLASS project team in carrying out formative evaluation

e) to facilitate communication between CLASS support managers of the four schools with a view towards examining school-specific practical applications of MIDAS and assisting with development issues once schools started to use the real data of their school

f) to facilitate project schools in developing professional networks

g) to raise project schools' awareness of the potential of intermediate band communication systems and develop the skills necessary for its use.

1.55 In practice, video-conferencing technology was mainly used to facilitate the management of the project to carry out testing of teacher competency in the use of MIDAS and to collect project evaluation data. As discussed below, video technology became one of the powerful levers of management control, by allowing the project team to exert pressure on teachers to complete training modules on time.

1.56 From a trainer's perspective, the constructed learning environment, emerging from the coupled video-conference tutor-support system and the CD-ROM, offers a three-element overall pedagogical structure:

a) Knowledge acquisition is offered through low interactive, high visual, automatic multimedia display of relevant aspects of MIDAS. Here, learners move through the MIDAS package at their own pace, repeating or reviewing essential procedures and gaining knowledge of the structure of MIDAS.

b) Skills acquisition is achieved by allowing the learners to try to utilise acquired knowledge in pre-set simulated problem-solving activities.

c) Understanding of the system and its value in improving school-based decision-making could be developed through a tutor-support programme, facilitated through video conferencing. In practice, only a limited use was made of video conferencing for developing in teachers a deeper understanding of the application of MIDAS. In part, this was due to the decision to locate the tutor-support centre in Omagh rather that in the project team's CLASS centre. This meant that video conferencing could only be carried out during planned periods. In part, too, deeper understanding of the application of these newly acquired skills required teachers to be using the systems with their school's data.

Implementation of the teachers' training programme: Phase 2

1.57 The CLASS Project is ongoing. The observations that follow are based upon the fulfilment of Phase 2 of the project, the completion of training. The next and, arguably, the most important phase, should be to explore how senior and middle education managers have integrated their new knowledge, skills and understanding into their professional practice and made an impact on the quality of educational processes in their schools. However, this aspect could not occur until the upgraded software and hardware was delivered and installed. Within these boundaries, it is possible to offer some observations on issues of efficiency and effectiveness in respect of education management professional development, facilitated by multimedia educational technology.

Implementation of the training programme at school level

1.58 The implementation of school-based training occurred during the months of October and November. The following account is formulated around what appeared to be significant issues.

Learning environment

1.59 The location of the computer and video-conferencing equipment in the school influenced the learning environment. The donated systems were dedicated to the project task, contained only project software and were used solely by teachers engaged in the project. In three of the schools, the equipment was located in an isolated room. Two of these rooms were each about 40 square metres and the other about 12 square metres. Each member of staff had easy access to the room and, in general, could work in quiet privacy at any period during the day without interruption. School D located its equipment in the work area of the staffroom. Here, staff were interrupted by surrounding activities, engaged in conversation and observed by interested colleagues. The reasons given for the selection of this particularly public location was that it might implicitly promote the use of IT amongst the staff and also convey the image of a senior management team collectively engaged in independent learning activities. It was not possible to determine if this 'message' had its designed impact. It was, however, possible to ascertain that those undertaking the training programme felt that this kind of learning environment was unsatisfactory.

Learning patterns

1.60 Each school was given the autonomy to develop its preferred ways of engaging in the training programme. In general, once the system had been set up in its particular location, teachers developed their own patterns of use. As can be seen from Table 2 and Table 3 (see paragraph 1.63), a variety of learning patterns emerged from teachers exercising this choice.

Table 2. Learning patterns of teachers in the four schools

Teacher	School	No. of training sessions	Period in training in days	Total training time in minutes	Initial session in minutes	Time to complete test in seconds	No. of errors in test
1	A	3	12	280	100	216	2
2	A	6	13	245	15	282	1
3 #	A	4	23	160	30	250	4
4 *#	A	4	17	110	45	202	1
5	A	2	10	120	60	307	1
6	A	5	13	230	40	213	1
7 #	A	4	10	180	50	276	3
8 #	B	3	25	120	35	277	2
9 *#	B	3	8	85	30	240	0
10	B	4	17	180	50	231	3
11	B	3	22	125	30	620	4
12 *	B	3	14	180	35	210	1
13	C	7	30	285	60	208	1
14 *#	C	6	27	245	60	333	2
15	C	6	27	220	45	137	1
16 *	C	6	28	185	35	328	2
17 #	C	8	31	295	45	239	0
18	C	8	32	185	30	157	1
19	C	5	13	190	60	282	4
20	C	7	15	260	30	242	2
21 *	C	6	30	230	60	250	0
22	C	4	24	120	30	293	4
23	C	9	23	320	30	300	2
24	D	2	2	105	60	306	4
25 *#	D	5	7	140	25	181	3
26 #	D	1	1	90	90	319	6
27 *#	D	N/R	N/R	N/R	N/R	208	0
28	D	3	2	130	10	296	4

= Teachers with prior knowledge and skills in the use of CLASS

* = Teachers with IT skills.

N/R = Non-return.

Time allocation

1.61 Teachers' allocation of time for training ranged from 85 to 320 minutes, with a mean time of 186 minutes and standard deviation of 66.8 minutes. Teachers with IT skills or prior experience of CLASS completed their training programme in an average of 168.3 minutes with a standard deviation of 61.9 minutes. Those who were novices took 30 minutes longer on average, with a mean of 199 minutes and standard deviation of 68 minutes. The recommended time for covering the MIDAS modules using traditional classroom methods was 180 minutes. Whereas the mean time for covering MIDAS modules in independent learning mode was broadly similar to the classroom mode, the value of the independent mode is that it allows teachers to exercise their judgement on the time required to achieve competence. This aspect of the independent learning model was highly valued by all teachers.

Study patterns

1.62 Two interesting aspects emerged when study patterns were observed. Firstly, as can be seen from Table 3 (see paragraph 1.63), the training day extended from 8 a.m. to approximately 6 p.m. or, in the case where a teacher took the CD-ROM home to run on his personal computer, until 10 p.m. In general, however, teachers utilised their non-teaching periods during normal school hours. Secondly, teachers were able to vary the length of time they allocated to each training session and the length of training period (see Table 2 in paragraph 1.60). The mean number of sessions to cover the CD-ROM material was 4.7, with a standard deviation of 1.99. The mean length of training period was 17.6 days, with a standard deviation of 9.3 days. The particularly short training period for School D is a reflection of the pressure that this school felt to complete the training programme on time. Training was undertaken immediately after the completion of a follow-up inspection by DENI, and consequently rushed to meet the project deadline.

Learning groups

1.63 In most sessions, teachers engaged in CD-ROM training in isolation. However, in Schools A and C, some teachers found it helpful to work with others. In School C, one session contained five teachers. In this case, four teachers gained some useful starting tips from a colleague who was making good progress. In other cases, teachers worked with a colleague of the same ability level. Teachers who found progress difficult usually paired with others who had similar problems. Highly competent teachers were only invited to, or took part in, problem-solving activities.

Table 3. Study patterns of teachers in the four schools

Period in day	No. of sessions
8 a.m to 9 a.m.	1
9 a.m. to 10 a.m.	15
10 a.m. to 11 a.m	8
11 a.m to 12 noon	23
12 a.m. to 1 p.m.	14
1 p.m. to 2 p.m.	14
2 p.m. to 3 p.m.	21
3 p.m. to 4 p.m.	19
4 p.m. to 5 p.m.	9
5 p.m. to 6 p.m.	2
At home after 6 p.m.	4

Testing of knowledge and skills

1.64 Following their training programme, a test was administered by a CLASS support officer using the video-conferencing system. Once visual contact was established and the teacher put at ease, the CLASS support officer used the screen-sharing function to hand over the test question for the teacher to solve. All teachers were given a test consisting of four questions. The questions required teachers to extract specific data from the MIDAS module. The actual data used in the test was different from that used in the training module. The time each teacher took to solve each question and the number of incorrect pathways taken was recorded. Teachers were not told that time to complete the task was being measured. The CLASS support officer used a bank of 25 graded questions to ensure that each teacher had similar questions and did not have prior knowledge of the questions. In only a few instances, where teachers were experiencing considerable difficulty, the CLASS support officer offered gentle but unspecified prompts. As shown in Table 4 (see paragraph 1.65), although each teacher answered all of their test questions, they completed the test with varying degrees of success. The mean time taken to complete the test was 264.3 seconds with a standard deviation of 84.9 seconds. The mean score for errors made was 2.1 with a standard deviation of 1.5. When the scores of those with previous CLASS experience or IT skills were compared with those teachers who were novices to both IT and CLASS, some differences in performance were evident. The groups with prior experience completed the test with a mean of 254.8 seconds and a standard deviation of 47.6 seconds, making an average of 1.8 errors with a standard deviation of 1.75. The inexperienced group completed the test with a mean time of 272.6 seconds and standard deviation of 106.5 seconds, making an average of 2.3 errors with a standard deviation of 1.29.

1.65 In general, as summarised in Table 4, those with IT or CLASS experience tended to take less time to complete the training programme and completed the test faster and with fewer errors than those with no prior IT skills or experience of using CLASS. However, these differences were not significantly large.

Table 4. Results of the end-of-programme test

Activity	Mean time to complete training programme (minutes)	Mean time to complete test (seconds)	Mean number of test errors
All teachers	186	264	2.1
Experienced teachers	168	255	1.8
Non-experienced teachers	199	273	2.3

1.66 The role of video conferencing in supporting testing of teachers' skills and knowledge was an influential part of the training programme. In practice, testing was a potent lever to persuade busy teachers to complete tasks within an agreed time span. It provided teachers with valued feedback on their competence, increased the degree of confidence teachers had in their ability to use MIDAS and added a degree of urgency to the felt need to master requisite skills. Many teachers expressed

feelings of anxiety about the prospect of being tested. They generally agreed it was beneficial to them to be given a deadline and recognised that the test strategy mirrored that used by themselves in their classroom work.

1.67 In addition to facilitating testing of project skills, the use of the screen-sharing function impressed on teachers the possible practical benefits of this video-conferencing tool to offer support when they engage MIDAS in analysing their school's real data. A number of teachers had expressed concern about moving from a training situation to an active database. The potential for a situation to be established in which a remote expert might be able to take control of their computer and provide 'hands-on' assistance was seen as reassuring.

Learning experiences

1.68 The NICLR beta-version of the multimedia CD-ROM was designed to enable teachers to acquire the knowledge and skills necessary for them to use the MIDAS module as a management tool. Although teachers varied in their knowledge of IT and CLASS modules, for most teachers this was their first encounter with a multimedia CD-ROM-based training environment. The general response of the teachers to the CD-ROM was very positive and they were impressed by its quality and effectiveness to support the acquisition of skills and knowledge. A feature of teachers' development is the accelerated level of expectations for the quality and function of interactive multimedia products. Teachers quickly generate high expectations for the learning product once they have undergone initiation. This factor places a high premium on multimedia designers who are capable of producing creative solutions to novel problems. The following offers a summary of their experiences and perceptions of the training event. We begin by addressing teacher criticisms, concerns and problems encountered.

Problem areas

1.69 The following problem areas were identified by the teachers. To give some indication of the assessed importance of these problem areas to the efficacy of the independent learning system, we have subjectively weighted each occurrence in terms of its impact on reducing teacher motivation: from –1 (low impact) to –10 (high impact). To give some indication of the number of teachers who were apparently affected by the problem, we have weighted the occurrence as High (H), Medium (M) or Low (L).

CD-ROM software

1.70 Teachers were aware of the meaning of a beta-release version of the software, in that they knew that it could not be guaranteed not to crash or give error messages and that the quality controls that usually apply to a commercially released product were not used. However, we feel that the teachers, possibly due to their lack of experience with this kind of product, did not make any significant concessions to the notion of being a part of a trial.

- Access to the system through passwords was different to the school CLASS system, leading to teachers encountering difficulty in entering the training program. (Motivation: –7, Frequency: M).
- Units 1 and 2, which were entirely information-giving and passive, were perceived by many to be off-putting and boring. (Motivation: –8, Frequency: H)
- Occasional error messages when carrying out activities required the teacher to leave the training module and re-start the program. It was not always possible to determine the root causes of these error

messages. Further exploration of the system and software needs to be undertaken. Nevertheless, the error messages caused a high degree of frustration in teachers who were unable to work out a recovery strategy. (Motivation: –6, Frequency: H)

- Some teachers found the amount of knowledge contained in some 'Show Me' sections too large to assimilate, requiring them to go through the demonstration again before able to complete the 'Try Me' tasks. (Motivation: –3, Frequency: L)
- The majority of teachers did not appreciate that they could access the task question during the 'try activity' by using a pull-down menu. Consequently, they wasted time writing the question down or in frustration in not completing the exercise. (Motivation: –2, Frequency: H)
- There was poor sound quality caused by either hardware or software defects. (Motivation: –6, Frequency: H)
- Most teachers strongly desired the training software to use their own school's actual data, and were disappointed when it was unable to fully simulate a real system, particularly with the inability to fully interrogate dummy data. (Motivation: –6, Frequency: H).

Technical problems

1.71 There was a very strong reaction from teachers who encountered a technical problem of any kind. Because they felt under pressure to complete the training modules and they were using their personal time, frequently culled from other valued activities, any impediment to efficient use of the system generated extremely strong feelings of frustration and anger. When using the CD-ROM, teachers encountered a problem in approximately 25% of the training sessions. In all but about 5% of the instances, the problem was solved, usually by the school project manager or by a colleague who had learned how to handle the particular problem from an earlier experience. In those cases where the problem was not solved within 10 minutes, usually because there was nobody available, the teacher quit the training session with extremely strong feelings of frustration or anger. There were very few instances where a teacher solved the problem unaided. Some of these problems could be classified as simple problems, such as correctly switching the equipment on, loading the CD or connecting the speakers. Some were related to the software, as outlined above (see paragraph 1.70). Most of the problems giving rise to frustration occurred during early training sessions. As teachers grew in their technical competence or familiarity with the system, the incidence of recorded problems diminished markedly. However, the importance of providing an effective technical support system, particularly during the initiation phase, should not be underestimated when using educational technology for school-based training.

Learning environment problems

1.72 How to create a productive learning environment to support independent learning activities for teachers is an important management issue. Once teachers have decided to allocate their scarce professional time to a training activity, very strong feelings of dissatisfaction are felt, but not necessarily publicly expressed, if their training session is interrupted. As shown in Table 5, 23% of all teachers' training sessions were interrupted by a school issue, such as an outside telephone call, an enquiry from a senior member of staff or a request to deal with a pupil incident, intruding into their learning environment.

Table 5. Interruptions to training sessions

School	No. of sessions	No of sessions interrupted	No. of sessions with technical faults	Total time in training (minutes)	Estimated time lost to technical faults or interruptions
A	28	9	12	1225	17%
B	16	1	3	720	6%
C	72	13	32	2515	18%
D	11	6	4	465	17%

1.73 Recorded interruptions varied from school to school. In one school, 54% of the sessions were interrupted, while in another school only 6% of the sessions were interrupted. Technical interruptions occurred in 40% of the sessions. Sometimes, both kinds of interruptions occurred in the same session. An estimated 13 hours (15.8%) of training time was lost due to a combination of physical and technical interruptions. Also, the feelings of frustration felt by teachers experiencing interruptions were very strong.

1.74 All teachers indicated that they had experienced problems in being able to allocate sufficient time to their training programme. In School D, experiencing a follow-up inspection by DENI during the project, the teachers found great difficulty in allocating enough time to personal training sessions. Whereas all teachers completed the training modules, albeit with varying degrees of success, many expressed the need for school-based planning if independent learning was to become widespread as a training mode.

1.75 Teachers highly valued being able to undertake training sessions in circumstances where they could not be observed by colleagues. The opportunity to make mistakes in private was seen as being particularly important by most teachers, including those who were not novices to IT or CLASS.

Positive responses

1.76 Without exception, teachers reported a high degree of satisfaction with the interactive multimedia CD-ROM learning experience. Apart from the areas of difficulty outlined above, teachers found this encounter with interactive multimedia an effective means of acquiring the skills and knowledge required for using MIDAS. Without exception, teachers preferred this school-based, independent learning training model to the traditional centre-based model. The following points identify those aspects which appear to make this model attractive to this group of senior teachers. To give some indication of the importance teachers place on these aspects, we have weighted them in terms of their perceived impact on teacher motivation. (from +1: low impact to +10: high impact)

- Although time to complete training is an important issue, the opportunity to engage in training at a time which suited the teacher was a major attraction of this learning model. (Motivation: +10)
- Similarly, the opportunity to cover material at their own pace was also highly valued. (Motivation: +8)
- Privacy to explore the computer material without risking professional embarrassment from exposure of ignorance or slowness in learning encourages teachers to fully engage in the training material. (Motivation: +8)

- Avoidance of having to travel to a training centre, particularly during winter months, increased the attractiveness of the school-based model. (Motivation: +6)

- Teachers valued training materials with an obvious practical relevance. The opportunity to select and spend more time on those materials that were perceived by the teacher as having significant personal practical relevance was highly motivating. (Motivation: +9)

- Teacher engagement in the CD-ROM increased significantly when they were interacting with the dummy data. Indeed, a number of teachers adopted the learning strategy of first attempting the 'Try Me' tasks, only returning to the passive 'Show Me' if they failed to achieve success with the task. In general, a highly interactive multimedia learning environment generated high engagement. (Motivation: +8)

- Teachers valued feedback on their learning progress. (+7 motivation). They were in general reasonably satisfied with the feedback offered by the 'Tell Me Again' feature of the CD-ROM. However, within-task feedback, given when an incorrect pathway had been taken by the teacher, was generally seen as inadequate.

- Teachers found the intrinsic qualities of the CD-ROM learning experience rewarding, such as enjoying a human voice talking them through the material and giving them sense of discovery. (Motivation: +6)

Effectiveness of the training programme

1.77 How to measure the effectiveness of a professional development project will always be an open question. At this stage, it is only possible to assess the achievement of short-term goals, namely the acquisition of those skills that would allow senior and middle managers to use MIDAS. Nor was it possible to compare training effectiveness with traditional classroom-based courses because these were not taking place during the project timescale and had not been evaluated using test questions in the past. However, in addition to the learning that occurred as a result of the formal curriculum, there were other kinds of learning taking place that fit readily with the concept of the informal, or hidden, curriculum. Each of these kinds of learning has an impact on the professional development of education managers and, in turn, on the development of the school organisation.

Formal learning

1.78 Two major indicators used to assess a project aim of 'helping staff acquire new and relevant skills' were a self-reporting monitoring log and an externally administered, competence test of four, unprepared, school-focused practical problems, completed through a video-conference link. From the data recorded in the personal logs, supported by personal interviews, each person completed the multimedia training programme, operated the video-conferencing system and completed the competency test questions, although the speed and efficiency by which answers to test questions were achieved, varied significantly.

Informal learning

1.79 There were two main kinds of informal learning from the hidden curriculum. Firstly, the experiences of the project impacted positively on the participants' attitudes towards IT. For prior non-users and low-users of IT, the project enabled managers to 'overcome hesitancy'; 'see computers as less threatening'; 'become more confident in using a PC'; 'be familiarised with operating procedures'; and 'increase their [professional] status with colleagues'. Secondly, the shared experience of the project further contributed to a sense of corporate identity in three

of the four management groups, partly through having acquired the same information management skills: 'we now have a more even platform of knowledge'. In part, too, the reflective processes that were an integral part of the project created opportunities for each team member to contribute to and learn about each others' area of school management concerns. There was also evidence that the common experience of feeling vulnerable and sharing solutions to problems encountered, mainly of a technical nature, contributed to the development of inter-personal relationships conducive to team-building.

Efficiency

1.80 One of the major incentives for the development of independent learning systems is the potential efficiency gains they offer over traditional training patterns. From the schools' and teachers' perspectives, the most immediate efficiency gain came from greatly reduced travel and teacher substitution costs. Because teachers undertook training during school time or at home on personal computers, there was no need to attend a training centre and employ substitute staff to cover absented classes (about £100 per day per teacher). The average time spent by teachers engaged in the training programme was equivalent to what might be anticipated in the traditional training model. Although 37% of the teachers spent significantly longer than the traditional package norm on the training exercises, it should not be regarded as a more inefficient mode of delivery. This 'overspend' was balanced in full by equivalent 'savings' derived from the 37% of teachers who required less than the projected training time. (The remaining 26% completed in about 180 minutes.) Given the absence of empirical evidence for teachers' proficiency in acquiring relevant new skills using the traditional training model, we believe a thorough and strongly weighted consideration should be given to the proven, multiple (informal and formal) motivational and developmental gains attributable to this independent learning mode.

Cost-effectiveness

1.81 Cost-effectiveness measures must take account of all qualitative outcomes balanced against financial and other costs, and are necessarily comparative in nature. With respect to the CLASS Project, a full cost-benefit analysis would extend well beyond the project boundaries, if full appreciation of the wide-ranging factors involved were to be examined. Estimation of the indubitable economies of scale alone would require extensive additional research. For example, if skills-based training for Management Information Systems was acquired through school-based independent learning, there would need to be a re-examination of the role and nature of in-service training. Currently, most in-service training courses in Northern Ireland are centrally funded and schools are not charged. There are, however, some clearly identified costs and benefits. For example, although capital outlay is high, with the commercial production cost of the multimedia CD-ROM at about £40,000 and hardware costs (multimedia computers and intermediate band tele-conferencing equipment) of about £5,000 per school site, the training support staff costs are only about 30 minutes per trainee. There are financial savings for the school of about £100 per teacher, although there will be some opportunity costs falling on the school owing to teachers being engaged on the training programme during the school day and to the utilisation of a teacher as school programme manager. Once the investment in capital outlay has been discounted through economies of scale, and opportunity costs of teachers engaging in the programme have been minimised, clear financial benefits are revealed to accrue to schools and the wider education system, within which professional interaction may be generated on a local or generic basis. These benefits are significant. For example, the cost of training Northern Ireland's senior management and pastoral care teams (a total of 2640 teachers) in the use of MIDAS, using traditional centre-based training methods, is estimated at £450,000, including teacher substitute cover.

Conclusion

1.82 All of the aims set by the CLASS project team were fully met. It can be clearly seen that the CLASS pilot project has made an impact on both individuals and school organisation. With respect to the teachers, the project has made two kinds of contribution towards their professional development. It has effectively equipped teachers with new CLASS operating skills and knowledge. It has also contributed towards their personal growth, particularly in feelings of increased professional status and confidence with educational technology. A contribution towards further organisational growth has been made through the increased engagement of teachers in school-based issues, and improved corporate understanding through sharing of knowledge and improvements in team work. Although evidence of these positive outcomes can be found in each of the schools, these benefits were not acquired to the same degree in each of the schools. Those schools that saw the potential of increased professional development and had already developed an open climate appeared to benefit the most.

1.83 Of the two educational technologies used in the pilot project, the CD-ROM had the greater impact on professional development. Video-conferencing technology had only limited impact on teachers' professional development and played a supporting role for the CD-ROM. The use of video conferencing to carry out universal testing of teachers' skills was seen as particularly valuable, both by teachers and the project team. The potential to help teachers, through the use of video conferencing, to gain a deeper understanding of how their newly acquired skills could be utilised in improving the effectiveness of their schools did not occur to any great extent. The opportunity for this development may, however, re-emerge when schools receive their overdue upgraded systems. In the opinion of the CLASS project manager, a further professional development programme will be strongly influenced by the outcome of future resourcing decisions.

1.84 The question that now needs to be answered is : 'Will the newly acquired individual skills be incorporated and further develop the quality of the school's educational processes?' Certainly, the teachers in three of the four project schools appeared to be enthused by the prospect of collectively utilising their newly held skills and knowledge. They were also eager for the new upgraded equipment to arrive in their schools so that they could begin developing a deeper understanding of how MIDAS can be used to improve the effectiveness of their schools' educational process. There remains, however, some anxiety on the part of some teachers about the extent to which their newly acquired skills will equip them to handle the real system. There is also a realisation that a number of complex issues need to be addressed before such a Management Information System may be effectively integrated into their particular organisation and institutional culture. A Phase 3 of the CLASS Project could usefully explore this important area.