special educational needs and information technology

EFFECTIVE STRATEGIES FOR MAINSTREAM SCHOOLS

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INVESTOR IN PEOPLE

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1. INTRODUCTION

This report uses data gained from ten case studies to present a range of strategies which have been found to have been effective by teachers and support staff in planning and implementing information technology use for pupils with special educational needs in mainstream schools.

Information technology is perceived as integral to the curriculum by educationalists and was embedded in both the National Curriculum and the guidance given to local education authorities and maintained schools in the *Code of Practice on the Identification and Assessment of Special Educational Needs* (GB. DFE, 1994).

National Curriculum

In 1989, information technology was designated an attainment target within the broader statutory Order for Technology in the National Curriculum (GB. DES and WO, 1990). The use of information technology was also referred to within other Orders, such as the use of LOGO in mathematics and word-processing in English. The National Curriculum Council hoped information technology would bring pupils with special educational needs five specific benefits: heightened motivation; better opportunities for small group work; improvements in the accuracy and appearance of work; better access to information; and the development of creativity (Hawkridge and Vincent, 1992). The revision of the National Curriculum, carried out by Dearing in 1993, separated information technology from technology, and gave it its own statutory document: *Information Technology in the National Curriculum* (GB. DFE and WO, 1995). This outlined the programmes of study and attainment targets for information technology at all key stages.

The National Curriculum of 1989 specified the need for access to the full curriculum for all pupils with special educational needs. It deemed it necessary to move away from the stark division between the mainstream curriculum and curricula for pupils with special educational needs. However, as Stakes and Hornby (1996) reported, professionals and parent groups complained that the National Curriculum was inflexible, and irrelevant to the needs of some children with special educational needs because of its academic nature.

The Dearing Review (Dearing, 1994) recognised this limitation, and the revised National Curriculum provided more flexibility for teachers working with pupils with special educational needs. A proportion of each school week, up to a maximum of 40 per cent at key stage four, could be used to cover aspects outside the National Curriculum, such as training in social skills. For example, *Information Technology in the National Curriculum*

(GB. DFE and WO, 1995) stated that information technology should be taught to pupils 'in ways appropriate to their abilities...to enable individual pupils to progress and demonstrate achievement' (p.1). It also required that 'appropriate provision should be made for pupils who need to use non-sighted methods of reading, such as Braille, or non-visual or non-aural ways of acquiring information' (p.1).

Code of Practice

Arrangements for identifying and providing for children with special educational needs were set out in the *Education Act 1993* (GB. STATUTES, 1993) and supported by the *Code of Practice on the Identification and Assessment of Special Educational Needs* (GB. DFE, 1994). The Code of Practice gave practical guidance to local education authorities and governing bodies of maintained schools on their responsibilities towards children with special educational needs.

There was an expectation in the Code of Practice that pupils with special educational needs would have had access to some information technology within their own school before reaching the stage of a formal, multi-disciplinary assessment. One of the assessment criteria the Code recommended local education authorities use at stage 4 was 'Response to Special Educational Provision'. Schools were expected to have 'explored the benefits of, and where practicable, secured access for the pupil to appropriate information technology' (p. 60). Suggestions were made of the types of information technology appropriate to different special educational needs. For example, for pupils with learning difficulties the Code recommended that local education authorities examine whether 'word-processing facilities, overlay keyboards and software' (p. 56) had been considered for the pupil by the school. For pupils with emotional and behavioural difficulties, it suggested 'painting programmes and other software which encourages communication and self-expression' (p. 60); and for those with physical disabilities, 'special keyboards and switch input to allow access to word-processing facilities and software' (p. 61).

The code put emphasis on information technology as a means of gaining access to the curriculum, suggesting that training is given to the pupil, his or her parents and staff to enable the pupil 'to use that technology across the curriculum in school and, wherever appropriate, at home' (p. 61).

The NFER Research

The National Council for Educational Technology (NCET) produced a series of 20 case studies of individual pupils with different special educational needs (Day, 1995). These described the long- and short-term objectives for

each pupil, the resources, activities and support they had access to, and the monitoring and review processes in place. The NFER research was intended to add detail to these case studies, by concentrating on four main areas, and analysing how they contributed to effective use of information technology by pupils with special educational needs and the integration of the pupils into mainstream classes. The research was also intended to explore some of the themes addressed in the wider literature on information technology and special educational needs.

The four areas chosen for detailed investigation were:

- planning and resourcing of information technology for pupils with special educational needs;
- training issues for class teachers and support staff;
- methods used to incorporate use of information technology into classroom practice;
- mechanisms for monitoring and review of information technology use.

Methodology

Case studies of ten pupils, in schools from eight different local education authorities, were carried out during 1997. Seven were undertaken in the spring term, and three at the beginning of the summer term. Schools were chosen on the basis of recommendations by a special educational needs expert from the NCET. All were considered to have well-established information technology use with some or all of their pupils with special educational needs by the NCET's special educational needs adviser. The aim was not to present a nationally representative picture of information technology use in this area but to investigate the factors which supported effective practice over a sustained period.

All the case studies focused on pupils attending mainstream, rather than special, schools. This was to enable issues of curriculum differentiation and social integration to be explored. The research was also intended to investigate strategies for managing information technology use for pupils with special educational needs and their peers within mainstream classes.

In each school selected as a case study, a relevant member of staff was asked to nominate a pupil with special educational needs to become the focus of the research. In the majority of the schools, the headteacher or special educational needs coordinator made this selection. Seven of the pupils were from primary schools and three attended secondary schools. Within the limited number of schools, it was hoped to select pupils who, between them,

had a range of special educational needs and who used information technology for different purposes, across the 'continuum of access requirements' as described by Day (1995, p.4):

> *For pupils with significant physical and sensory impairments, information technology can provide physical access to the curriculum. This is technology at its most dramatic, liberating the pupil from the physical barriers to learning.*
>
> *For pupils with learning difficulties, information technology can provide cognitive access. Information technology enables us to present the curriculum in a variety of ways, thereby encouraging the pupil who has difficulty grasping the concepts, skills and knowledge required of him.*
>
> *For many pupils, information technology has a special role in providing supportive access. By this we are referring to the power of technology to support pupils in particular areas of difficulty. The pupil with poor handwriting can enhance the presentation of his work by printing it out instead of writing it by hand.*

Details about the pupils, their special educational needs and any specific information technology equipment provided for them are given in Appendix 1. As can be seen from the Appendix, the range of need was limited in two main ways. None of the pupils had emotional or behavioural difficulties and none were switch users. However, these were not considered insuperable problems as the majority of the research focused on strategies which would be common to a wide range of special educational needs and an equally diverse range of information technology.

A number of interviews and observations was undertaken for each case study, with the aim of gathering detailed information about the policies and practice which underpinned the information technology use in the schools, and investigating how pupils used information technology as part of their usual routine. The interview guides and observation schedules were piloted in a primary school which had not been selected as a case study, and alterations to the research instruments made as necessary. Further information about the nature of the observations and interviews and details about the respondents can be found in Appendix 2. Documentation relating to the observed pupils was also collected from each of the schools, including special educational needs policies, information technology policies and individual education plans.

Although the observations provided useful examples of the hardware and software that the pupils with special educational needs used, and the strategies employed by staff to manage the information technology use, the limitations

of this particular research method were recognised. For example, the more severe a pupil's learning difficulty, the more unpredictable their responses were likely to be, and all pupils may have been influenced by the presence of a researcher in the classroom, watching their behaviour. For these reasons, the majority of the interviews were held after the observations. Researchers were then able to discuss with the class teacher how typical the activities and pupils' responses were.

2. PLANNING AND RESOURCING

2.1 Literature

> *Pupils with special educational needs are most effectively supported by information technology when its deployment is part of a planned process which involves the teacher in an analysis of the pupils' strengths and weaknesses in order to design an appropriate curriculum. (GB. DES. HMI, 1990a, p.15)*

The literature suggested that several main factors contributed to the planning of information technology equipment and software for pupils with special educational needs. These included:

- the nature of the pupil's needs;
- the teacher's preferred teaching style;
- consideration of the benefits of using information technology for a particular task, compared to more traditional teaching methods;
- practical implications of information technology use;
- consideration of the relative merits of different information technology applications to achieve the same educational goal.

The nature of the pupils' needs

The literature indicated that in many cases the planning of information technology was largely determined by the nature and severity of the child's special educational need. Day (1995) grouped these into a 'continuum of access requirements' (p. 4) and commented that:

> *if we are to provide effective solutions we must be aware of the access that is required. Without making this connection, we cannot ensure that the resources we provide will meet their purpose (p.5).*

A large proportion of the literature addressing information technology use by pupils with special educational needs illustrated disability-specific applications. For example, for pupils with visual impairments, Spencer and Ross (1988) noted that a 'micro-computer with appropriate software has several advantages over conventional toys' (p.175) by encouraging active movement by the learner during visual stimulation and providing brighter materials than would otherwise be available. They gave the example of a 'Touch n' Paint' program:

> *This package allows learners to draw on the screen in bright colours, using the end of the finger as a paintbrush. Thus, the light reaching the eye is under control of the learner — it is contingent on the actions made (p.175).*

Similarly, for those with speech impairments, Day (1995) described particularly useful software which allowed learners to record messages which could then be incorporated into computer work. She stated:

> *Software that allows pupils to see their speech patterns or vocalisations represented on the screen can be used in speech therapy to reinforce work on particular sounds (p. 24).*

The literature also gave several examples of software that had been used successfully with pupils with hearing impairments to give them practice at literary tasks (Hales, 1987) and to make amplified sound more meaningful by combining it with moving images on a screen, such as through CD-ROMS (Day, 1995).

The majority of literature addressing the use of information technology by pupils with physical disabilities was descriptive, giving detailed accounts of what hardware and software had been used by pupils with physical disabilities to improve access to the curriculum. A large proportion focused on the physical and supportive access information technology could provide. Several authors (for example, the Oxford ACE Centre, 1990; Day, 1995; Day and Detheridge, 1995; Hughes, 1995) gave an overview of the devices available to gain access to information technology applications (such as keyguards, switches and concept keyboards) and the software which could replace manual tasks (such as word-processing and information-handling programs). The indirect benefits of information technology use for pupils with physical disabilities were widely discussed in the literature. Hegarty (1991) and Stradling *et al.* (1994) highlighted the independence, self-esteem and motivation which many pupils experienced for the first time as a result of information technology use.

The literature relating to the use of information technology by pupils with dyslexia indicated that computers offered three main advantages over other teaching methods. Firstly, for pupils who had experienced reading failure, a computer may have seemed less threatening and more effective than a teacher. This was an advantage common to many other types of special educational need. Secondly, software provided specific help with writing and spelling. Newell and Booth (1991) described how their predictive word processor had reduced the number of spelling mistakes made by pupils with specific, and other, learning difficulties by up to 65 per cent. They commented that,

> *The predictive word processor was found to increase the opportunities for children with limited language skills by developing their written language, boosting their confidence and giving them a sense of*

> *achievement. It allowed children to concentrate on the content of their writing rather than the process of letter formation and spelling. The amount of written work children have been prepared to produce has increased, and in some cases more than doubled (p.42).*

Computer-generated speech was the third area in which information technology provided support to pupils with dyslexia. Talking word processors which read back what was typed helped pupils monitor what they had written, and identify spelling errors (Stansfield, 1991; Day, 1995). Pictures were combined with speech, through multimedia word-processing packages, as Day (1996) described:

> *As the learner types each word, a picture or symbol to illustrate it appears above the writing and, if the computer has a sound card, the text can be read aloud. For dyslexic writers this additional support can provide a useful prop in the reading process. It can also act as a checking device, since if the word is inaccurately spelt the symbol won't appear (p. 33).*

From the interviews and observations, it emerged that there were some planning and resourcing issues common to all types of special educational need, although the nature of the need did, in many cases, determine at what level provision was planned.

Teachers' preferred teaching style

The literature suggested that teachers' overall teaching approach may have affected their choice of the type and amount of information technology. Sepehr and Harris (1995) conducted a small-scale study to compare the use of information technology by teachers who used 'whole book' approaches to teaching literacy to pupils with specific learning difficulties with those who used more structured approaches. Their findings showed that teachers adhering to a 'whole book' approach preferred framework-type software, whereas those using structured or eclectic teaching methods tended to prefer more structured, 'drill and practice' software.

In the case study schools, planning and resourcing decisions were rarely taken by individual class teachers in isolation; therefore, there was little scope for examining the impact of preferred teaching style on choice of information technology equipment and software.

Comparisons with more traditional teaching methods and practical implications of information technology use

In planning the information technology use for pupils with special educational needs, both at a whole-school level and in individual classrooms, teachers

had to compare not only different types of information technology equipment and applications, but also the efficacy of using information technology at all, in place of more traditional methods.

Much of the literature on the use of information technology by pupils with special educational needs described, in general terms, the effectiveness of computer use in improving the motivation and self-esteem of the users. However, there had been relatively little research to measure the significance or permanence of these changes. The literature gave an indication of the potential effect of information technology on educational outcomes which could be measured quantitatively, but did not demonstrate whether these effects were sustained in the long term. Furthermore, as most of the pupils who used the information technology applications described in the literature were using information technology in a classroom setting for the first time, it was difficult for the authors to differentiate between the generic benefits of computer use, and those specific to the information technology applications used.

MacArthur *et al.*(1990) examined the use of information technology in teaching spelling to pupils with learning difficulties, comparing computer-assisted instruction with pencil and paper as a means of delivering individual spelling practice in classes for students with learning disabilities. The group of pupils using computers showed significant improvements in weekly spelling tests, a retention test and in their engagement with the subject. The authors suggested that the differences in achievement and engagement were most likely due to differences in instructional design:

> *The CAI [computer-assisted instruction] program provided immediate feedback and review of words spelt incorrectly, whereas the PPI [paper-and-pencil instruction] program relied on prompting students to self-check their work and delayed feedback from the teacher. The CAI program also provided greater control of student progress through the materials (p. 326).*

Similar gains were shown in a smaller-scale study in New Zealand which used word processors to improve the writing skills of deaf pupils (Mander *et al.*, 1995). Seven primary school pupils used word processors in their writing from the beginning of the study and were compared with a delay group who began using the computer 12 weeks later. Samples of written work were collected from both groups at the beginning of the study, and at 12 and 24 weeks. Relevant professionals were used to judge the quality of the work:

> *Quality ratings by experienced teachers of the deaf indicated that use of the computer as a word processor led to improvements in a number of significant dimensions of the written language of the children...It was also found, from independent judgments made by a*

> *speech and language therapist, that the use of the computer resulted in improvements in sentence development level and mean length of utterance (p. 450).*

However, although these improvements were made during the first 12 weeks of computer use, no comparable gains were made in the second 12-week period. Mander *et al.* speculated that either the scales of measurement were not interval-equal, and that improvements at the upper end of the scale were harder to achieve, or once the basic skills had been mastered the nature of language activities in the classroom needed to change accordingly: 'in particular, in planning their classroom language programmes, the teachers in the present study may not have adequately responded to the computer class children's increased written language performance over the initial period' (p.451).

From the literature, it emerged that although many authors had compared information technology interventions with more traditional teaching methods, few had examined issues of school management of information technology for pupils with special educational needs, particularly how staff accessed a range of equipment and software to provide differentiated tasks for pupils. This provided an additional focus for the study.

In addition to assessing the educational value of information technology applications, it is also necessary for teachers to consider the practical implications of information technology use. For example, the relative advantages and disadvantages of portable computers were discussed extensively in the literature. Several authors described them as useful pieces of equipment for easing the integration of pupils with physical disabilities into mainstream schools (see Stradling *et al.*, 1994; Humphrey and Plews, 1995). However, Hughes (1995) and HMI (GB. DFE. HMI, 1992) both highlighted specific difficulties for pupils carrying information technology hardware around schools. Hughes expressed concerns about the weight of portable computers and the batteries necessary to power them, while HMI stated that 'the practical difficulties of having computers subjected to the hurly burly of a school day must be considered' (p. 25).

Choices between different information technology applications

A small amount of research had focused on the efficacy of different information technology applications in teaching a particular skill or subject (see Wright *et al.*, 1992). However, as Wright *et al.* noted, 'at present there is little available research which would help with the selection of CAL [computer-assisted learning] systems to suit particular children' (p. 106). The NFER research explored at what level information technology use for pupils with special educational needs was planned and which members of staff informed the decision-making processes at the various levels.

2.2 Case study evidence

Interviews with staff indicated that, in addition to the themes outlined above, several other factors were also central to decisions about planning and resourcing information technology for use by pupils with special educational needs.

Continuity in information technology resources between home and school

Teachers in several of the case study schools emphasised the importance of maintaining close links between work done by pupils with special educational needs at home and at school. Several strategies had been implemented by the schools to strengthen these links. Five of the pupils with special educational needs observed in the study were able to take a laptop computer home to complete work. In two of these cases, the laptops had been bought with funding from the pupil's statement, but for the others it was part of a wider school policy, with equipment available for loan to more than one pupil.

In School 5, for example, five laptops had been bought for each class, and were allocated by way of a rota system. All pupils who found writing laborious or difficult were encouraged to use them. Staff agreed that the opportunity to use information technology at home had several benefits for pupils with special educational needs. It allowed them to reinforce work done in class, and improved their keyboard skills, as well as providing them with extra time on the computer without restricting use of the class computer for other pupils. Pupils with hearing impairments, who spent time in the school's withdrawal unit, had greater access to laptops, and could borrow one every other week.

In School 9, laptops were also available for loan, but only for pupils with hearing impairments (see Figure 2.1). Hearing impaired pupils have particular language difficulties which impede their access to the mainstream curriculum, and computers were used by the school as one of several tools to help them improve their language skills. Desktop computers were used frequently in school to allow them to edit and correct their written work more easily, and laptops enabled them to continue this process at home. Grants for Education, Support and Training had been used by the school to purchase a laptop for every pupil with a hearing impairment, with the aim of improving his/her literacy skills. Jessica, with moderate to severe hearing loss, used her laptop at home on a regular basis, and during the day of observation she completed work for an English story that she had begun at home on her laptop the previous evening.

Figure 2.1 Extract from 'Information Technology used by Hearing Support at School 9 and its Place in the National Curriculum'

- All hearing impaired children...have the use of a Tandy FD 1100 laptop at home. They have mainly used this for word-processed assignments.
- They sometimes prefer to use pen and pencil to complete assignments.
- Their work is usually transferred to the RM PC and opened as a Word file or converted to a ClarisWorks file on the Power Mac. It is then checked, amended and reorganised on screen, saved as a text file or exported to another application. The checking and amending is done by the student alone, the student and a friend or most commonly, the student and a teacher. These aspects of the work are the most crucial in reinforcing the mainstream curriculum and in developing language capability.

For pupils with special educational needs at other schools, the importance of continuity between home and school was also emphasised. In School 3, Patrick, who had cerebral palsy, had a computer at home that was compatible with the one provided for him at school. As his typing was often slower than his peers' writing, the compatibility of the two computers allowed him to complete work at home and thus keep up with the rest of his class. Similarly, in School 4, Jonathan, who had dyspraxia, used his laptop to complete work at home, allowing him to maintain the same work rate as his peers.

Ease of access to differentiated material

Tingle (1990) emphasised the teaching time that was required to introduce a new technology to pupils, contrasting this with the popular perception of information technology as a time-saving device for the teacher. However, the case studies demonstrated various whole-school strategies that had been put in place to help teachers access appropriate software programs for their pupils with special educational needs, particularly those with learning difficulties.

In School 5, all the software recommended on a pupil's individual education plan was loaded on to the class computer, and updated as required and, in two schools, computer networks enabled easy access to differentiated material. In School 1, for example, the class teacher regularly used software intended for reception classes with her pupils with learning difficulties in

Year 2. She felt that information technology had helped her provide appropriate material for her pupils with special educational needs: although it had initially been difficult to locate appropriate software, once programs had been installed on the school's network it had become easy to offer pupils with learning difficulties interesting work at a variety of different levels.

Similarly, in School 9, the school's computer network allowed pupils with special educational needs who were withdrawn to a separate unit for part of the school day to continue with the work they had begun on the computer in their mainstream class, without having to use floppy discs on a regular basis. Although a similar use of material would have been possible without a network, it had the advantage of reducing the time spent loading programs and copying work. For pupils completing work in the withdrawal unit, the ease of accessing work begun in other lessons also strengthened the links to the mainstream curriculum.

Planning information technology use

It emerged from the ten case studies that pupils for whom information technology was necessary to provide physical access to the curriculum generally discussed appropriate equipment and software during the review of their individual education plans whereas those, mainly with learning difficulties, for whom information technology was primarily an aid to cognitive development, were more dependent on the year group or class plan for information technology. Individual teachers then assumed responsibility for planning appropriate information technology use and differentiating tasks.

Whole-school plans

For those pupils with special educational needs for whom information technology was not specified in their individual education plan, information technology use was generally determined by the class teacher, guided by information technology plans for the pupil's year group or class. In School 4, for example, information technology for all pupils, including those with special educational needs, was planned by individual teachers, using the guidance in the school's scheme of work (see Appendix 3), produced by the subject manager. The scheme was very comprehensive and gave detailed targets for pupils in four age groups in the following areas: word-processing, data handling, sound, graphics, control, modelling and monitoring. As it showed a progression in information technology skills, it could be used to plan work for pupils in one class at a variety of different levels by drawing on targets for younger or older pupils as the teacher judged appropriate.

The school's information technology policy stated that the scheme of work 'will enable teachers to plan activities relevant to a child's individual level of development and once again to ensure that she is able to meet success'.

The school plan included details of the relevant software available in the school which could be used, such as the word-processing package ClarisWorks, ClarisWorks Spreadsheets and other software such as Kid Pix. It also suggested appropriate hardware such as concept keyboards and floor turtles. Cross-curricular links were provided under relevant units, suggesting subject areas in which specific information technology skills could be introduced.

Other versions of a whole-school plan were used in Schools 1 and 5. School 1 combined a simpler plan (see Figure 2.2) which was used for word-processing and data handling with a more detailed subject plan, linking information technology skills to particular topics at different times in the school year (see Appendix 4). Although the topic-specific plan limited the amount of differentiation possible, the simpler plan was used by class teachers to identify suitable work for pupils with special educational needs. The plan in School 5 (see Figure 2.3) focused on software rather than specific information technology skills. However, it clearly indicated what was appropriate for pupils with special educational needs, and gave constructive comments in user-friendly language to help the teacher. For example, the 'concept designer' program was described as 'fiendish to set up but makes multi-layered overlays'.

Teachers in all three schools found these plans helpful in determining information technology use for all pupils, particularly those with learning difficulties for whom information technology was not specified on their individual education plan but who benefited from programs at a different level from the majority of other pupils in their class.

In two of the case study schools, programs had been implemented for a larger group of pupils with special educational needs. Detailed and more prescriptive plans had been formulated to address particular areas of weakness across the school. In School 2, a literacy program had been developed for pupils at key stage 2 who had special educational needs. They used multimedia information technology for 20 minutes every day over a four-week period to improve their understanding of phonics. Similarly, in School 5, information technology was used as tool to raise the basic standards of attainment in literacy and numeracy for all pupils with special educational needs in Years 3 and 4. A special educational needs teacher had been employed to work with this age group, in conjunction with the special educational needs coordinator.

Figure 2.2 Extract from School 1's plan for information technology use

RECEPTION	
Matching	
Jigsaws	Blob 1 + 2
Sequencing	My World
Ordering	Animated Alphabet
Letter formation	Phases with concept keyboard
Word recognition	
YEAR 1	
Continue with as above as necessary and:	
Whole word entry via concept keyboard	Phases with concept keyboard, where necessary
Single letter entry from qwerty keyboard	
Cloze	
YEAR 2	
Continue with as above as necessary and:	Phases with concept keyboard, where necessary
Simple editing: checking for spelling and demarcation — use of Arrow Keys	
YEAR 3	
Continue with as above as necessary and:	
Further development of input via qwerty keyboard	Pendown
Changing fonts	
Centring	
YEAR 4	
Continue with as above as necessary and:	
Spell checker	Pendown
Pendown	
Underlining	

Figure 2.3 Extract from School 5's software list

Software	Hardware	Year Group	Subject	Other Information
COMMUNICATING INFORMATION				
Concept Designer	Acorn Needs User port	All	Concept Keyboard	Fiendish to set up but makes multi-layered overlays
Conform Plus	Acorn Needs User port	All	Concept Keyboard	Easy to set up, simple to use
Pax	Acorn	Art	Art	Simple drawing program
Easel	Acorn	3/SEN	Art	Infant drawing program
Clicker Plus	Acorn	3/SEN		Wordbank for assisting writing
Chailey Heritage	Acorn	SEN		Adds symbols to writing to assist understanding
Symbol Collection	Acorn	SEN		Adds symbols to writing to assist understanding
Sentence to Symbols	Acorn	SEN		Adds symbols to writing to assist understanding
Writing with Symbols	Acorn	SEN		Adds symbols to writing to assist understanding
LANGUAGE AND MATHS				
Oxford Reading Tree Level 2 More Level 2 Level 3 More Level 3	Acorn	3/SEN	Reading	Excellent program Takes up a lot of disk space
Sherston Naughty Stories	Acorn CD	3/SEN	Reading	Easy to use Early reading stage (red)
Claude and Maude	Acorn	3/SEN	Handwriting	
My World	Acorn	SEN/HLS		Once familiar with it, it can be used for all sorts of learning
My World 2	Acorn	SEN/HLS		
Fuzz buzz	Acorn	SEN/HLS		Use with My World
Cloze Reading	Acorn	SEN/HLS		Use with My World

Individual education plans

The planning process for individual education plans varied from school to school. In some, information technology was only discussed if it had been specified in the previous individual education plan, or was thought a useful tool to try in the future. In School 5, however, the potential contribution of information technology was always discussed in the reviews and, to guide the discussion about information technology, prompts were built into the individual education plan reviews. These were:

- the type of assistance to be provided by information technology;
- the ways in which it was anticipated this would promote integration;
- the ways in which it was anticipated information technology would contribute to the empowerment of the pupil.

Another method of ensuring specific information technology targets were set was to use an information technology programme which added detail to the more general objectives outlined in the individual education plan. Emily's individual education plan referred to information technology only briefly, in the context of supporting her fine motor skills. However, it was consolidated by more specific targets in her information technology programme (see Figure 2.4).

Figure 2.4 Emily's information technology programme

EQUIPMENT

1. A7000 computer in class with CD Drive (shared use)
2. SEMERC trackerball (three-button with single-handed drag)
3. Keyguard
4. Clicker software
5. Speedy Keys software

AIMS

1. To be able to use the computer confidently in class more independently, to support work across the curriculum.
2. Develop familiarity with the keyboard to support future independence and speed, using programs such as Speedy Keys.
3. To specifically develop word-processing skills with the support of Clicker software.

METHODS

1. Regular use of Speedy Keys program.
2. Regular use of word processor with Clicker grid in class (with support). Occasional 1-1 withdrawal sessions to develop specific word-processing skills, for example, selecting fonts, using the spell checker, etc.
3. Introduce a variety of programs to support work across thecurriculum, particularly maths.

In the primary schools in the sample, it was possible for all the key staff involved in the pupil's education to be present at the review of his or her individual education plan. However, in the secondary schools this was more difficult due to the larger number of subject teachers who came into contact with the pupil. School 7 had ensured that all subject teachers were able to contribute to the planning process: prior to the individual education plan review, all teachers and the relevant year head were asked for their curriculum objectives for the following six months. Departmental representatives then gave an indication of the information technology resources that could be made available in each subject for the period under discussion. The special educational needs coordinator used this information to plan a coherent strategy for the pupil's information technology use over all subject areas.

Collaboration between staff

A key component of effective planning processes in the case study schools was collaboration between members of staff. In School 5, for example, there was a high level of collaboration between the information technology coordinator and the special educational needs coordinator. Together, they experimented with new information technology programs to determine the most effective ways of using particular programs with pupils with a variety of special educational needs. Decisions as to the best programs and equipment to buy were always taken jointly. Similarly, in the school's unit for pupils with hearing impairment, all information technology work was planned in conjunction with mainstream staff. An additional benefit of this close working partnership was that the special educational needs coordinator had developed considerable information technology expertise as a result of their discussions and the informal training the information technology coordinator offered.

Each teacher in School 6 also worked in collaboration with other staff in planning information technology use for pupils with special educational needs. Plans for information technology use in the mainstream class for the following two weeks were drawn up by each member of staff. The special educational needs coordinator and special educational needs assistants then used these plans to determine the work they would do with pupils in the withdrawal unit and a weekly plan of objectives was written for each child, including information technology if appropriate. Longer-term plans were made every half-term on the basis of the progress shown in the weekly recordings.

Collaborative working also allowed good practice to be disseminated more effectively throughout the school. The teacher in the unit for pupils with hearing impairment in School 9 had worked with colleagues in the French department to ascertain what information technology could contribute to the curriculum and to demonstrate the benefits of the new technology for pupils with hearing impairments.

The impact of collaboration on individual pupils was evident during the observation of Jake. He spent four mornings a week with a support teacher to improve his communication and, during these sessions, used information technology twice or three times a week, for 10–15 minutes at a time. His information technology work during these periods was planned in detail. The support teacher wrote a weekly plan outlining all the activities she intended to carry out with him, including all information technology work. This drew on the class teacher's plan for the class and Jake's objectives as outlined in his individual education plan. She aimed to use the same information technology programs as the class teacher, and to reinforce work done in the mainstream class. The language program Jake used during the day of observation complemented both the work seen in his withdrawal unit and that in the mainstream class.

Leadership

From the evidence from a wide range of staff employed in the case study schools it became clear that strong leadership was a critical factor in ensuring a high level of information technology provision and use by pupils with special educational needs. In several schools, staff claimed that one or two colleagues in particular had been responsible for the transition from a school with few resources and little information technology use by any group of pupils to one where information technology permeated the curriculum and was supported by a more creative use of resources and greater training opportunities for staff.

In School 5, the head had led the development of information technology and this was recognised by staff at all levels of the school. She was concerned that the education establishment in general had not recognised the importance of information technology within the business world and other sectors of employment, and felt that teachers' information technology skills lagged behind those of their counterparts in other areas of work. Under her leadership, information technology had become the main priority for funding in the school and she also acted as a resource for other staff. The head of the withdrawal unit for pupils with hearing impairments commented that she went to the head for advice on suitable software to use, and they had both gone to an exhibition on information technology for pupils with special educational needs earlier in the year.

The head had made creative use of limited resources such as buying laptops for use at home by all pupils, allocated by means of a rota. She had also increased the level of staff information technology competence significantly through the purchase of four laptops for them to use at home and by establishing an information technology curriculum group which disseminated good practice. Although her interest was obviously in information technology generally, rather than solely for pupils with special educational needs, the impact of whole-school policies and procedures had had as positive an impact on this group of pupils as on any other.

More commonly, leadership in the area of information technology for pupils with special educational needs came from the special educational needs coordinator. Teachers in Schools 2 and 6 commented on the importance of the special educational needs coordinator in leading developments in information technology. It was interesting to note that in both these cases the special educational needs coordinator had gained his or her information technology expertise while acting in another capacity.

In School 2, for example, the special educational needs coordinator had formerly been an information technology adviser in a local education authority and held a Royal Society of Arts qualification in educational technology. She had also run courses on the use of information technology with pupils with special educational needs for national bodies: most recently she had helped run a training course for the NCET to show how information technology could be used effectively in whole-class teaching with pupils with special educational needs. Within the school, she used her expertise to give informal advice to colleagues, particularly in using specialist information technology equipment, and disseminated information about new information technology developments. She had also been instrumental in developing the school's literacy programme, which relied on intensive daily use of information technology to boost the literacy skills of pupils with special educational needs at key stage 2.

In the same way, the special educational needs coordinator in School 6 was judged by other members of staff to have been largely responsible for the improvement in information technology provision and use over the last six years. She too had gained her information technology expertise before she took on the role of special educational needs coordinator—as the school's information technology coordinator. This experience had given her sufficient knowledge to be able to train the support staff and some class teachers in relevant information technology equipment and applications.

Although not the school's special educational needs coordinator, the teacher in the unit for pupils with hearing impairments in School 9 had taken a lead in the school's information technology development. His expertise had been gained on the numerous courses in the use of information technology by pupils with special educational needs he had attended, the majority of which had been run by the local education authority. He used much more information technology than many of his colleagues in the school but had taken a number of steps to pass on his expertise to others. These methods included:

- arranging demonstrations of new equipment for other staff;
- collaborative working with one particular department, exploring how information technology could help with National Curriculum coverage, and the range of software available;
- providing INSET in information technology for some staff.

3. TRAINING

3.1 Literature

Reports by Her Majesty's Inspectorate (HMI) highlighted several areas for improvement in the information technology knowledge and skills of teachers. The 1990 report *Information Technology and Special Educational Needs in Schools* (GB. DES. HMI) documented an increasing use of information technology in mainstream schools but stated that 'Subject departments currently have little awareness of the potential of information technology for pupils with special educational needs' (p. 30). Furthermore:

> *The teacher needs to be aware of a wide range of suitable software and associated materials which will complement other resources in meeting pupils' individual needs; as yet such breadth of knowledge is not widespread, reflecting a continuing requirement for INSET (GB. DES. HMI, 1990a, p. 15).*

The report recommended that 'INSET is needed in ordinary schools to develop awareness of the potential of information technology to enhance the access of pupils with special educational needs to a broad curriculum, and to spread existing good practice' (p. 30).

Special Needs Issues: a Survey by HMI (GB. DES. HMI), also published in 1990, reported an increased awareness of information technology among teachers but observed that expertise was still confined to the few, with use limited to teaching language and mathematics, suggesting a need for further training and the promotion of information technology awareness across all the school. *Information Technology in Secondary Schools* (GB. DFE. HMI, 1992) highlighted more specific areas of concern, which training could address. For example, it described technical problems which, it suggested, could be associated with the wrong choice of hardware.

Day (1995) recognised that:

> *Training is an essential part of information technology provision if pupils and staff are to maximise their use of IT. Very often, special needs staff are coping with a wider range of hardware and software than their subject colleagues...Class teachers, too, need opportunities to discuss the rationale behind the use of information technology to support individual learning as well as the practicalities of what to do if things go wrong (p. 31).*

The NFER research aimed to explore the improvements that had been made in this area since publication of the HMI reports and to document training methods that were considered particularly effective by teachers and support staff using information technology with pupils with special educational needs.

Few of the methods discussed below were unique to the area of information technology and special educational needs. Instead, some drew upon effective strategies for information technology training. Others relied on more general whole-school methods for disseminating good practice and promoting a high level of communication between members of staff. They were included in the report because of the importance staff attributed to them in promoting effective information technology use by pupils with special educational needs throughout the schools.

3.2 Case study evidence

Informal methods

In School 6, the usual pattern for training class teachers in specific information technology applications for use by pupils with special educational needs was for the special educational needs coordinator, or a special educational needs assistant, to demonstrate the software with the relevant pupils in the classroom.

Other methods of training were applicable to work with all pupils, rather than solely those with special educational needs. For example, in School 8, an informal mentoring system had been implemented whereby all new staff or those with little information technology experience were allocated a more information technology-competent mentor. They could then approach the mentor for training, or with specific questions about hardware or software. In addition to developing the information technology competence of all staff, this promoted discussion of information technology more generally and strengthened lines of communication.

Many of the class teachers interviewed stated that they relied on the computers they had at home for experimenting with software packages and determining what was appropriate for the pupils in their classes, including those with special educational needs. However, not all teachers interviewed had access to information technology facilities at home and several claimed that they did not have sufficient time at school to explore a wide enough range of software to judge what could be used effectively by pupils with special educational needs and what could be used in conjunction with mainstream programs. School 5 had addressed this problem by purchasing four Acorn laptop computers for use by staff at home. The information technology coordinator thought that this had had a significant impact on staff development, allowing time at home to familiarise themselves with the technology, as well as providing an opportunity to use the computers to prepare teaching materials for use in the classroom.

Formal methods

Several schools also had formal systems in place for disseminating information technology expertise and providing training for staff, and often these involved internal information technology experts. In School 5, information technology expertise was spread amongst staff by way of the information technology curriculum group. A similar group had been formed for every subject taught in the school, and all staff were required to belong to at least two groups. The information technology curriculum group comprised the information technology coordinator and four other members of staff and helped keep the members up-to-date on developments in both hardware and software. By ensuring that all members also participated in another curriculum group, the information technology group could discuss information technology applications across most subject areas. Although this strategy addressed information technology in general, rather than solely provision for pupils with special educational needs, staff considered it a useful forum for disseminating information on information technology for both mainstream pupils and those with special educational needs.

Internal information technology expertise was also exploited in other ways: in Schools 1 and 4, the information technology coordinators produced hand-outs for use by other staff, and in the latter, basic information on all the school's information technology hardware had been given during staff meetings.

Training specific to pupils with special educational needs had also been provided by staff in one school. As part of a training course on curriculum differentiation, each department in the school had been required to make a presentation on what was done to differentiate the curriculum in their subject area. Information technology was one of several methods that staff demonstrated to their colleagues and was discussed during the day. During the interviews, several members of staff expressed an intention to use specific items of information technology hardware or software that they had seen for the first time during this training session, and stated how much they had learnt from the skills of their colleagues.

In School 9, a large proportion of the internal training for staff on the use of information technology with pupils with special educational needs was initiated by a highly motivated member of staff who ran the school's unit for hearing impaired pupils. When new multimedia equipment was bought for the unit, he invited other staff to watch a demonstration and explore the capacity of the new technology. He had also provided in-service education and training for staff in the French department and had worked with departmental staff in developing information technology resources. He had encouraged staff in other departments to increase their use of information technology, citing the benefits it gave to pupils with hearing impairments.

For many schools in the NFER project, formal training in using information technology with pupils with special educational needs was rare. Instead, it was more common for one individual to have attended relevant training, or to have developed expertise in the two areas of information technology and special educational needs at different times. Although in one case dissemination did rely on training arranged by an individual and highly motivated member of staff, the majority of schools which used this expertise most effectively had systems in place to disseminate it amongst other staff members or to promote collaboration between members of staff.

Role of support staff

In three of the schools, there was at least one support teacher with a high degree of information technology literacy. Information technology training had been provided by the schools, often building on the past experience of the support staff. In several schools, they had been given some non-contact time to develop information technology resources for the pupils with special educational needs with whom they worked. This seemed to be a highly effective strategy for disseminating knowledge of information technology hardware and software amongst both staff and pupils, as the support staff helped out in a number of different classes across the schools.

In School 5, the support teacher was receiving a lot of support from the information technology coordinator and had been given one free session a week to work solely on information technology development for pupils with special educational needs. She was using this time to develop individualised spelling tasks on the computer for pupils to use independently, for five to ten minutes per day and to investigate other suitable programs and equipment for pupils with learning difficulties. Day (1995) recognised the value of this, commenting: 'It could be more profitable [for support staff] to set aside time for the preparation of materials than spend the whole time in class' (p. 30).

Similarly, in School 7, the support teacher was involved in developing information technology teaching aids such as concept keyboards and overlays to help pupils with learning difficulties throughout the school, and was receiving continuous training and support from both the information technology coordinator and the special educational needs coordinator. School 3 had funded more formal training for a member of their support staff, on a Royal Society of Arts course on the use of information technology by primary school pupils, run by the local education authority. Although her main motivation was to develop enough expertise to be able to support Patrick, who had cerebral palsy and was highly dependent on information technology, her knowledge of information technology across the age range enabled her to become a useful resource for the school as a whole.

Use of non-contact time

In addition to allowing support staff non-contact time to develop their expertise in information technology, School 5 had also used non-contact time as a method of enabling other staff to enhance their information technology skills and evaluate the effectiveness of the systems in place to monitor information technology use by pupils. The school's information technology coordinator was using his non-contact time to compare a system of monitoring which relied on pupils and staff completing checklists of skills with another which used the pupils' folders of work, stored in the computer, to establish how far their information technology skills had progressed. The special educational needs coordinator had also been given considerable non-contact time over the past few years to develop her information technology expertise, particularly her personal information technology skills and her ability to evaluate software.

Personal exploration

In many of the schools, information technology was being used effectively by pupils with special educational needs because of innovative methods of disseminating information technology expertise amongst staff. As discussed above, many teachers took information technology equipment and/or software home to experiment with. Another informal method found to be effective included participation in the forum for special educational needs coordinators on the Internet, run by the NCET. The special educational needs coordinator in School 4 used the forum to discuss strategies for using information technology with her pupils with special educational needs.

4. CLASSROOM PRACTICE

4.1 Literature

Teacher interaction

Recurrent themes in the literature were the potential problems associated with inappropriate or inadequate teaching. Both Tingle (1990) and HMI (GB. DFE. HMI, 1992) commented on the extra teaching time necessary to set up and run effective software for pupils with special educational needs. HMI highlighted the lack of support given to some pupils with special educational needs who used basic skills programs and reported that in many schools that were visited 'such programs are used with too little discrimination and without sufficient support from the teacher' (p. 26). The importance of a high degree of teacher intervention for language programs, in particular, was emphasised. Similarly, Tingle stressed the teaching time that was required to introduce a new technology to pupils, contrasting this with the popular perception of information technology as a time-saving device for the teacher.

Social interaction

Several authors discussed the relative advantages of individual and collaborative use of information technology by pupils with special educational needs and strategies for grouping pupils during computer work. The use of information technology to provide individualised and private feedback was of particular value to pupils with emotional and behavioural difficulties. A teacher of pupils with emotional and behavioural difficulties interviewed in Hopkins' research (1991) stated that,

> *when computers are used individually the response from the machine is personal and private and this removes any fear the child may have of being ridiculed when correction is provided by a teacher in front of peers (p.144).*

Other teachers in Hopkins' study mentioned that the computer was unthreatening to users as it was perceived as neutral and impersonal. This encouraged them to persevere with their work. These advantages were equally applicable for pupils without emotional and behavioural difficulties but with generally low self-esteem. As Davidson *et al.* (1991) noted, pupils who have experienced reading failure for a variety of reasons found computers less threatening and more effective than a teacher: 'they have the time to provide large amounts of practice; they offer privacy; they can give consistent feedback' (p. 77). This was supported by Hegarty (1993), who suggested that information technology can further the process of integration within mainstream schools by providing individual attention to pupils, allowing them 'vast amounts of practice in basic skills' (p. 196), compensating for missing experiences and increasing access to specialists.

However, explicit in much of the literature was the potential for using information technology with pupils with special educational needs to address several different aims simultaneously. In addition to enabling access to the curriculum for pupils with physical disabilities or opportunities for cognitive development for pupils with learning difficulties, information technology was used to promote team working and other social skills. Fink (1990), for example, believed that solitary information technology use may further the isolation of some pupils with special educational needs. She recommended a collaborative use of computers, to increase cooperation between pupils.

The level of involvement by teachers and other pupils during information technology use by pupils with special educational needs was an important focus of the interviews and observations, and is discussed below.

4.2 Case study evidence

Contribution of information technology to curriculum differentiation

In all of the case study schools, information technology was used to help differentiate the curriculum for pupils with special educational needs and, in two secondary schools in particular, teachers felt that it had enabled a higher degree of integration than would have otherwise been possible. In School 7, all subjects were taught in mixed ability classes and information technology was perceived by staff as one of the tools which made this possible. The head considered that information technology played a significant role in differentiating work to enable those with special educational needs to cover the same curriculum as their peers and improve the presentation of their work. The geography teacher indicated that he had prepared special software programs on mapwork skills which were used only by pupils with special educational needs in his lessons.

Similarly, it was school policy not to withdraw pupils with special educational needs from any lessons in School 8, and the special educational needs coordinator considered information technology essential for providing pupils with extra support and differentiated material in the lessons in which they had particular problems.

Teacher interaction

The observations of pupils' information technology use highlighted the importance of support from the class teacher, a support teacher or another pupil to ensure they maintained their concentration levels and also to provide technical assistance. Geeta's class teacher, for example, ensured that she always used information technology with another pupil or an adult because of her continual need for prompting and encouragement as a result of her learning difficulties.

Whole-class teaching with information technology was one strategy which was used regularly with pupils with special educational needs in School 2. The special educational needs coordinator believed that this was an effective method of increasing the time each pupil spent using information technology, and allowed teachers more flexibility in their use of new technologies. She thought that information technology could be used as a similar tool to a white board, in front of the whole class. In several lessons she had used it to write a short book with her class of pupils with special educational needs, typing the words on to the computer, using a large font, as the pupils dictated them. She commented that this made whole-class teaching, and phonics in particular, more fun.

Collaborative working

Other strategies to provide an adequate level of support involved collaborative working between pupils with special educational needs and other pupils in the class while using information technology. In all of the case study schools, this type of work was also aimed at boosting the social skills of the pupils with special educational needs.

Jake, who had delayed communication skills, was always paired with another pupil for computer work to encourage him to talk and discuss the program he was using. Usually he was paired with one particular boy called Kevin, who talked a lot and was thus considered a good role model. During the sessions on the computer that were observed, Jake was much more talkative than at any other point during the day. He explained to some other pupils how to use the 'talking dictionary' CD ROM they were using, discussed which icons to click on and read aloud some of the names that appeared on the screen. His speech was also more fluent than usual. This contrasted with the written and practical activities he did during the day, when he rarely talked to pupils other than Kevin. When using a word-processing program with Rebus symbols, Jake was able to help Kevin by showing him the position of the letters on the keyboard for the words he wanted to spell. This level of cooperation was not observed in any other activity. Thus, in addition to improving his communication, the information technology also helped to foster social skills. His class teacher confirmed this, commenting that when he sat at his desk he interacted with other pupils much less.

Similarly, Geeta always used information technology with someone else due to her learning difficulties, her need for continual prompting and encouragement and her poorly developed social skills. Usually she worked with another pupil with special educational needs so that the program was appropriate for both of them. During the observations, Geeta had two sessions on the class computer, on each occasion accompanied by another pupil with learning difficulties. One of the programs involved sequencing shapes into a pattern, according to their colour and shape. Geeta worked on the task for about 15 minutes, taking turns with her friend to move the

shapes on the screen. She relied on continual prompting from her friend and the class teacher to complete the task, but was very pleased when she had achieved it.

Even when a pupil, for example, with cerebral palsy, was dependent on information technology for access to the curriculum, the class teacher took steps to promote collaborative working on the computer. In School 3, the mathematics teacher ensured that Patrick, who relied on information technology for the majority of his written work, was not isolated as a result of his computer use. In one lesson that was observed, Patrick was designated the scribe for his group and entered into his computer the information on shoe sizes and height that the group was required to collect. This was perceived as a positive advantage by other members of the group, as they were able to manipulate the information much more easily than if it had been written on paper. This counteracted Patrick's relative isolation when he was using the computer by himself.

The staff in School 6 followed the same pattern with Emily, who also had cerebral palsy. They acknowledged that she was often isolated from other pupils when she was working at the computer and so encouraged others to work with her in a group. An additional advantage of group work was that, as her information technology skills were significantly better than those of her classmates, she was perceived as 'the expert', boosting her self-esteem considerably.

During the observation in School 1, it emerged that pupils in the class were much more willing to help their classmates with special educational needs when they were using the computer than when they were engaged in other activities. This was confirmed by the class teacher who thought that information technology was considered a high status activity by most of the pupils, and she had noticed that they cooperated well over the computer when they were working in mixed ability groups. She cited the example of a language program which she thought had worked well: the more able pupils had read the words out loud and the pupil with learning difficulties had pressed the relevant keys on the computer.

Collaborative working was also perceived as minimising the extent to which pupils with special educational needs felt themselves 'different' from their classmates. This was particularly true for the older pupils such as Darren, who was 12. His mathematics teacher commented that he would never encourage him to use information technology when no one else in the class was using it, as he thought it would merely emphasise his learning difficulties, and usually paired him with another pupil for any activities at the computer.

Even when pupils were withdrawn from the mainstream class for part of the day, collaborative working on the computer was still perceived as an effective strategy. During the observations, Jessica spent the second lesson of her

day in the school's unit for the hearing impaired. She worked with another pupil on a multimedia program, adding sound captions to a story they had written. Jessica operated the program while her friend spoke into the microphone to form the captions. The class teacher explained that the objectives for the lesson were to improve their oral skills and also their ability to negotiate.

Methods of teaching information technology skills

Pupils with special educational needs were also paired with others when information technology skills were first introduced. The usual approach to teaching information technology in the classroom in School 5 was for two pupils to learn a new skill or program and then pass it on to others. This practice was also used in School 4, along with several other strategies for using information technology with pupils with special educational needs which were outlined in the school's information technology policy (see Figure 4.1).

In addition to promoting the social integration of pupils with special educational needs, methods which devolved the teaching to pupils also reduced the time the teacher had to spend introducing a new technology. These strategies thus addressed the concerns raised by Tingle (1990) and HMI (GB. DFE. HMI, 1992), who questioned the perception of information technology as a time-saving device.

Figure 4.1 Extract from School 4's information technology policy

Special Needs

We believe that all children should have equal access to information technology equipment regardless of ability. We will ensure that children are taught information technology skills which are appropriate to their needs using the following approaches:

- Opportunities will be provided for children to work alongside a more able and sympathetic peer who can help the development of their information technology skills.
- Introducing new skills to a small group of children enables the teacher to provide the child with a known group of children whom they may refer to for help.
- Where human resources allow, adult support will be provided on an individual basis to teach new skills and to support the development of skills.

- We are aware of the importance of developing the self-esteem of a child who has special needs. We will support this by providing opportunities for the child to teach their skills to other children
- We will plan activities which have clear learning objectives and recognise that a child will make greatest progress if learning objectives are small and achievable.
- We will ensure that we have software and information technology equipment available to meet the needs of all children regardless of ability.
- Regularly updating 'My list of computer skills' for each child will enable the teacher to provide opportunities for the child to acquire skills relevant to her level of development as well as ensuring that she is able to meet success.
- The progression outlined in the scheme of work will enable teachers to plan activities relevant to a child's individual level of development and once again to ensure that she is able to meet success.

Type of work that information technology was used for

Teachers in almost all the case study schools emphasised the importance of establishing strong links between activities on the computer and other work done in the classroom and this was borne out by the majority of the observations. In the cases where the information technology was used to provide physical access to the curriculum, mainly for pupils with physical disabilities, the work was usually identical to that undertaken by the other pupils in the class. However, even for those pupils with learning difficulties, for whom information technology was used to extend their cognitive capacities, tasks were tailored to complement other activities going on in the class.

In the withdrawal unit in School 2, the computer was used to extend the shared writing activity that had preceded it. Jake and his friend typed the story they had written on to the computer, using software which produced Rebus symbols which corresponded to, and reinforced, the words they typed. In School 1, two different mathematical programs were used as part of a carousel of five different activities for Geeta, who had learning difficulties, during a morning which was devoted to mathematics for all pupils in the class.

5. MONITORING AND REVIEW

5.1 Literature

The HMI report *Information Technology and Special Educational Needs in Schools* (GB. DES. HMI, 1990a) stated the benefits of systematic monitoring and review of information technology use:

> *In schools with a strong emphasis on the observation and recording of pupils' progress, the use of information technology by pupils and their response to this technology is beginning to be recorded. Such record keeping informs curricular planning and contributes to the schools' increasing confidence both in using information technology and in making judgements about the value of particular materials (p. 20).*

Day (1995) also recognised that:

> *It is important that schools keep records of the use of information technology by individual pupils, in order to assess how effective the provision is. The purpose for which the information technology is being used and the strategies employed by the user are as important as its frequency of use. Running records, home–school books, self-evaluation sheets and checklists are all useful methods (p. 32).*

Although few other sources addressing use of information technology by pupils with special educational needs focused specifically on mechanisms for monitoring and review, it was decided to explore how record keeping contributed to effective information technology use and to document progress since the publication of the HMI report cited above. Again, these mechanisms were not specific to special educational needs and information technology, but were part of wider whole-school strategies.

5.2 Case study evidence

The most common method of monitoring use was by means of class teacher records. However, where information technology was mentioned explicitly on a pupil's individual education plan, it was usual for it to be monitored separately. In School 6, for example, information technology was monitored alongside other curriculum areas for pupils with physical disabilities. Individual record books were used to record every lesson and these were then reviewed by the special educational needs coordinator at the end of every week. Similarly, in School 9, individual work plans were used to record progress in all areas for pupils with hearing impairments for whom information technology was an important tool in developing their language

skills. These were reviewed and new ones written every half-term. The special educational needs coordinator in School 4 highlighted the importance of regular communication between staff: informal monitoring occurred between reviews of the individual education plan as support staff informed the class teacher if any difficulties arose. These would then be discussed with the pupil's parents on an informal basis if necessary.

However, for the majority of pupils for whom information technology was not specified in their individual education plan, progress in information technology was monitored in the same way as for all other pupils in their class as their use of information technology was not considered significantly different. In School 8, this was by means of an annual audit of information technology carried out by the school's information technology coordinator. A method that was considered very effective was to involve both teachers and pupils in the monitoring process. In School 4, all staff were required to keep 'subject progression sheets' to plan and record the steps taken towards meeting the information technology targets specified in the schemes of work (see Appendix 3). Additionally, checklists of computer skills were completed by pupils on a regular basis to indicate what they had learnt (Figure 5.1).

Figure 5.1 Example of checklist: 'My list of computer skills' from School 4

Using Claris Works	Skill	Date
I can	use the space bar	
	write a sentence with the keyboard	
	return	
	delete	
	make a capital letter	
	turn printer on and print	
	save on the hard drive	
	save onto a disk	
	quit	
	open a file	
	open a program e.g. Claris Works	
	open At Ease	
	change a word within a sentence	
	turn the computer on	

Figure 5.2 Example of checklist from School 5

In a writing program, I can...		
Skills	**Your Tick**	**Teacher's Tick**
Correct my work using the cursor keys to move around the document		
Use the spell check to check and correct my work		
Enhance text using underline, bold and centre		
Change the font		
Change the letter size		
Make a text box and write in it		
Make a picture (graphics box)		
Alter the size of a box		
Put clipart into a graphics box		
Put clipart into a graphic		
Alter the picture to fit it		
Border a box		

Both forms of evidence were then monitored by the information technology subject coordinator to ensure that all pupils were making adequate progress in their use of information technology. In School 5, a similar method was used (see Figure 5.2). Pupils were required to complete information technology skills cards to show what they had learnt to do, and these were then countersigned by their teacher. Additionally, each pupil was given his or her own folder on the computer in which to keep copies of all the work done. The class teacher was required to monitor all folders to assess how the pupils were progressing. Both these methods were used in all classes throughout the school and in the unit for pupils with hearing impairments.

Additional methods, such as observations and discussions were outlined in the school's information technology policy:

Figure 5.3 Extract from School 5's information technology policy

The use of information technology is monitored by:

- classroom observation
- discussion with pupils
- inspections of schemes of work, overviews and teaching plans
- observation of stored and displayed children's work
- inspection of pupils' target sheets

Differences between phases were likely to influence the approach to monitoring and review that the school adopted. Darren's secondary school, for example, viewed information technology as a tool rather than an end in itself and had adopted subject-specific criteria for monitoring and evaluation rather than specific information technology criteria. These were not set until pupils started studying information technology as a separate subject in Year 9.

6. SUMMARY AND CONCLUSIONS

The interviews with staff, observations of pupils and review of the literature highlighted a number of key areas which underpinned effective use of information technology by pupils with special educational needs.

It is important to establish *continuity between work done at home and at school* for pupils with special educational needs.

Portable computers increased the opportunities for pupils to consolidate the work done in class at home. In many cases, laptops heightened the motivation for pupils to complete work at home and also provided those with physical disabilities or specific learning difficulties with the means to revise work easily. When equipment was not funded via the statements for individual pupils, some schools had adopted whole-school strategies to provide pupils with laptops for work at home.

Teachers need *easy access to differentiated material* on the computer.

If a wide variety of material for a range of different age groups was pre-loaded or available on a network, then teachers were able to save time setting up work for their pupils with special educational needs. Furthermore, these strategies helped to integrate pupils with special educational needs by obviating the need for any separate software, thus reducing the degree to which the programs they used were perceived as 'different' by other pupils.

Detailed planning requires *collaboration between those who have expertise in information technology, special educational needs and different subject areas.*

In all the case study schools, a key component of effective planning was found to be collaboration between staff. Collaborative working also allowed examples of good practice to be disseminated more effectively throughout the school.

Staff need to *receive training and be given time to experiment.*

The majority of class teachers had gained their knowledge of software and established what was appropriate to use with their pupils with special educational needs through experimentation on a school or home computer at the end of the school day. One method of facilitating this, which was found to be particularly effective, was the provision of a small number of laptops for loan to staff. Other strategies drew on the expertise within the organisation such as an informal mentoring system or information technology curriculum group.

It is important to *invest time and training in support staff* so that they can use information technology effectively in their work with pupils with special educational needs.

Support teachers were used effectively in several schools to demonstrate good information technology practice with pupils with special educational needs as they moved from class to class and worked with different pupils and their class teachers.

Special educational needs coordinators who *develop information technology expertise* are providing a critical role in ensuring effective use.

Strong leadership was an important factor in many of the case study schools in ensuring a high level of information technology provision and use by pupils with special educational needs. In several schools, this leadership was provided by special needs coordinators who had developed considerable information technology expertise while acting in another capacity.

***Group working* improves classroom organisation when pupils find it difficult to use information technology effectively on their own. It can also make a substantial contribution to improving social skills.**

Pupils with physical disabilities and those who were dependent on information technology to access the curriculum were generally able to use it independently, with relatively little input from the class teacher or other pupils in the class. However, this was not the case for some of the pupils with learning difficulties, who required substantial input from others to be able to use the information technology effectively. Various strategies were used to provide this including:

- whole-class teaching for pupils with special educational needs, using the new technologies;
- pairing the pupil with special educational needs with another of similar ability;
- pairing the pupil with another of different ability to act as a role model.

Many of the teachers who were interviewed perceived strategies to promote collaborative working as equally necessary for pupils with physical disabilities. Although they required much less support to use the information technology effectively, teachers felt that group working minimised the potentially isolating effects of using a computer situated away from other pupils, usually at the edge of a classroom.

Progress of pupils in using information technology should be *recorded and evaluated.* Teachers considered involving pupils in the recording to be an effective strategy.

Generally, separate records were kept for those pupils who were dependent on information technology to provide physical access to the curriculum or for whom information technology was an essential tool for improving the presentation of their work. For the majority of the others, class teachers usually relied on the same methods they used for their mainstream peers. Teachers considered that the most effective methods for monitoring use were those that required input from both teachers and pupils.

Evidence from this study highlights the potential of information technology but underlines as well the key management and training issues which have to be addressed. At present, effective use in a school still appears to be highly dependent on effective special educational needs coordinators. Strategies need to be considered for further embedding special educational needs and information technology experience and expertise in each school. This can only happen when:

- collaboration in planning takes place;
- training is provided for the majority, rather than the minority;
- successes and weaknesses are reviewed by the whole staff.

Finally, the importance of the contribution of the home to the continuous and progressive development of information technology with special educational needs pupils must not be overlooked.

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APPENDIX 1

Details of Case Study Pupils

Pupil	School year	Stage of Code of Practice	Nature of special educational need	Any individual IT equipment
Jake	1	5	Communication disorder	None
Geeta	2	3	Moderate learning difficulties	None
Emily	2	5	Cerebral palsy	Shared use of A7000 computer with own trackerball, keyguard and speedy keys
Jonathan	5	5	Dyspraxia[1]	Laptop/electronic typewriter
Billy	6	2	Learning difficulties	None
Patrick	6	5	Cerebral palsy	Lightwriter[2], Archimedes computer, monitor and printer
Zeina	6	5	Hearing impairment	Laptop
Jessica	7	5	Hearing impairment	None
Darren	8	2	Specific learning difficulties	None
Sarah	13	-	Moderate learning difficulties	None

[1] Dyspraxia is an inability to carry out voluntary purposive movements but is not caused by paralysis or defect in muscular coordination. Dyspraxia sufferers generally need help in training or retraining skills that other children learn more readily.

[2] A lightwriter is a device which enables the user to communicate orally with others. The user types in the words or sentence that they want to be spoken and the lightwriter 'speaks' using synthesised speech.

APPENDIX 2

Further Information about the Methodology

Observations

Prior to the school visit, staff were asked to identify one pupil with special educational needs for the basis of a case study. Researchers then spent one day tracking the pupil and observing their actions in all lessons using an observation schedule. The schedule was developed to cover the following issues:

- the information technology available in the classroom;
- the information technology used by the pupil with special educational needs and that used by any other pupils;
- the extent to which the task the pupil was engaged in differed from that of the others in the class;
- the success of the pupil with special educational needs in completing the task set, their level of concentration, interaction with others and any problems they encountered;
- strategies used by the teacher to manage the information technology used in the classroom, including the location of the information technology equipment, the number of pupils using it and interactions between the teacher and the pupils;
- the social integration of the pupil with special educational needs.

The pupil with special educational needs was tracked for the whole day, including any lessons in which they did not use any information technology. This enabled a comparison between their behaviour whilst using information technology and that at other times.

Interviews

A second day was then spent interviewing teachers involved with the pupil, and other staff who could provide a wider perspective on school policies and practice. As most of the interviews were held on the day after the observations had taken place, it was possible to ask staff to reflect on the particular types of information technology that had been used the previous day as well as other issues specific to the case study pupil such as the contribution of information technology to meeting the targets defined in their individual education plan. Other issues covered in the interview schedules included:

- the planning, funding and management of information technology in the pupil's class, and in the school as a whole;
- mechanisms for monitoring and reviewing information technology use;
- the training and support available for class teachers within the school and externally;
- perceptions about the role of information technology in facilitating curriculum differentiation and social integration.

Interviews were held with a wide range of staff, including:

- class teachers;
- support staff;
- special educational needs coordinators;
- information technology coordinators;
- heads/year heads;
- staff in withdrawal units.

A total of 36 staff were interviewed across the ten case studies. Where possible, the case study pupils were also interviewed about their perceptions of the information technology they used and what they liked and disliked using it for. However, due to the nature of some of the special educational needs, it was possible to interview only seven of the pupils.

A semi-structured interview schedule was used in the interviews, with similar areas for discussion for all staff interviewed in each of the schools. This allowed interviewers to pursue interesting themes not originally anticipated, but ensured that all researchers were covering broadly similar themes. The notes taken during the interviews and observations were then written up according to specified categories to enable comparisons to be drawn between the case studies as well as ensuring consistency between researchers.

Appendix 3

School 4's Scheme of Work

Word-processing Progression

Early Years and Unit 1

Early Years:

All the following activities will use Claris Works:

To be able to use the concept keyboard to print names, numbers, etc. ...

To start to use features on the keyboard, including 'space bar', 'delete', 'return'.

Unit 1:

All the following activities will use Claris Works:

To independently use the keyboard for writing including all of the features such as the 'space bar', 'return', 'delete', and 'shift' key for capitals.

To be able to independently save, load and print their work.

To be able to select words by double clicking.

To start to select words and sentences by dragging with the mouse.

To start to learn about fonts, text size, style.

To be able to quit and find saved work.

To be able to notice the uses of word-processing in the outside world e.g. difference between printed labels and hand written labels, discuss how letters sent home have been written, etc. ...

Word-processing Progression

Unit 2

All the following activities will use Claris Works:

To learn to present their work and make decisions about fonts, text size, text colour, alignment, editing text, etc. ...

To learn to edit their work and use the following skills:

- selecting by dragging and clicking;
- spell checking;
- incorporating writing and painting boxes into their work;
- starting to cut, copy and paste;
- tabbing;
- using columns;
- adding date, time, footer and header.

To discuss their work and make comparisons with other methods of presentation, e.g. pencil, pen, typewriter ...

To discuss whether or not this was the best method of presenting their work.

Word-processing Progression

Unit 3

All these activities will use Claris Works:

To be able to edit their work independently, using a wide range of word-processing skills, e.g. moving text

- incorporating text, pictures, tables, spreadsheets, etc.. into one piece of work
- spell checking confidently
- cut, copy, paste from other programmes, CDs and on their existing piece of work
- using the Thesaurus
- using writing boxes and painting boxes independently
- using Page Set-up
- altering the arrangement
- changing page size on screen
- saving work to floppy disks
- using shortcuts

To be able to present their work showing both an awareness of their audience and the appropriate method of presentation for their piece of writing, e.g. report, letter, newspaper ...

To be able to evaluate their use of the word processor and compare with alternative methods of communication.

To learn how to programme the Concept Keyboard and to be able to design an overlay showing an awareness of the design which is appropriate for a particular user.

To be able to discuss and understand the implications of the word processor in the wider world, e.g. in offices, newspapers, book writing, etc. ... To learn about alternative methods of communicating information, e.g. **Fax, EMAIL and understand where they are used and the implications of using them**.

Appendix 4

School 1's Programme of Study Showing Links between IT Skills and Topic Areas

POS	Programmes of Study	Activities and Skills to develop	Assessment Focus		Resources and Software
			Skills	Knowledge	
	Learn to communicate and handle information	**AUTUMN—OURSELVES** Word process own name on to computer using 'Pendown'	CONTROLLING AND COMMUNICATING INFORMATION Able to select options when using electrical devices to produce different outcomes	Understand switching on and off domestic machines	Pendown ROAMER
2b	Enter and store information	Use the ROAMER		know how to control some machines, e.g. tape recorder	
	Controlling and modelling	**SPRING—ELECTRICITY** Learn how to control electrical appliances.	Able to switch ROAMER on	Know that control is built into many everyday products	
		Use the tape recorder and listening centre			
3a	Recognise that control is integral to many everyday devices		Can make cursor and ROAMER move forwards and backwards	Know that computers can be used to produce drawings, paintings, designs, patterns	Pictogram
		SUMMER—WEATHER AND SEASONS		Understand use of space bar	
3b	Give direct signals or commands that produce a variety of outcomes, and describe the effects of their actions	Collect data to draw graphs. Use 'Pictogram	Can make the ROAMER turn		
			Able to use the return keys	Understand that buttons or commands make things work	
		Collect information on very simple data collection sheets prepared by teacher. Make class pictograms			