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ICT in Schools

Effect of government initiatives

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Progress report April 2002

HMI 423

A report from the Office of Her Majesty's Chief Inspector of Schools

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Introduction

1 This is the second progress report by the Office for Standards in Education (OFSTED) on the effects of the government's information and communications technology (ICT) initiatives for schools. The report draws its evidence mainly from visits to schools and local education authorities (LEAs) by Her Majesty's Inspectorate (HMI) and Additional Inspectors recruited by OFSTED for the purposes of evaluating the initiatives. Additional evidence is taken from the findings of OFSTED's national programme of school and LEA inspections.

2 During the summer and autumn terms of 2001, HMI visited 368 schools in total: 113 primary schools, 239 secondary subject departments and 16 special schools. They visited eight LEAs in relation to their support for ICT, involving a further 15 school visits and interviews with senior LEA officers. Visits were also made to four of the eleven Regional Broadband Consortia (RBCs), involving an additional 15 school visits. The four were chosen because of their relatively advanced stage of development.

3 The term 'ICT' is used in this report to mean the subject of information and communications technology as well as the infrastructure and resources (telecommunications, networking, cabling and so on) needed to run it.

4 The use and awareness of ICT within schools have continued to grow since OFSTED's first progress report in April 2000. Much information from government sources has been made available to schools on the Internet and LEAs have been required by the government to increase their use of electronic communication with schools. A DfES statistical survey (2001) shows that 96 % of primary schools and all secondary schools were connected to the Internet. Pupil to computer ratios rose from 18:1 in primary schools and 9:1 in secondary in 1998 to 13:1 and 8:1, respectively.

Background

5 In 1997, the government announced plans to encourage the widespread use of ICT in teaching and learning in maintained schools. Its main aims were to:

- equip schools with modern ICT facilities
- create a National Grid for Learning (NGfL) containing educational information and study material
- organise in-service training for teachers and school librarians to enable them to use ICT effectively in their work.

6 The government's key targets for 2002 included:

- all schools, colleges and public libraries, and as many community centres as possible, to be connected to the NGfL
- Britain to become a centre for excellence in developing software content, and a world leader in exporting learning services
- serving teachers to feel confident and be competent to teach using ICT within the curriculum

- school-leavers to have a good understanding of ICT, with measures in place for assessing their competence.

ICT Initiatives

7 The DfES determines ICT policy for education and steers the implementation of most aspects of the government's ICT strategy for schools. This involves working with the ICT supply industry, LEAs, the Teacher Training Agency (TTA) and the British Educational and Communications Technology Agency (BECTa). The New Opportunities Fund (NOF), a non-departmental public body sponsored by the Department of Culture, Media and Sport (DCMS), has responsibility for managing and funding the teacher training programme, using policy directions drawn up in consultation with the DfES and the TTA.

8 The government established Regional Broadband Consortia (RBCs) of LEAs in 1999 to investigate the provision of broadband connections (providign more data per second) to schools through the procurement of an appropriate infrastructure. RBCs have focused on the capital procurement of their regional infrastructure and on meeting the government's target of connecting 20 % of schools to broadband by August 2002. They have also worked on the development of content-interactive learning materials.

9 Other significant funded schemes include the distribution of laptop computers for headteachers and consultants working on the National Numeracy and Literacy Strategies (NNS and NLS). The Computers for Teachers Scheme is now in its third year. Over 50,000 teachers have benefited from this and related schemes; in January 2002, a £50 million extension to the scheme was announced. During 2000/01, the National College for School Leadership (NCSL) worked with BECTa to run pilot courses for senior managers in primary and secondary schools in the management and leadership of ICT.

10 Contracts have now been awarded to provide online support for teachers who have followed the NOF teacher training programme, with an emphasis on classroom applications. The government has also announced its intention to support the Curriculum Online project, which will see the production of digital learning resources across subjects and key stages.

Funding

11 DfES funding for the NGfL amounted to £657 million over four years and began in April 1998. This was distributed to LEAs via the Standards Fund. In 2001, the NGfL scheme was extended, with £710 million of additional funding for 2002/04. The total spend – actual and planned – over all related initiatives from 1998 to 2004 is £1.8 billion.

12 From April 1999, £230 million of Lottery funds were made available, across the UK, from the NOF to help increase the competence of all teachers in their use of ICT in teaching and learning. The scheme uses independent training organisations, approved by the NOF and quality-assured in England by the TTA. The NOF training has been extended to December 2003, with schools having to sign up for the training by March 2002. In England, 340,000 teachers, about 83% of those eligible, had signed up for the programme by December 2001 and this is a significant improvement in enrolment figures at the time of the first progress report.

13 Funds are distributed to LEAs through the government's Standards Fund. Each LEA in receipt of these allocations has to provide matching funds. Some LEAs were nominated as Pathfinders to enable them to explore the value of particular patterns of networked provision or other facilities. Some Pathfinders received more generous funding than most LEAs. The DfES also made specific grants to various development agencies and software authors to support the creation of digital resources.

14 Funding for the work of RBC is allocated from central NGfL funds on a year-by-year basis.

Main Findings

- The NGfL Standards Fund has continued to play an important role in enhancing the ICT resources available in schools.
- Personal access for teachers to a computer for the purpose of preparation and planning is one of the strongest influences on the success of ICT training and subsequent classroom use.
- In response to the recommendation in OFSTED's first progress report, the NOF has improved its publicity and information for schools about the training scheme and this has resulted in better recognition by schools of its main purposes.
- NOF training remains unsatisfactory in its overall effect. Training in around six out of every ten secondary schools and half of the primaries has so far failed to tackle adequately those issues relating to the quality of ICT use in classrooms. Training materials for specific subjects at secondary level ahve often failed to excite teachers. In many secondary schools, the programme has simply ground to a halt.
- In spite of this poor overall picture, there have been some improvements in the NOF training, especially where providers have acted on feedback from schools and from the TTA's quality assurance. Teachers have improved their basic ICT skills and the extent to which ICT is used in classrooms has risen, especially in primary schools.
- The NOF training is most successful where senior managers in schools take an active interest in teachers' progress, where there is effective peer support, and where groups of teachers meet for part of the training. Teachers left to their own devices to use distance learning materials in their own time rarely make the same headway.
- There has been a positive shift in LEA support for ICT away from infrastructure towards its use in the classroom to enhance teaching and learning. Nevertheless, weaknesses remain in a significant minority of LEAs.
- Regional Broadband Consortia have made satisfactory progress overall, though with wide variations. Progress towards the government's target of connecting 20% of schools (including all secondaries) to broadband services by August 2002 has been good.
- Improvements in teaching and learning with ICT are evident in those schools that have been connected to broadband services.

Commentary

General observations

15 This report confirms the broad picture of OFSTED's first progress report that government funding of ICT resources through the NGfL continues to make an important contribution to the development of the ICT curriculum in schools. It is also the case that the associated training for teachers has not had as widespread an effect on classroom practice as intended, or as might reasonably be expected at this stage of the programme. There have been improvements in pupils' achievements in ICT and in the teaching of ICT, but it is the effective application of ICT across subjects that needs to improve most.

16 The strengths in teaching identified in this report stem from other factors as well as government initiatives. These include ICT requirements of the National Curriculum in each subject and, in design and technology, the provision of high-quality training and software for computer-aided design and manufacture (CAD/CAM). There is, however, evidence that the climate created by the NGfL and the NOF initiatives provided a positive context for development. For example, where subject development of ICT had stalled, it was given a new impetus by the initiatives.

Teacher training

17 There is now an unprecedented willingness in the teaching profession to embrace ICT. Initial teacher training has provided a strong emphasis on the use of ICT across the curriculum. As a result, newly qualified teachers accept ICT as an integral part of their professional life, as do many of their more experienced colleagues. These teachers understand the criteria involved in judging the effectiveness of ICT in lessons. However, there are still too many teachers who struggle with an unfamiliar technology and are sometimes apprehensive about using it. These teachers in particular need good professional support to help them move forward. The training funded by the NOF fulfils this role only partially, and continues to disappoint many teachers. Nevertheless, the existence of the scheme has raised the profile of ICT training in many schools, and it has helped teachers to improve their ICT skills significantly.

18 The range, scope and complexity of web-based materials are continually increasing, especially as broadband services to schools become more commonplace. The NOF training methodology is therefore intended to point teachers in the right direction rather than provide a definitive prescription for using ICT as a classroom tool. Unfortunately, the training often lacks sufficient relevance to individual subjects to do this effectively. For many secondary teachers, the training materials do not sufficiently engage them or make them want to explore the application of ICT to their subject.

19 The most positive influence of training funded by the NOF often occurs where schools feel confident in adapting the materials to meet their own needs. For example, some schools select the training units most relevant to them, rather than working slavishly through the entire set. The involvement of LEA advisory staff in supporting such selection often gives schools the confidence to do this. Where schools are dissatisfied, there is evidence of providers refunding their money and the schools switching to more successful trainers. Some schools remain unaware of their power in this respect.

20 Because of the way that existing resources are distributed within schools, the lack of opportunities to try out what they have learned in training is an issue for many subject teachers, especially in secondary schools. For example, where computer rooms are heavily timetabled for ICT lessons, it is difficult to book these rooms at appropriate times. This situation often arises from a lack of realism in whole-school ICT planning, for example aiming to do too much within the resources available. Schools generally need to match deployment options more carefully to their whole-school ICT objectives, and to seek greater flexibility, for example through the use of clusters of machines located in departments or faculties or sets of laptops with wireless links to existing networks. That said, many popular schools simply run out of space in which to locate more computers.

21 The experiences of the NOF scheme highlight the need to consider how best to match training approaches to the individual learning styles of teachers. Some respond better to online work, for example, while the optimum level of face-to-face tuition also varies. All teachers, however, are likely to benefit from the provision of allocated time in which to undertake this professional development, especially at a time when they are assimilating major changes on a broader front.

Access to ICT

22 Since the last progress report, broadband connections have been provided in a growing number of schools. The RBCs developed these services, involving LEA staff collaborating at a regional level. Where broadband connections have been made, the improved reliability has affected teachers' perceptions of what they can achieve and has further raised the overall level of ICT use in the school. The development of the provision of broadband services to schools would now benefit from being part of an overall national strategy.

23 BECTa's study, ImpaCT2[i] points to high levels of home access by pupils to ICT generally and the Internet in particular. Planned government funding will support the Curriculum Online project by stimulating the market for the materials, which will be readily available both in school and beyond. These materials will offer intelligent, individual responses to learners in all key stages and subjects and will be available to teachers in school, to pupils and their parents or carers at home, and in community and other centres. There is therefore likely to be considerable growth in access to good learning materials outside schools for many pupils. Schools will need to consider how best to take advantage of this and how to cater for pupils who do not have access to ICT outside school.

Planning

24 The ability of senior managers to plan for ICT developments continues to improve, as does the support for this process provided by LEAs, but there is still some way to go. Good support ensures that schools focus on how ICT will have a positive effect on teaching and learning across the curriculum alongside the appropriate development of pupils' skills, knowledge and understanding of ICT itself. Since the first progress report, the National College for School Leadership (NCSL) and BECTa have run pilot training courses for headteachers and deputies on the management and leadership of the ICT curriculum. This is an important development that needs to be extended if schools are to make the most of the extensive expenditure in ICT.

25 Inspection evidence indicates that ICT is capable of improving the quality of teaching and learning for individuals, even though this is not yet the norm in schools. Demonstrating a clear and consistent influence on attainment remains

more elusive. This report includes examples of how ICT can improve teaching as well as pupils' achievements across subjects. If the transition from improved provision to better outcomes is to become more commonplace, increased consistency in pupils' use of ICT is required. This in turn will depend on the ability of educators to make effective use of ICT, on a continuation of funding to sustain the gains made so far, and on good management and leadership in schools.

Recommendations

At national level, there is a need to:

- initiate discussions in schools where the training funded by the NOF is unsatisfactory, the TTA and the NOF between the schools and the providers to address the situation, either by improving materials and processes, or by facilitating a change of provider where appropriate
- plan for the continuing support for different groups of teachers after the training scheme funded by the NOF ends, including subject groups in secondary schools and groups who have gained little from the current scheme
- set out broad intentions with regard to any future specific funding of ICT beyond 2004 to ensure that recent advances in ICT resources in schools are maintained
- develop a long-term unified national strategy for broadband services, to include a wider range of services such as libraries, community learning centres, museums and galleries alongside industrial, commercial and domestic uses
- integrate training in the strategic management of ICT into the national training programme for senior managers in schools, by building on the pilot courses run by NCSL and BECTa
- develop further the role of ICT in the National Literacy Strategy, National Numeracy Strategy and Key Stage 3 Strategy in order to complement the NOF training scheme and any subsequent national schemes
- provide guidelines on the assessment of ICT capability as part of the ICT strand of the Key Stage 3 Strategy, and in Key Stages 1 and 2.

In RBCs, there is a need to:

- promote more effectively, through direct communications with schools, the role and value of RBCs as providers of content (interactive digital learning materials)
- match the best practice in content development by involving more classroom teachers
- work with commercial partners to develop content that exploits the potential of broadband services
- monitor and evaluate more effectively the influence of broadband on teaching and learning.

In LEAs, there is a need to:

- provide a clear corporate vision and strategic plan for ICT which is in line with the specific ICT objectives for education
- embed support for ICT more firmly within the various support functions for school improvement, by providing appropriate professional development for advisers and inspectors
- provide better support for senior managers in school to help them make progress in ICT development planning
- monitor, evaluate and review progress in schools in order to make more informed decisions about the release of NGfL and NOF funding
- work in partnership with teachers to develop their confidence in assessing pupils' ICT capability.

In schools, there is a need to:

- improve whole-school ICT development planning in order to make the best use of available resources, and so that teachers can reinforce new skills in their teaching and pupils can experience a wide range of contexts for their use of ICT
- establish the ICT needs of teachers following training funded by the NOF and, in particular, provide opportunities for them to share classroom experiences where ICT has been used successfully
- develop a curriculum that builds on pupils' ICT experiences outside school that contribute to their ICT competence
- maximise access to ICT for pupils without access outside school.

Effect of the Initiatives

26 The examples given below for primary, secondary and special schools are drawn from fuller ICT reports for subjects and phases, available on the OFSTED website (www.ofsted.gov.uk).

Primary Schools

Teaching using ICT

27 The use of ICT in primary schools is increasing and becoming a much more regular and effective feature of teaching and learning. The role of the NGfL in bringing about this change has been of considerable importance. As a result of funding from the NGfL and other sources, many schools have significantly augmented the up-to-date ICT resources they use. Pupils' ICT capability is improving throughout the primary years, with examples of beneficial effects on their achievements in literacy, numeracy and other subjects. However, this effect on work in other subjects lacks consistency and is still small in some schools. The gap between the best and the weakest provision is widening. Too many schools still have difficulty in managing their ICT resources and struggle to increase pupils' ICT competence, let alone use this across the curriculum.

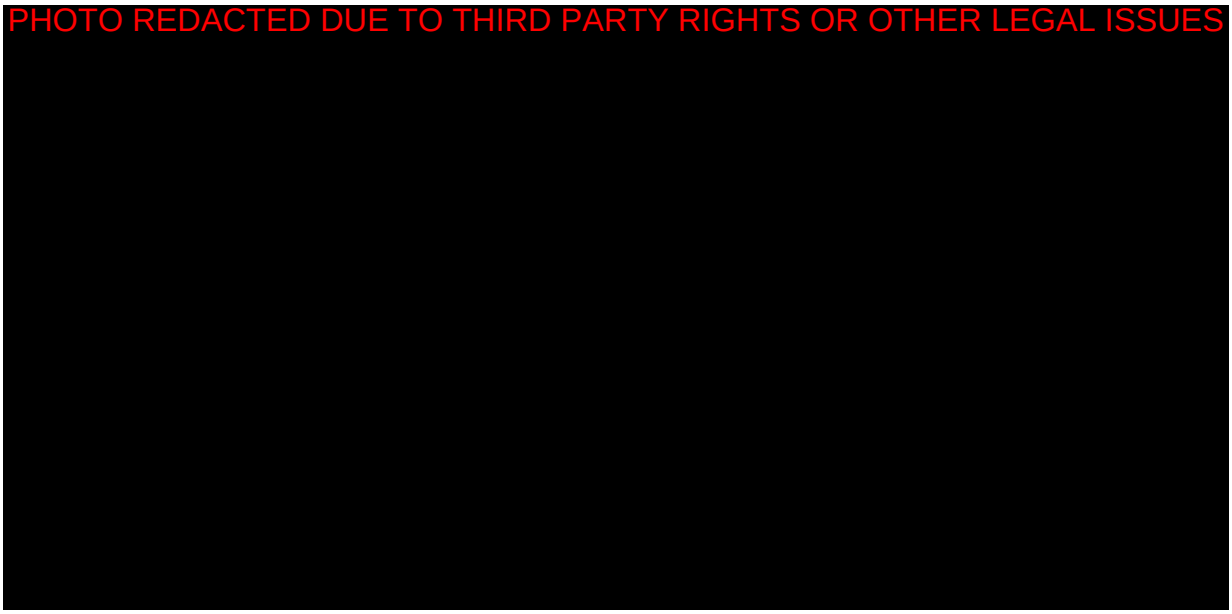
28 The use of ICT to support the national literacy and numeracy strategies is increasing, albeit slowly. In the most common and effective practice, teachers use whole-class activities, with or without the use of ICT, as a forerunner to tasks that require pupils to work in pairs or individually at computers.

> Pupils in a Year 2 literacy hour were finding information about an author using a range of resources. The pupils had researched authors in two previous lessons. They had contacted one author directly and she had provided them with resources and posters. E-mail contact with another author had been established via a commercial web site. The whole-class teaching at the start of the lesson used both a real book and the web site, projected onto a screen and operated by a pupil. The class looked at one of the works by an author and were taught how to log onto the web sites of two other authors. The class then worked in three ability groups working with the teacher and a well briefed teaching assistant. In the plenary, the pupils talked about and the differences, similarities, strengths and weaknesses of e-mail and written mail. The whole class shared the e-mails sent by one group and the written records of another. The pupils' response was excellent. They showed a high level of independence and navigated the technology without assistance.

29 Many teachers find it easier to use ICT during a literacy hour or daily mathematics lesson when a projector and screen are available for whole-class instruction. Typically, the whole-class activities – shared reading or writing, word-level work, or oral and mental mathematics – are followed by pupils using computers in pairs or individually.

> Year 5 pupils were writing diaries with the aim of using the past tense, first person and connectives to record a memorable event they had experienced. The teacher used prepared text to reinforce appropriate sentence composition, identifying tenses and connectives in the sentences. The use of ICT enabled words to be highlighted and underlined to

emphasise relevant teaching points. Pupils practised pieces of text similar to the one used by the teacher. The teacher then led a shared writing session, typing in text while pupils offered suggestions and pointed out errors. Particularly good demonstration by the teacher showed pupils how to italicise words, how to use the spellchecker, and how to select a font and size of lettering. The discussion included the use of different words and punctuation that were appropriate to the context. Pupils then worked independently, supporting one another as appropriate, and tried out the techniques and strategies their teacher had demonstrated. The result was that pupils used their highly developed word-processing skills to use words more imaginatively, distinguish between different verb tenses and use the first person correctly.



30 Teachers often end lessons effectively with a plenary to recapitulate and extend the work done, as in the following Year 4 example.

> The session featured particularly good questioning by the teacher and was drawn together at the end with a view to extending the work. The teacher picked up a question from two pupils: 'Can we write a LOGO procedure using more than one shape?' The teacher then asked: 'How can we get the computer to draw 40 squares, 40 triangles and 40 hexagons with one instruction?' This prompted high-attaining pupils to demonstrate and explain how to complete the task using a repeat command within a procedure.

31 In the best examples, the literacy or numeracy focus is clear and the use of ICT is well chosen to match the objectives of the lesson.

> In a Year 1 literacy hour, the teacher used a prepared presentation in the ICT suite to enable pupils to practise phonics with a focus on initial sounds and consonant-vowel-consonant (CVC) words. The pupils then worked independently at computers to consolidate their learning. The lesson was directly linked to the National Literacy Strategy. The activities challenged pupils well, both in terms of increasing their literacy knowledge and understanding, and by reinforcing their ICT skills of mouse control, 'click and drag', highlighting and basic word-processing.

32 Teachers are much more confident in using a wider range of ICT resources to improve pupils' writing than previously. In some of the most common and effective literacy activities, teachers used carefully chosen texts to demonstrate the importance of extending sentences from simple to complex or compound, for instance by adding clauses and conjunctions. While editing text is commonplace, generating new text is less so, despite its importance in whole-class shared writing. This whole-class teaching approach is often helped by the availability of good-quality digital projectors and whiteboards, resources that are becoming much more widely used and available in primary schools.

33 Where training has not yet started or has failed to meet the needs of teachers, the use of ICT is usually underdeveloped in schools. Too many teachers still lack confidence in using ICT and this is often made worse by a lack of appropriate software, unreliable computers and Internet connections, and insufficient technical support when things go wrong. Common weaknesses in teaching with ICT include the following:

- Poor match between lesson objectives and ICT tasks. In too many instances, teachers set tasks that are unrelated to the objectives of the lesson. By focusing on getting all pupils to use the limited computer resources frequently and in rotation, the careful selection of appropriate tasks is neglected.

- Lack of guidance for pupils. Pupils carrying out computer tasks are left unguided by adults for long periods of time. This is most common in classrooms where computer tasks are chosen for individuals or pairs of pupils to attempt. Too often such activities become 'independent', and lack adult intervention to support, challenge and question pupils to help them gain more understanding from the work.

- When and when not to use ICT. Except when specifically teaching ICT skills, many teachers remain unsure when and when not to use ICT. A small number of teachers still give more emphasis to the 'little and often' use of computers at the expense of a 'fit-for-purpose' approach.

- Lack of teacher expertise and confidence. Many teachers feel anxious about their technical knowledge, especially when something goes wrong with hardware. This inhibits their ICT teaching and sometimes leads to a safe option for chosen activities.

- Lack of teacher intervention. In whole-class teaching, the lack of appropriate intervention by teachers during the main activity of a three-part structure is sometimes a weakness. This can result in pupils working for too long at the computer without the opportunity to reflect on their work.

- Lack of recognition of pupils' expertise. Teachers often know too little about pupils' experiences of using ICT outside school. As a result, they rarely take account of such knowledge, skills and understanding in their planning or teaching.

Pupils' achievement

34 In the early years, pupils in primary schools gain confidence in using a mouse to control the cursor on the screen, for example to draw pictures or type their names. They use CD-ROMs to gain familiarity with words, numbers and pictures and are able to match one to the other. In Key Stage 1, pupils increasingly use spelling programs or phonics exercises to practise and improve their writing. Towards the

end of the key stage, they cut and paste text and manipulate sentences to improve their writing composition.

> In the Year 1 and 2 lessons, after learning about suffixes, pupils worked on writing a newspaper article about imaginary school events. Pupils concentrated hard on word-processing and, while most typed using only one or two fingers, they were able to change the font and print size quickly and confidently. The pupils had a clear understanding of headings, subheadings, paragraphs and sentences. They had taken digital photographs the previous day and the support assistant helped them to import the pictures into their text. This extended the pupils' knowledge well and enabled them to import pictures from an external source.

35 Pupils' ability to write for an audience is often enhanced through ICT. In one school, pupils e-mailed the start of a story they had written to pupils in another school for them to complete. Key Stage 1 pupils also use ICT to manipulate numbers or to practise their knowledge of fractions and measurements. Whole-class activities often involve the use of programmable toys to give instructions and directions.

36 In Key Stage 2, pupils experience a wide range of opportunities to use the Internet. In the best examples, pupils use search engines selectively to find text and pictures to use in their own documents and they think about the best way of adapting and presenting these. Pupils also use a wide range of other applications. For example, in one primary school, Year 6 pupils gave an effective presentation of a story to Year 1 pupils using text, sounds and pictures. In another school, Year 6 pupils used a desktop publishing application to make folding brochures about their school, incorporating their own digital photographs. Key Stage 2 pupils increasingly use computers for display and presentations and such use is particularly effective when used alongside ICT resources such as digital cameras, projectors and interactive whiteboards.

37 Opportunities for pupils to use ICT to extend their achievement in mathematics are still less common than in other areas of the curriculum. When opportunities are provided, they often develop and quicken pupils' learning by enabling a focus on understanding rather than a routine skill, as in the following example.

> In a Year 4 data-handling investigation, the teacher and pupils recorded the totals from repeated throws of two dice. Following the practical work, pupils worked together to input the data into a spreadsheet prepared by the teacher. They then displayed their data as a bar chart. The need for pupils to open dialogue boxes to explain their findings was particularly helpful. Some pupils showed their ICT skills by adjusting the font and dialogue box size to suit the display.

38 The effectiveness of ICT use in the classroom is often demonstrated by the extent to which it engages pupils and sustains their attention, and in its ability to enable activities to take place that would otherwise be impossible or difficult. By extending the learning context, ICT often provides increased stimulus and it is in these examples where inspectors have observed most effect. There remains much still to do, however, in developing the confidence of teachers to judge when and when not to use ICT.

Special Schools

Teaching using ICT

39 Teachers increasingly use word-processors, presentation packages and spreadsheets in their teaching. In schools for pupils with severe learning difficulties, teachers are familiar with specialised switches and other access devices, but few are yet able to plan for the effective use of the equipment to enrich the curriculum.

40 The use of standard word-processors and specialised software to produce personalised 'big books' for the literacy hour and for other subjects enhances class discussion well. Such discussion can be very effective for scene-setting and for establishing an understanding of key vocabulary in preparation for independent individual and group work in science and humanities.

41 More use is now being made of ICT communication devices for pupils with little or no speech. The more complex and potentially effective devices are still slow to operate, however, so that teachers have difficulty incorporating pupils' use of these aids into activities in and out of the classroom.

42 As in primary and secondary schools, teaching assistants are often key players in their school's use of ICT, as the following example illustrates.

> A teaching assistant demonstrated how she had used a symbol-writing program to produce a personalised communication book for a pupil without speech. As the contents of the book were held on disk, they were readily accessible and could be updated as the pupil's requirements changed. The same teaching assistant had produced digitised pictures with accompanying words and phrases as starters for pupils' story writing. These were successful in encouraging pupils to overcome their reluctance to begin writing their own stories using either words or symbols.

43 The growing use of digital cameras can provide evidence of pupils' achievements and experiences. The increasing computerisation of records and pupils' targets is encouraging schools to analyse outcomes and trends in attainment in relation to national curriculum levels and other indicators. This helps them to engage in a greater degree of reflection upon the school's performance in relation to their pupils' achievements.

44 The quality of teaching in ICT remains lower than that in all other subjects in special schools, except in schools for pupils with physical disability and in hospital schools. Even in schools where there is good and widespread use of ICT, it is rare to find that this is fully effective across all subjects and very rare to find complete coverage of the ICT programmes of study. Very few schools, for example, give pupils satisfactory access to control technology, to data-logging or to modelling on the computer. As a result, most schools fail to extend pupils' natural progression from early software that helps them to understand cause and effect. Similarly, there are too few opportunities to develop increasingly complex mathematical skills within a practical and engaging context.

Pupils' achievement

45 The use of ICT is beginning to lead to higher achievement in almost all special schools. Pupils with severe learning difficulties are making more use of switches and toys, large rollerballs and, eventually, standard computer keyboards and

mice. An increasing amount of age-appropriate software is promoting self-image as well as the achievements of older pupils. These pupils show a readiness to use more complex and demanding software at an earlier age, and, perhaps most importantly, they are using computers with greater independence.

46 Pupils of all abilities respond positively to digital images of familiar scenes. As the images are immediately available and can be shown on large-screen displays, they enable experiences outside the classroom to be relived and discussed by classes and groups in school, thus increasing greatly the gains made from educational visits. The attitudes of pupils with emotional and behavioural difficulties towards writing can be transformed by the availability of digital images to incorporate into their text. Pupils who previously were very reluctant writers have become eager authors of text for on-screen presentations of mixed images and narratives of their own experiences.

47 Pupils are using presentational software in an increasing range of applications and this is promoting their achievement. In a food technology lesson, for example, a presentation of words, symbols and images enabled pupils with moderate learning difficulties to sequence a preparation process quite independently.

48 Pupils with severe physical disabilities enjoy access to a wider range of everyday materials and learning activities through the use of special switch and keyboard systems. As home computers become more common, schools are beginning to work with parents to ensure that pupils' access systems are duplicated at home.

> In a school for pupils with physical disabilities, a teaching assistant, specially trained in the use of ICT, helped a teenage pupil with no speech and poor hand control to customise special software to enable the pupil to use the Internet and e-mail at home. The pupil's mother was invited to school for the session to see how the system worked and how it could be fine-tuned to the pupil's requirements as their skill increased.

49 The development of newer technologies, such as the interactive whiteboard, has opened up further opportunities to support the achievement of pupils with special needs. In one school, pupils with a wide range of abilities from Years 3 and 4 were working on literacy skills.

> The aim was to aid pupils' understanding of the difference between direct and indirect speech and to help them begin to understand the punctuation of direct speech. The interactive whiteboard enabled pupils to enjoy quite vivid experiences, not usually associated with the punctuation of speech. These included taking turns to pick up the words actually spoken by a character from a sentence at the foot of the screen and to place them into the character's speech bubble. The child controlling the screen was completely absorbed in the activity, while the rest of the class observing were also fully involved, spontaneously reading from the display and eager to have their turn. There was good incidental learning about the conventions of ICT systems, as, for example, when the children learned to use the Undo command as a shortcut to return the words from the speech bubble to the sentence.

Secondary Schools

Teaching using ICT

50 There remain large differences among and within schools in the incidence and quality of subject teaching using ICT. Across the range of subjects inspected, ICT has a some beneficial effect on teaching in over four in ten departments. However, nearly one third of departments have not been affected by the use of ICT. Between these extremes lie departments in which productive developments are taking place with some good teaching using ICT, but where ICT has not yet had a significant effect on standards. There are also variations among subjects. The productive use of ICT tends to be more advanced in design and technology, although even here, there are wide variations.

51 In many very good lessons, ICT is used as a tool for demonstration, exposition or instruction. This contributes to improvements in learning. There is increasing use of data projectors with presentation software to present information to pupils or as a focus for discussion. For example, in one school all science teachers had access to a laptop computer and data projector, and prepared lesson resources using presentation software. Some presentations included simple but effective simulations designed by teachers, such as a sequence showing the movement of particles during convection and the alignment of domains as a nail is magnetised. Teachers are thus able to produce resources that exactly match their objectives and use them in a way that encourages interaction with pupils. Such resources also enable pupils to be given clear instructions and demonstrations, which are crucial to successful teaching using ICT, as in the following account of a geography lesson.

> The teacher used a projector to demonstrate maps from a web site. She modelled activities by introducing the school postcode to call up a map of the school area, and demonstrated and discussed methods of changing map scale. Pupils were encouraged to go to the front of the class to demonstrate skills such as tracing a route before turning to their own computer to pursue individual work.

52 Demonstrations using an interactive whiteboard can also enable high expectations of pupils to be more clearly communicated. In the following Year 12 A-level PE lesson, the teacher used ICT effectively to enhance the link between theory and practice in movement analysis.

> The teacher showed a video of the students' personal performances of a badminton shot. He used the interactive whiteboard to demonstrate how to download video files, incorporate still images from these into a word-processed document and annotate the images as part of an analysis of performance. The use of ICT significantly enhanced the link between the theoretical and practical aspects of movement analysis and enabled accurate annotation of performance.

53 Such teaching need not be confined to computers. Good work in mathematics with graphical calculators, for example, often uses demonstration facilities to help pupils understand the processes involved, as in the following account of a lesson with a very able Year 9 set.

> Using an overhead projection (OHP) version of the graphical calculator, the teacher demonstrated how to solve simultaneous equations by the original method while pupils used individual graphical calculators. The

teacher showed on the OHP calculator how to draw two linear graphs on the same grid, reading off the x and y values at the point of intersection. As the lesson progressed, most pupils mastered the task and undertood the process involved.

54 Good teaching using ICT begins with clarity of purpose in its use. Most often this comes with experience, and through thoughtful planning and collaboration between teachers in integrating ICT into a scheme of work. Once pupils are working on their own or in groups, effective teaching involves teacher intervention to make sure that the objectives of the lesson are met and that pupils do not become distracted by the technology.

In two parallel history lessons, pupils used presentational software. One lesson was far more productive because the teacher intervened to deepen the pupils' thinking by sharing historical ideas and persuading them to go back to sources to probe a hypothesis more closely. In the other lesson, time was lost searching for clip art and experimenting with fonts. There was less depth of explanation, and the teacher drew on pupils' existing knowledge rather than using new sources of evidence. Some pupils copied from exercise books. The lack of intervention allowed the lesson to drift, and far less was achieved.

55 Teacher intervention is also crucial in lessons involving web-based research. Good lesson preparation includes setting clear parameters for searches and bookmarking known sites where appropriate. Good teachers let pupils know that they have high expectations of the outcomes, for example by including a strong evaluative element, or by emphasising the need for relevance in a particular enquiry. They are aware too of how well pupils understand how to search effectively, for example knowing the benefits of different search engines or how to refine a searche.

56 Effective work with ICT often builds on work undertaken in discrete ICT lessons by providing fresh contexts in which pupils can apply newly learned skills and techniques, as with the following Year 8 high ability English set.

The pupils were working on a genre study of horror fiction. In the previous lesson, they had begun to write draft text and sketch design ideas for a horror fiction web site home page. They had been learning about web-page design in their ICT lessons and in the previous English unit. They were now working in the ICT suite, designing their home page with hypertext links to other pages. They referred to a worksheet, which contained clear instructions for setting up hypertext links. The teacher stressed the primacy of purpose and audience rather than design for its own sake. Pupils worked quickly and effectively in pairs, constructing their home pages and incorporating images and text from the Internet as required. Motivation was very high and the task forced pupils to summarise in a very accessible form what they had learned about the horror genre, which they did well.

57 Despite these positive gains, there are notable weaknesses in teaching using ICT. Common weaknesses include the following:

- Unclear objectives. ICT is used where other modes of learning would be more appropriate, or the potential of ICT applications is not fulfilled. For example, in English, pupils work individually on computers on activities that would be more productive if done as a group discussion or collaboration.

- Low expectations of written outcomes. The tasks set in lessons using ICT are unsatisfactory in almost one third of departments. Teachers tolerate shortcomings in ICT-based products that they would not tolerate in products produced by other means. For example, pupils used CD-ROMs to answer simple, closed questions.

- The acceptance of glossy computer-generated effects, without extending pupils' artistic or intellectual capabilities. For example, in design and technology, there is sometimes a failure to distinguish between genuine design capability and the use of the computer to give only the impression of this.

- Allowing work that simply reproduces information rather than enabling analysis. Often this is the result of simple copy and paste or download activities.

- Failure to use the full potential of particular ICT applications. For example, in mathematics, teachers do not always exploit the power of the data-handling facilities on graphical calculators or the facility of graph-plotting software to transform general shapes.

Pupils' achievement

58 ICT makes a good overall contribution to pupils' achievement in around four in ten subject departments. In over two in ten, its contribution is unsatisfactory, with time spent sometimes being counter-productive. In the remaining schools, pupils' access to ICT is limited or sporadic in subjects across the curriculum, so that they are unable to apply or reinforce their ICT skills to enhance their learning.

59 Pupils generally use ICT well for production, presentation and display; such use is good in over half of schools and unsatisfactory in fewer than one in ten. Generic word-processing software enables pupils to give more sustained attention to amending and redrafting their text, which, in turn, can help them to improve their writing, think more about audience and purpose, argue a case more effectively, explore writing styles, and to shape and draw conclusions. It also helps them to develop subject thinking. For example, in a school where the use of ICT in English was well developed, pupils regularly word-processed much of their work and used desktop publishing packages to display it to best effect. They also used ICT to plan and draft their work and to import or scan in images. They used digital cameras imaginatively to construct good visual effects: for instance, in producing brochures of the local area for visitors.

60 The use of ICT often leads to positive effects on the quality of presentation of pupils' work, as in the following examples.

> A Year 10 GCSE history class produced a leaflet with text and visuals on the causes and consequences of the Wall Street Crash. Pupils' achievement was raised because of the capacity to experiment and redraft, and produce a professional leaflet. Because pupils came to the task well prepared, but composed their text on screen, the ICT supported the development of historical thinking.
>
> In a geography lesson on environmental problems in the local area, pupils tested hypotheses, producing reports with images they had taken with a

digital camera, annotated with text boxes to set the context for their analysis. This approach was particularly motivating to the middle and lower-attaining pupils, and resulted in high achievement.

61 Increasingly, pupils make good progress in the use of multimedia packages. In the example below, an art department offered pupils a range of ICT-based work that complemented and extended their work in other media.

> In Year 9, pupils completed a substantial unit of work using a digital camera, scanner, desktop publishing software and a photocopier, together with traditional painting and drawing materials, to produce a package based on David Hockney's use of photomontage and joiners.

62 Achievement in the retrieval and exchange of ICT-based information is good in four departments in ten and unsatisfactory in nearly two in ten. Ready and reliable access to the Internet is relatively recent in most schools, and can often be traced to NGfL funding. The Internet offers vast scope in the range and variety of educational resources and, where achievement is high, it often reflects well-planned use to meet clear subject objectives. In Modern Foreign Languages (MFL), for example, pupils frequently retrieve information to develop their learning through comparisons with other countries and communities, and benefit from using authentic French or German web sites. In art, the Internet is frequently used to research the background or work of artists. The most profitable research is focused on finding out about modern artists, especially where there is little information in book form or where the work is linked to visits to art galleries.

63 Sometimes pupils use the sites they have found to develop an understanding of bias, as shown in this account of a Year 11 RE lesson on abortion.

> The purpose of the lesson was to detect bias on Internet sites in preparation for researching abortion on the Internet for GCSE coursework. Pupils analysed three sites and compared the authority, accuracy and objectivity of each. They had no difficulty in deciding on the provenance of sites, but the process of judging accuracy and objectivity prompted lively and informative discussions. The pupils acknowledged that the lesson had considerably extended their insights into the use of the Internet and they felt well prepared to undertake a balanced and critical investigation into abortion.

64 Although the use of e-mail is at a relatively early stage of development, it is sometimes used to good effect. In a few English departments, for example, pupils use e-mail regularly to exchange work in progress with other pupils or staff, or to communicate beyond the school. The use of e-mail in MFL is rare, despite the immense possibilities it offers for communication with 'real audiences' abroad. Many schools understandably adopt a cautious approach to the use of e-mail because of the safety issues involved. They are seeking ways of monitoring pupils' correspondence without hampering good curriculum development.

65 Increasingly, the use of spreadsheets is making a positive contribution to achievement in mathematics. In GCSE coursework investigations, for example, many pupils are able to explore ideas quickly and efficiently using spreadsheets. In one lesson, pupils used spreadsheets to explore the area enclosed by a fixed length of fencing for an increasing number of sides, plotting their results and noting how the area approached a limiting value.

66 In science, some of the best use of data-logging exploits the capacity of electronic instrumentation to respond rapidly or monitor changes for long periods of time. For example, in one school, a Year 12 class captured and analysed data in an experiment to investigate the discharge of a capacitor through a resistor. A spreadsheet was then used to plot a decay curve. The use of ICT, carefully guided by the teacher, enabled the students to focus on the principles involved rather than spending much time on recording and carrying out many repeat calculations.

67 Achievement in producing, exploring and improving designs is good in half of the relevant subject departments and unsatisfactory in nearly two in ten. In design and technology, the most significant area of improvement is in computer-aided design (CAD). Pupils make good use of three-dimensional CAD software in an increasing number of schools. Licence agreements enable pupils to install the programs on their own computers at home, often leading to rapid progress by highly motivated pupils, and producing many high-quality examples of work. Pupils studying GCSE music sometimes combine acoustic and electronic facilities well, using sound samplers and multi-track recording techniques to compose and perform their own pieces. They use the recording and editing facilities to refine their work and to improve or extend the musical content.

68 ICT is used creatively in a variety of other ways. For example, in one art department, Year 10 pupils used software to metamorphose images of the human face, captured with a digital camera, into tonally defined landscapes, as part of a well-designed lesson on natural forms. ICT enabled students to generate quickly a number of rich sequences that a more conventional process would have taken them many hours to produce. In a PE trampolining lesson in another school, Year 11 pupils effectively used a digital video camera to capture accurately the performance of rebound and tumbling style movements. This provided good-quality feedback and enabled pupils to evaluate their performances and recognise areas for improvement.

69 Achievement in using ICT for practice and reinforcement is good in one third of departments where it used, uinsatisfactory in one quarter. One or two particular Integrated Learning Systems are adopted in English and mathematics, or used

within SEN withdrawl sessions, and are helping to improve pupils' basic skills, at least during the period when the program is being followed. This is especially so where such use is complemented by direct teaching and plenary discussion. Pupils achieve well in a range of subjects where effective use is made of good-quality revision software or web sites. Pupils are motivated by this approach and appreciate the immediate feedback and sharp examination focus that these packages provide.

Implementation in Schools

Leadership and Management

70 The leadership, management and co-ordination of ICT in all types of school have continued to improve since the first progress report. Although there are weaknesses in only one in seven secondary schools and one in eight primary schools, senior managers have not always been clear what action to take in order to remedy unsatisfacory training. Where headteachers have approached training providers to address weaknessesin the training this has often led to improvements and occasionally to refunds.

71 The requirement of NGfL funding arrangements for schools to submit ICT development plans continues to underpin this improvement, especially where LEA staff engage senior staff in schools in a professional dialogue about their plans. The quality of development planning varies widely, however, especially in the secondary sector, where four in ten departments show weaknesses. At worst, development plans are little more than a wish list of resources, occasionally pre-dating current initiatives and Curriculum 2000. Many plans provide an insufficiently clear picture of how staff training, access to ICT and curriculum intentions across subjects relate to each other. They give little indication of the range of ICT experiences pupils will have. The better plans take a strategic view of developments in staff expertise, resources and curriculum and seek to align these.

72 Good use of NGfL funding and of training funded by the NOF in primary schools is often associated with strong leadership by the headteacher and ICT co-ordinator, as in the following example.

> Jointly, the headteacher and co-ordinator have been very effective in leading the staff forward in ICT initiatives. The impact of their efforts is very significant. The headteacher has taken a lead role in seeking funding and she sees ICT as a tool which will raise the standard of pupils' achievements. The ICT co-ordinator is now a member of the senior management team, so there is a strong lead at management level for the promotion of ICT throughout the school. Since the first visit to the school, when most initiatives were literacy based, very good progress has been made to develop pupils' ICT capability, now also involving extra-curricular initiatives. ICT is now as prominent in numeracy as in literacy and there is evidence that it is supporting learning in most subjects of the curriculum.

73 The co-ordination of ICT demands a considerable range of expertise, requiring good ICT understanding and knowledge, technical skills and the ability to provide professional support. Too many demands are placed on some ICT co-ordinators, most of whom have a full teaching commitment and few opportunities for monitoring the subject adequately across the school. In recognition of the demands of the role, larger primary, middle and secondary schools increasingly have more than one member of staff involved in the co-ordination of ICT, as in the middle school described below.

> Five members of staff share the co-ordination of ICT, including the deputy head and a member of the non-teaching staff. Each is responsible for a different aspect of ICT work in the school and they meet frequently to discuss progress. Apart from sharing the considerable workload, if any of the group leave the school, four other colleagues will be there to minimise disruption.

74 ICT leadership within secondary subject departments varies considerably; it is good or better in four in ten, but unsatisfactory in nearly a third. In some subjects, recruitment difficulties, staff changes and the Key Stage 3 strategy have meant that the development of ICT has been given a lower priority. In the best-managed departments, schemes of work refer to possible uses of ICT that meet, and often go beyond, National Curriculum requirements. The head of department or a postholder with specific responsibility for ICT injects energy, enthusiasm and a clear vision of how ICT can enhance teaching and learning in the subject. This support generates productive discussion among teachers in the department about their use of ICT and an insistence that it is used only where it will improve teaching and learning in the subject. In these well-managed departments, all teachers evaluate their use of ICT against clear criteria. More generally, however, the monitoring and evaluation of ICT use in departments are particular weaknesses in over four in ten departments.

Staff Development: Training funded by the NOF

Identifying training needs

75 Training schemes funded by the NOF aim to increase teachers' awareness of the potential of ICT to improve teaching and learning, and develop their understanding of when and how to use ICT. In half of the schools visited, the pedagogical needs for teachers to achieve these national training intentions were not identified effectively at the outset. This failure was partly due to the misunderstanding in the early stages of the training, now largely overcome, that its key purpose was to improve basic ICT skills. In addition, the materials provided nationally to identify needs, provided by the TTA, did not prove helpful to schools and were not widely used. The auditing of teachers' training needs has been most effective where detailed discussions have been held between individual teachers and the school's ICT or staff development co-ordinator.

76 Teachers' needs in personal ICT skills have proved easier to identify and a third of schools have done this well. Pre-NOF training, offered to those with few ICT skills, has often been successful in raising teachers' competence and confidence and has led to their making more use of ICT for a range of tasks, including the preparation of teaching materials, general administration and report writing. In many special schools such training has led teachers to become regular users of ICT for the first time.

Effectiveness of NOF training

77 Training funded by the NOF has been effective in a quarter of secondary departments and a third of primary schools. In around six out of every ten secondary departments and half of the ten primaries, the scheme has so far failed to build on teachers' ICT skills or enable them to tackle pedagogical issues adequately. In a minority of schools, the scheme has acted as a catalyst for improvement.

78 The last few years have seen a sea-change in the general attitude of the teaching profession to ICT. For example, teachers now recognise the potential for ICT to benefit teaching and learning and most are keen to develop their expertise. However, many teachers criticise the training funded by the NOF they have received for failing to meet their aspirations and many senior managers criticise providers for not fulfilling their promises. Motivation has waned in many teachers where they have not obtained appropriate subject advice and guidance. Disillusionment arising from organisational problems, poor or inappropriate

training materials, and dismay at the provider's requirements for evidence of completion have sometimes set schools back in their ICT development. Even allowing for the fact that some teachers have barely begun their training and others are only midway through it, these are unsatisfactory findings.

Features of effective NOF training

79 Where training funded by the NOF has worked well, teachers have gained in confidence and competence in their classroom use of ICT. The training has been most successful where it has been based on information from an effective audit of training needs, carefully differentiated, and tailored to subject-specific requirements. Schools usually measure success by the extent of the increase in the range of applications that are used. In the best cases, however, such training has encouraged teachers to explore ICT use in their classroom, then evaluate and review their practice, incorporating what proves to be successful in their schemes of work. Good training has enabled teachers, especially in primary schools, to begin to adopt effective pedagogical practice in ICT suites. In special schools, training funded by the NOF has had a consistently strong and positive effect on pupils' learning in relation to the use of software which prints symbols alongside text to develop pupils' literacy skills.

80 Training has been most successful in schools where ICT is a recognised school priority, where staff are already competent users of ICT and where senior managers have taken a strong, active interest in teachers' progress through the training. In these schools, training has been integrated into existing good staff development practice in ICT. In addition, any shortcomings in training have been identified early and addressed energetically with the providers or have been overcome by the intervention of school staff.

81 Although the scheme excluded teaching assistants from training, but many special schools and others have found ways of including them, for example by providing specific training from the ICT co-ordinator or from a community-based facility. Some providers have found ways of extending the training to include this important group of staff. This has proved to be a very successful strategy in all types of school, enabling teaching assistants to contribute at a higher professional level to the work of the school.

82 A few schools have benefited where they have had the confidence to adapt and select from the NOF materials for their own ends, rather than work dutifully through them. Such schools used NOF training materials as a resource, supplemented by good in-school ICT support and other materials as appropriate. This pragmatic approach has been more effective than a formally delivered NOF programme.

83 Peer support and collaboration are crucial to the success of training funded by the NOF, which has been most effective where groups of staff in a school have followed the training together. For example, in one secondary school, all the humanities teachers trained at a set time each week, with the most competent supporting less skilled colleagues and sharing ideas through presentations of their portfolios.

84 Many teachers have found online support to be unsatisfactory. This was usually because access was unreliable or because mentors were dealing with too many teachers and their responses were therefore often infrequent, shallow or unhelpful. Successful online mentoring operated at ratios of under 30 teachers to each mentor.

85 Personal individual access to a computer by teachers, especially at home, has continued to be one of the strongest influences on the success of ICT training. This has applied particularly to the use of the Internet and e-mail, not least because the school day provides insufficient opportunity for staff to use school ICT systems. Teachers with personal access to a computer, to practise and develop their skills, investigate ICT-based materials and plan their lessons, are better placed to explore the effective use of ICT. In spite of the recent government subsidies for personal computers, too many teachers still either do not have their own computer or enough time to use school computers.

86 Appendix A comprises four case studies of schools where training funded by the NOF has been successful.

Features of ineffective NOF training

87 Despite their training, teachers in around half of the secondary departments and one in four primary schools visited are no better placed to sustain and develop ICT in their subject teaching. This is because the training has not been completed successfully and because most schools do not have in place a suitable post-NOF ICT staff development programme. The reasons why teachers and schools fail to persevere with the training vary widely. The most frequently cited by teachers include lack of time, technical and organisational difficulties, poor support from trainers or mentors, poor match of training materials to needs, expectations to complete exercises or compile portfolios that are unrelated to teachers' current work, and the lack of good subject-specific ideas and resources. Common complaints about trainers from teachers include under- or over-estimating teachers' existing knowledge, personnel changes that are so frequent that trainers do not establish an effective working relationship with teachers, and mentors' failure to respond to communications. In far too many schools, there has been a lack of differentiation in the training programmes to extend the highly competent ICT users and at the same time meet the needs of those teachers with lower levels of confidence.

88 While some schools made good use of distance learning materials and online support, the best practice has included an element of personal contact between teachers and training providers. Some remote training got off to a poor start as it wrongly assumed that teachers had the requisite skills and ready access to electronic communications for materials and tutorial support. Some providers experienced major problems with their online systems to such an extent that teachers became frustrated by repeated failure to access their web sites. Teachers who were left to their own devices to use distance learning materials on CD-ROM frequently made little headway and did not complete the training. Many teachers found the expectation to work on training materials outside school hours incompatible with other pressures on their time.

Resources and accommodation

89 NGfL funding continues to contribute to an overall improvement in ICT resources, although the funding for each pupil varies widely from school to school. Despite the injection of NGfL funding, only those special schools that have made the most determined efforts to raise additional funds for equipment have a sufficient number of computers to give pupils ready access to ICT in most teaching areas. Many secondary schools face difficulties in enabling all departments to access ICT resources.

90 The characteristics of good general secondary provision include:

- availability of different groupings of resources to match the needs of departments, for example computer rooms, clusters of machines and individual workstations around the site
- computers networked and well maintained with good Internet access from all workstations
- well-lit, comfortable computer rooms with sufficient space for pupils to work away from computers and for teachers to circulate and talk to individual pupils
- effective communication with the whole class using digital projectors or the capacity to control all the computers
- an efficient and equitable booking system for computer rooms.

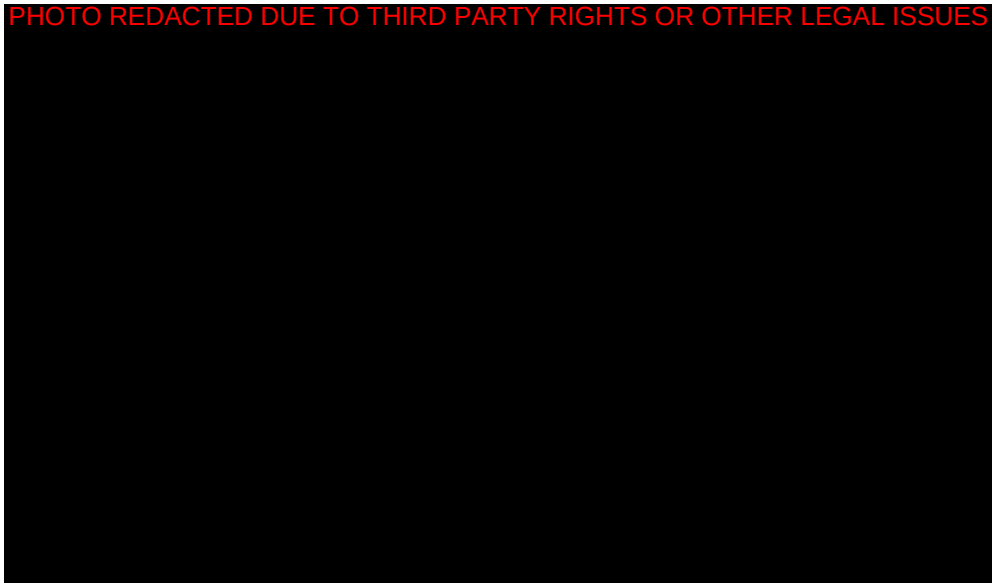
Increasingly, schools are exploring the possibility of greater flexibility in serving subject needs through the use of wireless links between banks of laptops, managed centrally and linked to the school network.

91 The suitability of accommodation varies considerably; a minority of schools have good levels of high-quality accommodation, equipment and software, for both general and subject-specific purposes. Many primary schools now deploy their ICT resources in dedicated computer suites. Not all schools can accommodate these, but they are an important factor in improving pupils' ICT capability by enabling dedicated time for ICT lessons. Many schools, however, find it difficult to complement these lessons by sufficient use of ICT in other subjects. There is a similar problem in special schools, where suites promote the teaching of ICT as a subject, but are rarely used to full effect by subject and class teachers. This means skills learned are not applied in new contexts and subject work is not enlivened by ICT. The access of the whole age-group to the ICT suite in 3–19 schools is often problematic, as is the access of pupils with severe physical disability, who often need their own customised access systems and special seating arrangements.

92 Where they are unable to find space for a dedicated suite, schools often use mini-suites or clusters of computers in one space or distribute computers between classrooms. The management of the latter is difficult, though not impossible, requiring very organised teaching to ensure that each pupil has sufficient access to the computer over a period of time.

93 A minority of primary schools use laptops or hand-held computers to give flexibility of use in different classrooms. The use of wireless links to the school network for Internet access is growing, especially where networking costs to classrooms separate from the main school building are too high. But this approach also enables more flexibility in the way that ICT is used in the curriculum, for example by locating sufficient resources in the normal classroom to support work in other subjects.

94 In many primary and special schools, the availability of good technical support makes a significant contribution to the reliability and quality of ICT resources. Where individual schools or groups of schools employ a technician, this often gives teachers confidence in knowing that help is at hand when things go wrong. Where there technical support is poor or absent, teachers feel frustrated and dispirited when carefully planned lessons are disrupted by resource failures.



95 In view of the range and complexity of ICT equipment in most secondary schools, effective technical support is necessary to ensure that teachers are free to concentrate on teaching. This means having technicians who are sufficient in number, well qualified and sympathetic to the educational purposes of ICT, and ensuring that support is easy and quick to obtain.

96 Resources are generally managed effectively. Most secondary schools and many primaries now have an Acceptable Use Policy to safeguard against inappropriate use of the Internet. Software is subject to regular auditing and evaluation, with software licences carefully reviewed and filed efficiently. Pupils are able to use computers outside class time, for example in school cyber cafes, computer clubs and the school library, helped by well-informed teaching and non-teaching staff.

97 Impediments to the improvement of ICT resources include excessively tight delegated budgets that prevent some schools from supplementing NGfL funds. A significant number of schools, both primary and secondary, have insufficient space to accommodate more hardware. In one very popular school with a burgeoning roll, for example, the predominant concern was to increase the number of classrooms rather than add to the problems of overcrowding in the existing computer rooms.

98 A high turnover of technical support staff also impedes progress in many schools. Well-trained ICT technicians are often highly marketable, with some schools unable to pay for their services at the going rates. As a consequence, it is not unusual to find hard-pressed ICT co-ordinators or other teachers taking on technical roles for which they have neither the time nor professional expertise. In one instance, the deputy head of a primary school spent his summer holiday re-cabling a computer suite.

Support for Schools

LEA Support for ICT

99 Since April 2001, there has been a general improvement in the quality of support that LEAs give schools on ICT issues. There has been a welcome shift in the balance of their planning of ICT support away from technical issues and towards the use of ICT in the classroom to enhance teaching and learning. Nevertheless, tweaknesses remain in a significant minority of LEAs.

100 For example, even in LEAs with effective ICT planning, there is often a lack of co-ordination between corporate ICT developments and those within education. The absence of a clear corporate ICT strategy, with an unambiguous commitment to the development of ICT to raise levels of attainment in schools, leaves many LEAs operating in a policy vacuum. Even in local authorities with a clear commitment to developing the use of ICT, for example by funding ICT developments to underpin regeneration work or in tackling social deprivation, the overarching vision is seldom clearly articulated in corporate plans.

101 In the most effective LEAs, there is a clear ICT strategy for education, led and managed by a senior officer, and developed in consultation with schools to ensure that they are clear about its purpose and committed to its delivery. In many such LEAs, the council provides additional funding for ICT support over and above their match-funding of the NGfL central grants. This additional funding has had positive effects in broadening the scope of support received by schools.

Case Study: ICT Funding for Cumbria LEA

The LEA received SRB funding for a programme which has established 73 ICT community development centres (CDCs) mainly, but not exclusively, in schools. The programme specification requires these centres to provide training for the local community to support the social and economic regeneration of the communities in which they are sited. During the life of the programme, over 6,000 people have obtained qualifications and over 60,000 pupils have benefited from projects to raise attainment. Several members of the community who attended the courses are now providing classroom support in ICT lessons in one of the primary schools involved. Headteachers have commented on the considerable improvement of parental support from those attending courses and on the impact the programme has had on the employability of parents.

This scheme and the NGfL are distinct, with separate targets, but the two projects complement each other well. Pupils are able to use CDC facilities in school time, thus increasing their access to ICT; equipment from both funding sources use the same networks and ISDN lines, thus reducing costs. Excellent communication between the two service managers has resulted in both the community and pupils benefiting from the project.

102 Of the 57 LEAs inspected last year, 77% had a dedicated priority related to ICT, but few educational development plans (EDPs) included targets for attainment in ICT. Moreover, links between ICT-related activities and other priorities were often underdeveloped, with insufficient emphasis on activities focused on raising levels of attainment both in IT and its application across the curriculum.

103 The quality of schools' ICT development plans remains variable, despite the requirement for LEAs to monitor plans before releasing money from the NGfL

and the NOF to schools. The best practice continues to be where LEA support staff engage schools in a professional dialogue about their plans and discuss with them how these might be improved. Occasionally, the evaluation of plans is superficial. However, there is also much good practice and recent improvements have included a drive to require schools to assess the impact of NGfL funding on standards.

Case Study: Support for ICT development planning at Northamptonshire LEA and Sponne School

> The LEA advisory team rejected the school's first plan, providing a clear indication of their concerns. In particular, the team felt that the plan did not show sufficiently how the impact of ICT on teaching and learning would be identified. The school's technology vision was not reflected in the plan and the curriculum was described solely in terms of discrete ICT provision rather than the effect on learning across the curriculum. There were insufficient links with the School Development Plan. The team referred the school to written guidance and to the LEA's web site, which included guidance and a model plan, providing clear criteria to be addressed.
>
> The school responded by recasting its ICT development plan as a learning and ICT development plan. This reflected a change from a resource-driven model to one guided by curriculum and learning intentions. It had a well-articulated vision and clear aims, one of which was 'the use of ICT to make a substantial contribution to whole-school improvement, raising standards of teaching and learning and standards of literacy and numeracy'. Other aims were to incorporate best practice in the application of ICT in schemes of work in all faculty areas, and for all staff and students to become autonomous users of ICT. Actions, timescales and success criteria were also plainly set out in the plan, as was the responsibility for monitoring. Faculty bids for additional resources are now required to demonstrate how proposals match the school plan.

104 Individual LEAs are often imaginative in their use of the NGfL funding they are allowed to retain. This funding is used to finance posts such as NGfL advisers, technicians and web authors. However, the general picture is that there is insufficient use of the funding to finance the evaluation of the NGfL initiative. In one LEA, centrally retained funding supports the development of a very high-quality curriculum web site, which is easy to use. Teachers are encouraged to contribute to the materials on the web site and, in return, receive a small amount of additional funding to purchase ICT resources.

105 Most LEAs manage the administration of the funded by the NOF training scheme effectively. The extent of their involvement in the actual training varies widely. Many have entered into partnership with commercial training providers to deliver successfully the face-to-face elements themselves. Such partnerships have been particularly effective in LEAs where known and respected ICT team members have been able to tailor training to the needs of individual primary schools. They have also enabled the LEA to be well informed of post-NOF training requirements. This partnership approach has however, been unsuccesful at the secondary level, where LEAs have generally been unable to provide the subject support required. Many LEAs continue to provide a range of other specific training and support for teachers, relevant to the central aims of the NGfL, for example in the creation of school web sites.

Case Study: Support for the development of school web sites at Walsall LEA

This support was planned as an integral part of the NGfL programme of the LEA. The aim was to enable individual schools, teachers and pupils to use the Internet as a means of celebrating success, sharing good practice and strengthening relationships with their communities. This was achieved by providing training in web site design and creation, using familiar software. Teachers created live sites with unrestricted web space during the initial training and subsequently received support online as well as through weekly drop-in workshops. As a result, over three quarters of primary and special schools now have active web sites that include contributions from many of their teachers and pupils.

106 A minority of LEAs support teachers in their assessment of ICT capability, by enabling them to judge pupils' ICT work more accurately against National Curriculum level descriptors and by developing the standardisation and moderation of such assessments. A few LEAs, have promoted schemes to support transition between phases, for example, involving secondary schools in annual standardisation meetings of Year 6 work with their primary colleagues. This, in turn, positively influences the secondary school's own ICT curriculum.

107 In most LEAs, the support for senior staff in schools in the evaluation of effective teaching and learning using ICT is an area that still requires considerable development. Although the NCSL and BECTa have now embarked upon pilot training for senior managers, many managers remain insufficiently aware of the issues that should be considered when evaluating the effectiveness of teaching using ICT. Generally, ICT co-ordinators receive good support. In the most effective LEAs, this involves the sharing of good practice and discussion on schemes of work.

Regional Broadband Consortia

108 The eleven Regional Broadband Consortia (RBCs) are in various stages of development, from initial procurement of services through to content development and purchase. Some were unable to take advantage of funding in the first year. Inspectors visited four RBCs, chosen because they had made the most progress towards the target of 20% of schools connected. These RBCs all serve large geographical areas containing different patterns of LEA working and collaboration. Factual information on progress was obtained from all RBCs.

Management and Collaboration

109 The four RBCs visited have clear management structures and lines of reporting. Sound strategic decisions are made and appropriately ratified at senior level. To facilitate the procurement of contracts within the short timescales, each Regional Broadband Consortium has nominated a lead authority to be responsible for financial and/or legal issues.

110 The RBCs have enabled LEAs to retain their independence and to benefit from regional collaboration. They employ a range of strategies to enable LEA and private sector representatives to work together on the provision and development of the infrastructure and content. Operational management involves LEA inspectors, advisers and officers and is often helpfully supported by subgroups with specific remits and responsibilities. Membership of these groups appropriately includes headteachers, teachers, and commercial partners who have broad experience and expertise. Clear lines of demarcation between LEA and RBC responsibilities considerably enhance the operation of RBCs.

Case Study: Collaborative Working at the South West Grid for Learning

There is a good history of the LEAs working together before the formation of RBCs. There is a clearly defined and well-communicated focus on the use of broadband connections and content to improve teaching and learning. This underpins the RBC planning and activities. There are strong and effective lines of communication between management groups and members of such groups are informed of issues and developments.

Each area of operation is the responsibility of a senior officer who is given paid time to undertake the role. The LEA officers running the consortium have good relevant experience and have earned the respect and trust of the whole RBC.

Each participating LEA has contributed its NGfL broadband allocation to a central fund that is democratically administered by a representative management group. Because of this central funding, the priorities of the Regional Broadband Consortium take precedence over LEA priorities in any year.

111 RBCs are responsible for the quality of broadband connection to each of their constituent LEAs. Where an RBC's responsibility for the connection also extends to the schools, headteachers and teachers have a clearer understanding of the role and value of the RBC. Communication between RBCs and LEAs is on the whole effective, with clear lines of reporting and accountability, and regular updates of current and future activities. In some RBCs, communications with schools are solely the responsibility of the LEAs and this can lead to an inconsistent flow of information. Where RBCs have an agreed strategy for communicating directly with schools, there is a more consistent understanding of the role and benefits of RBC membership.

Infrastructure and Service

112 RBCs have approached connections to schools in different ways. Some have negotiated a fully managed service, which provides a broadband connection from a central server to each individual school in the consortium. Others provide a regional broadband 'spine' into which each LEA links its existing network. In the former case, schools understand that the responsibility for the quality of the connection clearly lies with the RBC. In the latter case, schools are less aware of the role of their RBC and, where they receive Internet access through their LEAs, many schools currently make little or no use of the regional broadband spine.

113 The RBCs have been successful in negotiating the provision of an 'always on' broadband connection with appropriate levels of technical support through service level agreements. This ensures high levels of access and reliability and the integration of some private and public sector networks into services available to schools. Although schools that are connected appreciate that they are achieving good value for money, sustainability is still a major concern, particularly for smaller schools. All RBCs have, however, taken appropriate steps to ensure that the technology can be upgraded as demand increases.

114 The regional approach to the organisation of broadband connections has led to a wide variation in the cost charged to schools. Individual LEAs have adopted a variety of funding models to help reduce the charge. Even where schools meet the full cost, they recognise that this represents good value for money compared with purchasing their own connections. However, smaller schools in particular

are concerned about their ability to meet or sustain an unsubsidised charge. Future plans for RBC activities need to be developed within the context of a long-term national strategy for broadband connectivity, including a wider range of services such as libraries, community learning centres, museums, galleries and Regional Development Agencies.

Content

115 Content here refers to interactive digital learning materials that take advantage of the technology. The initial uses of broadband connections by schools have been largely focused on faster and more reliable multiple access to the traditional, or narrowband, Internet content. The RBCs have identified the need to develop effective and relevant broadband content that makes use of faster data transfer, for example video materials. They have implemented a wide range of effective strategies for the identification, development and procurement of such content. These include the negotiation of bulk purchase arrangements for all of their schools, the commissioning of new content, brokering discounted content costs for schools and working in partnership with teachers and commercial organisations.

116 Strategies for content development are most effective where evaluation criteria are clear and open, levels of funding are appropriate, teachers are involved and content creation is well managed. However, at this stage most schools are unaware of how to influence or contribute to their RBC's content development.

Case Study: Content creation at the Northern Grid for Learning

Content development is seen as an important aspect of this Regional Broadband Consortium's work. It aims to develop high-quality multimedia content that will affect teaching and learning positively across the region and it allocates 10% of its total budget to this activity.

Teachers are encouraged to play an active role in the identification and development of new content and, once agreed, individual project teams are created. A curriculum development teacher works with each group of teachers and the content is produced to an agreed budget and timescale. In some cases, productive partnerships have been developed with commercial companies to create new resources. In these cases all RBC schools in the region are able to make discounted purchase of the content. Content developed solely with public funds is available to all schools nationally.

117 Although all RBC are developing web sites and portals for schools to access RBC-provided content as well as external resources, most connected schools are unaware of, or make little effective use of, these. There is a need for RBCs to promote further their role and value as content developers and providers.

Influence in schools

118 In the schools connected, the introduction of broadband is making a significant contribution to teachers' confidence and their use of ICT to support teaching and learning across the curriculum. More teachers are now using online resources as key parts of their teaching. Teachers increasingly realise that they can rely on the broadband connection to provide access to the Internet, which gives additional access for pupils and more efficient use of time.

119 The effect of broadband connections on pupils' learning is also significant. Pupils now have more opportunities to access resources that support their learning. Faster and more reliable access can enable pupils to become more discriminating users of information because they can explore a wider range of potential resources in a given time. They can also focus more on the use of the resources because they do not have to wait so long for materials to download. They are able to locate and download a wider range of resources such as video clips, animations and sounds that can be used within their presentations and create broadband resources for other users. For example, a Year 11 pupil created a presentation on different ways to kick a rugby ball; this included video pictures, a voice-over commentary and text.

Monitoring and Evaluation

120 RBCs recognise that they have a role in monitoring both the quality of connections and the impact of broadband on teaching, learning and standards. However, practice varies widely. In one RBC, there are no planned procedures to collect and analyse information, whilst in another, 28 teachers, working with a local university, are seconded to act as school-based curriculum evaluators. In another RBC, information about the reliability of the connection and the bandwidth is used by each LEA and school to monitor the service level agreement and to pre-empt schools' requests for greater bandwidth. The recently established national RBC group is addressing the lack of a coherent, national approach to monitoring and evaluation by trialling a draft evaluation tool.

Appendix A: Case Studies in NOF Training

An 11–18 technology college with 1,500 pupils in West London

The school has a clear vision, planning and strong leadership in ICT. It has a good whole-school strategy for ICT staff development and the NOF training fitted into this well. The enthusiasm and drive to increase ICT use within the school, led by the ICT co-ordinator, are strongly supported by the headteacher and the staff development co-ordinator. The ICT co-ordinator asked the heads of department to work with their staff to provide a short statement of the minimum subject-specific requirements that were needed by staff. At the same time, virtually all departments highlighted ICT as a priority for departmental development planning.

The school started the NOF training early in the scheme, selecting a distance learning training package. Staff needs were analysed in advance of NOF training and pre-NOF training in basic ICT skills was already in place, so departments could begin to work on pedagogical developments during the NOF phase. Senior managers were included in the training and recent NQTs used to support staff, including teaching assistants. Departments read through the materials and began to use these in some areas. The ICT co-ordinator monitored and organised two school training days and twilight sessions in school and linked with the LEA and the training provider to mark assignments. There was an expectation that teachers would submit work and complete the NOF course. The amount of ICT work within subject teaching has now been extended. There is still a long way to go in several subjects, but staff can articulate what needs to be done.

Teachers see the NOF as a beginning rather than an end of ICT training and the NOF training fits in well with the school's own training agenda. The main contribution of the NOF initiative has been to raise the profile of ICT professional development; this has encouraged teachers to take the training seriously and has made them willing to spend time on it. The school continues its own professional development for ICT alongside the NOF training.

An 11–18 rural comprehensive with 1,000 pupils in Cheshire

The member of staff in charge of staff development for ICT was chosen as a good classroom practitioner, rather than for any technical expertise. All staff received an introduction about the NOF and the teachers were clear about the scheme's purpose. The school found the TTA needs identification materials useful and the analysis surprising as they had been unaware of the skills that staff had developed, often at home with their own computers. Departments were asked for preferences for training providers; the history, MFL and geography departments opted to use specialist providers. The other staff wanted face-to-face training and all signed up to the same provider. A trainer comes into school weekly and staff like the regular contact. Staff also join school drop-in sessions according to their specific needs and welcome the mutual support these provide. Initial concerns about the time commitment have been mostly dispelled because the sessions are co-operative, positive and friendly.

One of the specialist programmes being used by one department is very intensive and had been criticised by teachers for its lack of differentiation. It never became very advanced in terms of ICT skills, but scored highly on challenging teachers to think carefully about why they used the applications. Having completed the programme, the teachers now find themselves evaluating their use of ICT and its value to learning far more carefully.

Another of the specialist programmes has been very well received by teachers and they are on course to complete in summer 2002. All staff have been stretched by the materials. They have learned new skills through the distance learning modules and shared ideas and applied them in lessons. They are required formally to plan, teach and review the lessons and have been particularly grateful for the speedy and helpful feedback on written submissions they have had from the trainer. As a result, they have developed good classroom tasks which are shared within the department.

Primary foundation school with 235 pupils aged 4–8

All teachers wanted to do the NOF training together as a team and start at the same level. They decided not to follow a programme which trained an in-house trainer first, but used a distance learning provider, with significant support provided by the LEA adviser.

Most staff had low ICT skills and their general needs were discussed at staff meetings. The headteacher and ICT co-ordinator then talked to each teacher individually to assess the needs and training approaches and to set targets. Some staff meetings were dedicated to the NOF training and non-contact time was given to staff each week, allowing them to pursue tasks and study in school time. This meant that they were under less pressure to complete training in their own time. This illustrated that the NOF training was a high priority for the school and a worthwhile initiative that would raise standards. Weekly staff meetings included opportunities to discuss ICT and NOF training.

The NOF training has been received very positively by all staff. Teachers have welcomed the support given by an LEA adviser specifically to meet their needs through one-hour sessions with individual or pairs of teachers. The staff have worked well together and have given each other good support.

Good progress is now being made in personal ICT skills and in teaching skills. As a result of the training, teachers now use spreadsheets, e-mail and the Internet and are motivated to plan ICT use, especially in numeracy and literacy. The increase in teachers' confidence has resulted in greater use of computers and teachers communicate their enthusiasm to pupils.

The governing body, headteacher and co-ordinator have evaluated outcomes from the training and feel that the school has received good value for money. The staff targets have been evaluated and discussed. The headteacher has been the driving force to ensure that training has met the needs of the staff so that, in turn, teachers are totally committed to the ongoing professional development in ICT.

Small primary foundation school with 191 pupils of 4–11

The school became heavily involved in the NOF training at the earliest possible time. The staff decided that it would be best to train together to provide opportunities for discussion. A local training provider was chosen for convenience and good liaison.

Staff skills were identified well by the training provider. The trainer was very flexible and adapted to the needs of the people involved. All staff worked through the TTA materials to identify their own current skills levels and, once areas of weakness were identified, appropriate software was provided to support them. The resources provided for the school were of good quality, enabling additional activities to be carried out by teachers at home and in school.

Weekly attendance at training sessions was useful in ensuring that the school's focus on ICT was maintained. The ICT co-ordinator was able to assist and lead some of the sessions. Teachers found it useful to receive demonstrations of software which they could then explore with pupils during lesson time and evaluate. This worked particularly well in mathematics.

The main benefits of the NOF training have been improved confidence in ICT and increased awareness of its uses. Teachers are more willing to explore ICT applications and recognise that their teaching skills with ICT will improve as they become more familiar with the software. All staff are now at a sound level of personal competence. In ICT, pupils are reaching average standards, which is a big improvement upon the previous position. The increased enthusiasm and motivation of the staff have helped the ICT co-ordinator to develop this. Work is now well planned to include ICT in most subject areas and class monitoring of this is the next step for the school. There has been plenty of dicussion within the staffroom about when and when not to use ICT and staff are aware that it should not be used in subject teaching just for the sake of it.

Appendix B: Glossary

Approved Training Provider (ATP): An organisation approved to provide training for teachers under the NOF programme. The training is funded by the NOF through allocations to schools and quality assured by the TTA on behalf of the NOF.

Broadband/bandwidth: bandwidth provides a measure of the volume of data that can be transmitted through a cable in a given time and is measured in Megabits (Mb) per second. A full page of English text is about 16,000 bits, while full-motion, full-screen video would require about 10 Mb in one second, depending on how it is transmitted. Broadband refers to higher rates – in the terms of this report – 2 Megabits per second upwards.

Digital camera: A camera that stores photographs in digital format.

E-mail: electronic mail; the sending and receiving of messages using the Internet. Users who subscribe to the Internet are given unique addresses, which enable them to send messages to, and receive messages from, other users.

Hardware: A general term for referring to computers and, often, other peripheral devices such as printers that connect to computers.

Infrastructure: The cabling and network components that enable computers to exchange information.

Internet: The worldwide 'network of networks' connected by telephone communication systems. The Internet enables the transfer of information such as text, pictures, databases, web sites and e-mail, and provides other services such as news and information.

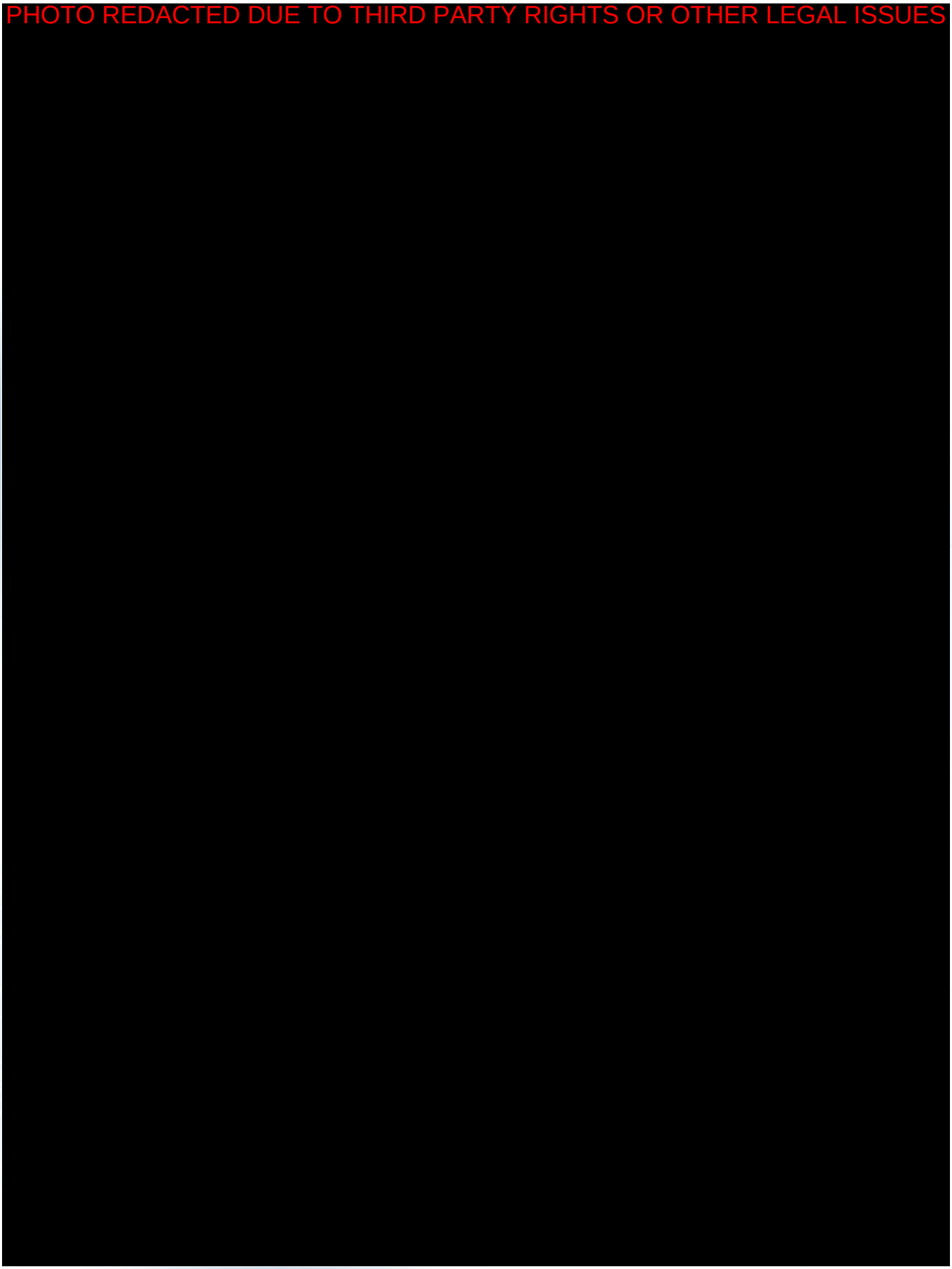
Internet Service Provider (ISP): A commercial company, LEA or other institution, which provides 'gateway' access to Internet services.

Intranet: A restricted network that uses the style and search facilities of the Internet on information held locally within an organisation's own network. An intranet usually has a facility to connect to the wider Internet.

Network: A network connects computers together so they can share the use of software and peripherals such as printers and access to the Internet. A school network is likely to be a LAN (local area network). A network connecting different buildings on a large campus or various schools/homes is a WAN (wide area network).

Software: The applications (or programs) which run on computers.

[i] ImpaCT 2: a longitudinal study funded by the DfES and managed by BECTa involving 60 schools, aiming to identify the impact of ICT on children's achievement.



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