The importance of ICT

Information and communication technology in primary and secondary schools, 2005/2008

This report is based on evidence from inspections of information and communication technology (ICT) between September 2005 and July 2008 in 177 maintained schools in England, as well as other visits to schools where good practice was identified. Part A describes the quality of ICT education in primary and secondary schools over this period. Part B considers how tackling assessment, vocational qualifications, value for money and resources might improve ICT provision.

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Executive summary

This report draws on evidence from the inspection of information and communication technology (ICT) in more than 177 schools between 2005 and 2008. The schools selected represented the range of schools nationally and included small, large, rural and urban schools from across England.

Part A reports on the quality of provision of ICT in primary and secondary schools and its impact on achievement and standards. Part B explores four important areas that are central to developing ICT education in England: assessment; ICT qualifications and progression routes; direct access to ICT provision in classrooms; and value for money.

The evidence from the visits to primary schools suggests a picture of improvement with rising achievement and standards, particularly at Key Stage 1. The pupils[1] observed generally used ICT effectively to communicate their ideas and to present their work, but they were less skilled in collecting and handling data and in controlling events using ICT. Most of the primary schools ensured pupils received their full entitlement to the National Curriculum for ICT, although commonly the curriculum was not well balanced. Teachers tended to give more attention to those aspects of ICT where they themselves felt confident. At best, teachers integrated ICT carefully into the curriculum and it was helping to raise standards in other subjects. Good leadership and management made developing ICT a priority in these schools. Effective use of self-evaluation to inform investment in resources and training was driving the improvements which were seen.

In the secondary schools, students'[2] achievement was good or better in 41 of the 92 schools visited, satisfactory in another 41 schools and inadequate in 10. There was a suggestion of improvement in the final year of the survey. The Key Stage 4 curriculum was inadequate in around one fifth of the schools visited; assessment was unsatisfactory in a similar proportion, and many students were following qualifications of doubtful value. Although students used ICT well to present their work, communicate their ideas and, increasingly, to manipulate and use a variety of digital media, standards in using spreadsheets, databases and programming remained low. Furthermore, teachers gave too much emphasis to teaching students to use particular software applications rather than helping them to acquire genuinely transferable skills. There was widespread use of more reliable resources but in some schools responses to some serious, long-entrenched failings were stubbornly slow.

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[1] Throughout the report, 'pupils' refers to children in primary schools, while 'students' is used for children and young people in secondary schools.
[2] See note 1.

In a minority of the primary and secondary schools visited, higher-attaining pupils underachieved. This was particularly marked at Key Stage 4 where accreditation of vocational qualifications is based mostly on the assessment of coursework. Students were spending considerable time demonstrating proficiency in what they could already do in order to meet the assessment criteria, rather than being introduced to new and more challenging material and skills. Most students who chose not to pursue an ICT qualification at Key Stage 4 did not receive their statutory entitlement to the National Curriculum for ICT.

Teachers' subject knowledge was mostly good and they used ICT effectively to improve their teaching. However, weaknesses existed in specific aspects – especially assessment, which was the weakest aspect in primary and secondary schools and was inadequate in one school in five.

Schools have invested heavily in ICT. The gains reported here are due to the commitment of school leaders to improving ICT provision, with more resources and better use of them. However, only around half of the schools visited showed that they were systematically evaluating the impact of ICT resources on improving learning. Part B considers how far the four principles of best value (challenge, compare, consult and competition) have been applied.

The past few years have seen a sharp increase in the number of students taking Key Stage 4 vocational qualifications instead of GCSE ICT. Although these vocational courses are the equivalent of up to four GCSEs in other subjects, they offer limited challenge in ICT. Part B of the report discusses how this has contributed to the low numbers of students choosing to study computing post-16. This is especially serious given that students say they enjoy ICT and recognise its contribution to their personal development and future economic well-being. Although vocational qualifications and the national Computer Clubs for Girls (CC4G) initiative have been successful in engaging girls in ICT, they have not reversed the long-term decline in take-up by girls: the number of girls choosing to study computing post-16 has fallen to an all-time low.

Key findings

■ Pupils' achievement was good in over half of the primary schools visited, but in less than half of the secondary schools – albeit with a higher proportion of schools judged good or outstanding in the final year of the survey. In both phases, higher-attaining pupils and students were insufficiently challenged, often spending time consolidating what they could already do rather than acquiring higher-level skills, particularly in some vocational courses at Key Stage 4. Over-reliance on a standard 'office' application and operating system restricted their opportunities to develop generic and transferable skills.

- The leadership of ICT had improved during the period of the survey and the schools visited had made ICT a high priority for development. Leaders were providing a vision for the place of ICT in learning and were investing significantly in infrastructure, resources and staff training.

- Investment in resources had improved teaching, but had still not made ICT a part of everyday learning. Many schools were seeking to make ICT resources more readily available to pupils and students in classrooms. Some of the schools visited did not apply the four principles of best value to their purchasing and did not obtain good value for money from their investment. Only around half of the schools showed evidence that they were systematically evaluating the impact of ICT in improving learning and raising standards across the curriculum.

- Using ICT was contributing positively to the personal development and future economic well-being of pupils and students. It developed their skills of working independently and cooperatively and was in most cases motivating and engaging.

- Support for pupils with learning difficulties was mostly good, enabling them to make at least the progress expected. Appropriate modifications were made to hardware to ensure good access to learning for disabled pupils.

- The very great majority of the schools visited taught their pupils and students about the risks associated with using the internet. However, very few of the schools evaluated the effectiveness of this teaching and very few had recorded the incidents they had dealt with where students' safety had been compromised.

- Most of the teachers observed had good subject knowledge in some aspects of ICT and were confident and competent users of it. This was generally best where schools had audited the training needs of staff systematically and had begun to tackle any gaps. Teachers' subject knowledge was weakest in data logging, manipulating data and programming.

- Increasingly, teaching assistants were acquiring good subject knowledge, although the picture here was more inconsistent. Pupils with learning difficulties and/or disabilities made good progress where teaching assistants had the necessary subject knowledge and skills to support them effectively.

- Assessment was the weakest aspect of teaching and was inadequate in one school in five. The schools visited rarely tracked the progress of individuals in ICT, established their attainment on entry to secondary school or took into account their achievement outside school. Although the use of ICT in other subjects was increasing in secondary schools, the skills were rarely assessed. As a result, ICT teachers rarely knew how well students applied their ICT skills elsewhere.

- In one fifth of the secondary schools visited, students who chose not to pursue an ICT qualification at Key Stage 4 did not receive their statutory entitlement to the National Curriculum for ICT. The number of girls choosing to study computing in school sixth forms has fallen.

Recommendations

The Department for Children, Schools and Families should:

- seek ways of reinforcing the importance of ICT as a subject and in its use across the curriculum
- evaluate the degree of challenge posed by Key Stage 4 vocational qualifications in ICT
- seek ways of encouraging more girls to choose computing qualifications post-16.

All schools should:

- evaluate the effectiveness of their provision for teaching pupils and students how to keep themselves safe when online and record incidents where the safety of individuals may be compromised
- ensure that they achieve value for money by implementing the principles of best value in evaluating, planning, procuring and using ICT provision
- improve the assessment of ICT by establishing pupils' and students' attainment on entry and by tracking the progress of individual pupils, including their achievement when using ICT in other subjects
- audit the training needs of teachers and teaching assistants and provide extra support to improve their subject knowledge and expertise, particularly in data logging, manipulating data and programming.

Secondary schools should:

- provide the statutory National Curriculum for ICT for all students, especially at Key Stage 4, and give appropriate emphasis to all aspects
- find ways of making ICT readily accessible to students in their classrooms so that it can be used to improve learning in other subjects.

Part A. The quality of ICT education

Primary schools

Pupils' achievement and standards

1. At the start of the survey in 2005, achievement was good in over one in three of the primary schools visited; it was satisfactory in around half of the schools, and unsatisfactory in one in seven. At this time, none of the schools visited had outstanding achievement in ICT. However, during the latter part of the survey, pupils were making good progress in two thirds of the schools visited, including three where their achievement was outstanding. There is some evidence to suggest that overall, pupils' progress slows in the upper years of Key Stage 2 when some of the gains of the earlier years are not consolidated.

2. In the schools visited for the survey, most pupils in the Foundation Stage were confident in using the keyboard and mouse, and in selecting from on-screen menus.

3. During Key Stages 1 and 2, most pupils developed their use of ICT well for communicating ideas; standards in this aspect of using ICT were higher than in others. For example, pupils combined text and images in page layouts in eye-catching ways: they used software slides well to enhance formal presentations to an audience, such as their class or in a school assembly; and increasing use was made of animation and of digital still and video imagery to explain thoughts and to capture learning. Such activities provide a considerable boost to many pupils by allowing them to express themselves visually in ways that were not previously possible. The technology allows them to be creative and work collaboratively. For example, some Year 4 pupils observed during the survey made sophisticated use of digital cameras in photographing a cloth to explore how folding causes changes in light and shade.

4. Pupils reached lower standards in the use of data logging and spreadsheets than they did in using ICT to communicate ideas. This is because pupils have insufficient opportunities to develop their understanding of data collection and modelling and because some teachers are less confident with these aspects. Too much emphasis is sometimes placed on pupils using ICT to present their work well, at the expense of developing their skills in handling information, programming and modelling data. Where standards in handling data were higher, pupils were taught how to collect data using sensors and how to interpret the data using software. For instance, in a Year 6 science lesson, pupils used temperature probes to record a hot potato cooling down and used a spreadsheet to record the data. However, this kind of experience was the exception.

An urban primary school had good provision for developing pupils' programming skills. Two Year 6 pupils attending provision for gifted and talented pupils at their local secondary school were introduced to a freeware application which enabled them to design and program a two-dimensional computer game. Their enthusiasm prompted their class teacher to download the software and to introduce a new unit of work for the whole class based around it.

Pupils were asked to design the graphics, layout and functionality of their own computer game and to write the program to implement their ideas for its design. Over a series of lessons, pupils used a 'paint' application to design their game backgrounds and sprites. Having completed the graphical elements, pupils wrote scripts to control movement and interaction in their games. This required them to learn to use sophisticated programming constructs such as 'repeat… until' and 'if… then' in capturing keyboard input, managing variables and testing whether particular conditions had been met.

The choice of task and software motivated pupils who were therefore able to make good progress. Most were able to write a series of executable instructions to implement the features of their game design. One autistic pupil excelled at this task and made better progress than his peers. He made outstanding use of loops, conditional jumps and incremental counters in his program. His skills exceeded those of his teacher, to whom he had to explain the principles of what he had done.

5. Sometimes pupils' ICT capability was so good that it outstripped their teachers' subject knowledge and, as a result, their good progress was not sustained. In such circumstances, higher-attaining pupils often underachieved.

6. Increasingly, schools are using ICT to improve learning in other subjects. For example, in a Reception class, pupils learnt how to use a digital camera to take photographs in the nature garden. This provided them with an exciting way of recording evidence of springtime. In a Year 2 lesson, pupils learnt to select and rotate images of different types of leaves. In another Year 2 lesson, all the pupils were highly motivated and worked purposefully to produce symmetrical and geometric designs using a combination of motifs and symbols. They used ICT proficiently and were able to describe clearly, with specialist terminology, how they had used the software to create their designs. Effective use of ICT in other subjects enabled pupils to develop their independence as learners and improve their thinking skills, creativity and problem-solving.

7. In a few of the schools visited, ICT had not only provided a further dimension to learning in subjects across the curriculum but had also raised standards, particularly in English. Examples included:

- the use of talking books to raise standards in reading in Key Stage 1

- good use of the internet for pupils to undertake research and produce presentations; this raised standards of writing at Key Stage 2, including for pupils previously identified as being reluctant readers and writers

- using ICT as a medium to motivate underachieving boys in studying poetry

- using software for creating cartoon imagery to help pupils who were learning English as an additional language to construct sentences.

8. One of the schools visited had a particular focus on using ICT to improve boys' writing. A recent visit by an author had stimulated Year 1 pupils in their writing and captured their imagination. The teacher built well on this in the subsequent activity, taking text from the story to engage them in writing using word processing. The pupils were encouraged to change the font size, colour and style of the text to reflect the words being used: for example,

   enormous, blue eyes. This approach was highly successful in engaging and motivating boys in the task.

9. Pupils with learning difficulties and/or disabilities achieved well in ICT when they had appropriate extra support. In many of the schools in the sample, pupils' individual education plans included targets for ICT which helped to improve the quality of work planned for specific groups. For example, working with ICT helped pupils to express themselves more effectively if they were able to use photographs, record or type the words they wished to communicate.

10. The progress of pupils with physical disabilities who were using ICT was good in the schools visited. Almost all of the schools in the survey had adapted computer hardware to meet pupils' needs and had provided appropriate software.

   > A Year 5 pupil with a brain tumour had deteriorating vision. The school worked with the local authority's ICT adviser and the pupil's occupational therapist to draw up a specification for modifying a desktop computer. The computer had a larger monitor than normal so that menu items, icons and text were all displayed in a larger size. A larger keyboard and trackball were also provided. Although the pupil had support from a full-time teaching assistant, these adaptations meant he could work completely independently when using ICT.

11. In some schools, pupils who were learning English as an additional language achieved well in their language development, using ICT to support their learning of vocabulary, grammar and phonology. Pupils in a school who had previously been reluctant to read and write made good gains because they had the opportunity to record themselves reading aloud or speaking and then to listen to their own pronunciation to identify how to improve it.

12. Pupils showed great enthusiasm for learning using ICT, both in school and at home. In nearly all the schools in the sample, using ICT engaged and motivated pupils including in one of the schools, for example, pupils identified as at risk of exclusion. In another school, pupils cited how learning about other cultures and faiths was made more interesting by the use of virtual tours, combining high-quality images and sound.

13. ICT contributed effectively to pupils' personal development by encouraging independent and cooperative working. Commonly, pupils worked together at computers, usually carefully and considerately, following their teacher's protocols. On the whole, pupils were very supportive of one another when using ICT, collaborating well, listening carefully to each other and helping one another to solve problems. In one school, pupils in the Reception class behaved very sensibly, making excellent use of an oversized egg timer to ensure they each spent an equal amount of time on the computer.

14. The vast majority of pupils spoken to in the survey schools were aware of health and safety matters when using ICT, such as the amount of time spent in front of a monitor, interactive whiteboard or screen. When learning about email and how to use the internet, teachers taught pupils not to reveal personal details and talked about the importance of telling an adult if they received inappropriate material. Most pupils said they understood the risks associated with using the internet and knew how to keep themselves safe when online. Schools said the increased availability of mobile phones had led to a small number of reported incidents of cyberbullying.

Quality of provision

15. At the beginning of the period covered by this survey, teaching and learning in the schools visited were good in the Foundation Stage and Key Stage 1, but only satisfactory at Key Stage 2. More recently, the sample of schools visited indicated improvement: teaching and learning were good overall in all three key stages. Over the period of the survey, inspectors judged teaching and learning to be unsatisfactory overall in three of the schools visited.

16. Several factors contribute towards explaining the general trend of improvement, although they vary from school to school: good training provided by the school itself; good support for schools from local authorities; and helpful national guidance. Schools have also benefited from better access to resources, including computers from the 'Laptops for teachers' scheme.

17. The quality of lesson and curriculum planning was good in over half of the schools. At its best, such planning ensured that pupils progressively developed ICT skills, knowledge and understanding in different contexts. Most of the schools needed to improve planning to meet the full range of pupils' needs and, in particular, to provide for higher-attaining pupils.

18. Staff have clearly benefited from national guidance and training over the period of the survey. This has been most effective where schools have audited individual teachers' and teaching assistants' needs and tailored training accordingly. Most of the teachers observed had good subject knowledge and were confident in using ICT. Although teaching assistants were also acquiring increasingly good subject knowledge, the picture was more inconsistent and the variation in their ICT knowledge and expertise was wider that it was among teachers. However, ICT develops and changes so rapidly that some teachers who have not maintained their professional development have gaps in their subject knowledge and have fallen behind. Some of the teachers in the survey were able to use ICT effectively to enhance their teaching, but lacked the skills and knowledge to use it to improve pupils' learning. Deficiencies in teachers' subject knowledge and expertise in teaching ICT were most apparent at Key Stage 2 where more technically challenging applications such as control and using spreadsheets are required. Some teaching and support staff, therefore, still lacked the necessary expertise and confidence to be fully effective.

19. Several characteristics defined the outstanding teaching seen during the survey.

    ■ Planning was meticulous, with assessment used precisely to inform tasks and the next stages of learning.

    ■ Teaching was highly motivating, using engaging and relevant contexts: for example, a classroom simulation of a shop till with a working bar code scanner was enlivened by a visit to a local supermarket; pupils were allowed to work real tills and see how the bar codes were used to generate spreadsheet data for retail stock management.

    ■ Teachers asked challenging questions skilfully to assess pupils' understanding and to build on their knowledge.

    ■ Teachers provided regular feedback to pupils on how well they were doing.

    ■ Pupils were given the opportunity to collaborate and critically review their own work and that of others; as a result, they were able to demonstrate ICT capability at a higher level.

    ■ Good use was made of teacher assessment to track pupils' progress and achievement and pupils knew the areas they needed to improve.

    ■ The well used final plenary session of such lessons tested pupils' understanding and achievement of the lesson objectives.

    ■ The schools where teaching was very good or outstanding overall established consistency by developing detailed curriculum guidance and a portfolio of assessed work with examples of work in ICT at different levels.

20. In the few ineffective lessons seen during the survey, teachers' expectations were too low and the pace of learning was slow. The teaching failed to engage all pupils sufficiently and stimulate creativity. Pupils did not have the

opportunity to develop their independence, review and evaluate their work, or share their experiences with each other. Teachers' questions focused more on checking that pupils understood instructions rather than on extending and assessing their specific understanding of ICT. Assessment remains the weakest aspect of teaching and is discussed further in Part B.

21. Teachers and teaching assistants generally worked well together to plan and teach ICT. The presence of teaching assistants helped pupils with learning difficulties and/or disabilities to make progress in developing their ICT capability that would not otherwise have been possible. They were most effective when they were well trained, had a good personal level of expertise, and planned and worked well with the class teacher. One school used a teaching assistant's expertise particularly effectively to enable Year 6 pupils to use specialist software to produce complex animations; this helped to develop their understanding of social relationships.

22. In the most effective schools, work at Key Stage 1 built on work done in the Nursery and Reception, which itself was integrated well into work to achieve the Early Learning Goals. There was planned development for pupils from Year 1 to Year 6 in modelling, monitoring, control and data handling, as well as in presentation and multimedia. The majority of the schools visited followed the Qualification and Curriculum Authority's schemes of work. In the better provision, schools had often added to and adapted these schemes to create their own cross-curricular themes and had carefully considered the use of ICT within these. In these schools, pupils were proficient in using digital still and video cameras to enhance their learning in a range of subjects. Commercial software packages aimed at improving pupils' knowledge of particular subjects were integrated well into the cross-curricular themes. Learning improved through the use of ICT in a wide range of subjects. Some schools attributed their rising standards in English in particular to their use of ICT to improve provision.

23. In weaker provision, ICT was taught in isolation and links to other subjects were insecure. Pupils had a limited range of applications to choose from in supporting their learning and there was an overemphasis on using ICT to develop communication and presentation skills. The coverage of aspects of control technology, data logging and using spreadsheets for modelling was superficial.

24. The informed use of ICT in other subjects was adding to pupils' interest in and enjoyment of learning. Where resources were used effectively, this was particularly evident for boys and for children in the early years. Some very effective teaching using ICT was seen when pupils were learning in other subjects. For example, the use of high-quality simulations to demonstrate a heart pumping blood around the body or the growth of a flowering plant from seed led to pupils' greater engagement and understanding.

25. The increasing use of ICT in other subjects is encouraging schools to explore ways of making resources available in the classroom at the point of learning rather than locating them solely in a computer room. ICT has the greatest impact on learning when there is a greater availability of resources, particularly laptops and hand-held computers. Generally, in the survey, good use was made of digital cameras, projectors, programmable toys and a wide range of software applications. Laptops and wireless networks provided more flexible opportunities for pupils to apply and develop their ICT capability. Such facilities helped to foster pupils' independent working and sense of responsibility. The majority of the schools provided an interactive whiteboard in most classrooms; teachers generally used these purposefully to enhance teaching and, to a lesser extent, learning. The schools used the internet effectively for pupils to research a variety of information, particularly in religious education, geography and history. Internet access helped to bring to life pupils' understanding of, for example, what it was like to live in another country.

26. In schools where technical support was readily available, teachers were more inclined to experiment with using ICT and to encourage pupils to do the same. In many schools, however, technical support had to be summoned from outside when problems arose and this limited teachers' willingness to try out new hardware and software. One school had trained its most able Year 4, 5 and 6 pupils to support other pupils and so assist the teacher; these pupils were highly motivated and took their responsibilities seriously.

27. Inadequate resources in a small number of the schools visited limited the use of ICT. This included technical difficulties, lack of access to a network, no broadband internet access and too few computers. In a small number of the schools, some equipment was dated and in need of replacement and, occasionally, the lack of air conditioning in computer rooms meant that ventilation was poor.

28. In a small but growing number of the schools in the survey, teachers were planning for the long-term skills that pupils were likely to need. A small number of the schools had deliberately chosen to expose pupils to alternative operating systems: this equipped them with the generic and transferable skills for coping with rapidly changing technology rather than taught them the idiosyncrasies of just one platform which would quickly become out of date.

29. Schools with well managed websites used them as a source of information and news about the school. Generally, school intranets are under-used as a source for sharing information for pupils and staff. The vast majority of the schools visited had yet to identify how they would use the virtual learning environment that the government expects them to have in action in the next few years. At

the time of their visit, only one primary school in the sample had a functioning virtual learning environment.[3]

30. The most forward-thinking schools had undertaken audits to identify pupils without access to ICT at home, with a follow-up to reduce the potential disadvantage that might result. For example, one school's audit showed that a high proportion of pupils did not have such access. It responded by initiating a 'family learning' project. Computers were acquired from local companies that no longer needed them. They were cleaned, upgraded and lent to parents, so that they and pupils could have access to ICT at home. The school provided weekly training for the parents, with the help of the local authority. Parents were very positive about this scheme which was ensuring that their children did not miss out due to their circumstances.

Leadership and management

31. The survey provides evidence of steady improvement in the leadership and management of ICT. Their impact was seen in the good quality of teaching and learning in three quarters of the schools visited in the final year of the survey.

32. Headteachers and governors were placing a high priority on developing ICT. In the most effective schools, the strategy and vision for ICT were clearly informed by an effective evaluation of implementation and impact. Some of these schools used external and local authority ICT frameworks effectively.[4] There was a very clear understanding of the strengths and weaknesses of provision for ICT and a very strong commitment by senior leadership teams, governing bodies and staff to maintaining and developing high-quality teaching and standards of achievement in ICT. This was seen in a significant investment in resources, staff training and support for subject coordinators. The vision and strategy for ICT were clearly supported by policies and documentation: these identified success criteria and were fully costed. In these schools, the school improvement plan incorporated the plan for ICT, as well as targets to ensure that ICT was integrated within and applied appropriately to all subjects and classes. Effective monitoring of the coverage of ICT and the achievement of individuals and groups in ICT informed planning for further development. Staff in these schools had become discerning about when the application of ICT made a difference and when it did not.

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[3] An Ofsted report on virtual learning environments was published in January 2009: *Virtual learning environments: an evaluation of their development in a sample of educational settings* (www.ofsted.gov.uk/publications/070251).

[4] These include the National College for School Leadership's courses on strategic leadership of ICT (www.ncsl.org.uk/programmes-index/slict-index.htm) and Becta's self-review framework. (http://schools.becta.org.uk/index.php?section=srf). Please note that National College has now closed its Strategic leadership of ICT courses, but elements from them are used in new courses; the web page has further information.

> An urban primary school gave the development of ICT a high profile. Good self-evaluation informed a three-year strategic plan and the four principles of 'best value' were applied very well. The governors made investing in new resources and technical support a priority for the budget. The headteacher gave demonstration lessons for other staff. His strong vision and outstanding leadership brought about rapidly rising standards in ICT which also contributed to better achievement in English and mathematics.

33. The role of ICT coordinator now has high status in most schools and is a vital component in improving provision. Although some ICT coordinators in the survey schools were relatively inexperienced teachers, they often brought excellent subject and technical knowledge to the role. The most effective coordinators showed a clear understanding of the strengths and areas for development in ICT, both as a subject and as a cross-curricular key skill. Their responsibilities also included monitoring the quality of planning for ICT and, through observation of lessons, the quality of teaching and learning.

34. However, in general, the schools allocated insufficient time to ICT coordinators for them to assure the quality of the provision and to organise the moderation of pupils' work. In some of the schools, the ICT coordinator produced comprehensive documentation, such as a handbook which clearly stated all working practices, policies and procedures for the subject. Good practice includes using a portfolio to exemplify standards and provide evidence of ICT work from all year groups at different levels, moderated and annotated by teachers. The ICT coordinator in one of the schools visited provided good demonstration lessons and opportunities for peer observations among teaching and support staff.

> Although the coordinator has been in post only since September, she has been active in using her initiative to develop the subject. She has already carried out a detailed audit of hardware, software, the confidence and competence of staff, pupils' skills and knowledge, and she has a very good understanding of the strengths and weakness in teaching and learning. She has established good links with the local authority and the company providing the new hardware to ensure best value in all purchases. She has already introduced formal pupil assessment by teachers and is developing opportunities for pupils to assess themselves.

35. Only a minority of the schools visited rigorously tracked the progress of pupils in ICT. Most of the schools drew together data showing the achievement of each year group in ICT. However, only in the schools where the progress of individuals was regularly tracked were teachers aware of which pupils were exceeding expectations and which were on target or falling behind. Consequently, few of the primary schools visited had data to inform their deployment of extra support so that pupils who were underachieving in ICT could catch up. This limits achievement.

36. In a small proportion of schools where the leadership of ICT was weak:

- the lack of a coordinated approach meant that the development of ICT was patchy and depended on the enthusiasm and interest of individual teachers

- self-evaluation was incomplete or inaccurate, demonstrating that senior leaders did not have a clear understanding of their school's strengths and weaknesses in ICT

- there was no discrete ICT development or action plan produced by the ICT coordinator; where one did exist, the priorities were not adequately informed by the outcomes of monitoring and evaluation

- there was no monitoring of achievement in ICT or tracking of the progress made by individuals or groups.

37. While most of the schools visited had a policy for using the internet safely, in some it had been several years since the policy was reviewed. In their self-evaluation, around half of the schools visited described the measures they took to help keep pupils safe, but very few had actually evaluated the effectiveness of these measures. This meant that those schools could not be sure that all children knew how to keep themselves safe.

Secondary schools

Students' achievement and standards

38. Evidence from the period of this survey suggests that there has been slow improvement in students' achievement in ICT since 2005, but with more good and outstanding achievement seen in the survey's final year. The proportion of schools where achievement in ICT was unsatisfactory has fallen. In the first year of the survey period, achievement was inadequate in one in seven of the schools visited; in the final year it was inadequate in one in 30.

39. Of the students taking the full GCSE course in ICT in 2007, 64% achieved a grade C or above, which was similar to that for all other subjects. The proportion of students who follow either the applied double award or the short course GCSE has declined by a third since 2004 with 49.1% and 48.7% attaining a grade C or above respectively. Before the course was withdrawn, just over two thirds of students following full General National Vocational Qualification Intermediate courses studied ICT, with results similar to those for other vocational qualifications.

40. In the schools with sixth forms which were visited for the survey, only a small number of students were studying discrete ICT or computing courses. Nationally, few students attain the highest grades in A-level examinations. In 2007, just 49% of A-level ICT candidates and 57% of those studying computing gained a grade C or above compared with an average of 73% for other

subjects; a much higher proportion of students (6.6.%) failed the courses than in other subjects.

41. The number of candidates following a computing course has declined sharply in recent years. Despite outperforming boys at GCSE, an alarmingly low and declining proportion of girls choose ICT or computing at Advanced level. Of those entered for examinations in 2007 in A-level ICT, 37% were girls. For A-level computer studies, just 8% of entries were girls. Participation and pass rates were similarly low at GCE AS level in both subjects, with nearly a quarter of students failing their course altogether. The performance of students following sixth-form vocational ICT courses was lower than that in most other subjects.

42. In secondary schools, students made the best use of ICT in communicating their ideas and presenting their work. Access to a wider range of software applications is now better; for example, students were increasingly using ICT for manipulating digital media, composing music and reviewing their performances in dance, drama and physical education. Where achievement was good, students were independent and creative, using ICT naturally to support their learning. They appreciated the importance of design, layout and the function of tools in analysing information and modelling real-world scenarios. However, standards in the more complex uses of spreadsheets and databases were generally lower. Students' use of logical operators and functions was basic. They lacked understanding and made limited use of macros, scripts and programming principles and structures.

43. In one of the few schools in the survey where the standard of database work was above average, the students could design and construct a database with appropriate fields and data control facilities. They used search routines well and the higher-attaining students used Boolean logic effectively within search parameters. In this school, students were also skilled in using data logging because of the strong emphasis placed on this aspect by the science and geography departments. Students accessed remote cameras from around the world over the internet and overlaid their photographs of their work on satellite imagery of the terrain.

44. Increasingly, good standards in using ICT were evident across the curriculum. In one of the schools visited, students used digital video cameras effectively in science to record their experiments. Subsequently, they analysed and evaluated the way the experiment was conducted and, as a result, were better able to understand and explain their findings. In a geography lesson, students were taken on a virtual field trip to improve their knowledge and understanding of the planet.

45. Students who are capable in ICT are able to make informed judgements about when and where to use ICT to consider the implications of their choices of solutions when solving problems. However, few of the schools visited enabled

students to experience more than one operating system, and this limited their awareness of different platforms' strengths and weaknesses. In many schools, students turned to 'office' application suites even when a task would have been better dealt with by a type of software not usually provided as part of such suites.

46. Unsatisfactory achievement was due mainly to weak teaching, weaknesses in the planned provision, or both. In particular, in Key Stage 4, the vast majority of students who chose not to study for an ICT qualification did not receive their statutory National Curriculum entitlement and so this sometimes sizeable group made inadequate progress. For example, at one rural comprehensive school, over half the students in Years 10 and 11 did not follow a taught programme of ICT. Many of the Year 11 students had received only around 20 hours of ICT tuition in total since joining the school. As a result, their progress was inadequate and many of them failed to use what ICT skills they did have to improve the standards of their work in other subjects.

47. The assessment requirements of some vocational qualifications may actually be limiting students' achievement. In many of the schools visited, higher-attaining students were insufficiently challenged. Even where the full National Curriculum was provided, vocational qualifications and coursework requirements at GCSE required students to devote a large proportion of their time to demonstrating competency in the skills to be assessed. Consequently, much of the work in ICT at Key Stage 4, particularly for the higher attainers, often involved consolidating skills that students had already gained proficiency in and therefore the rate at which new skills were learnt was relatively slow.

48. In the schools visited, students almost always enjoyed working with ICT and were well engaged by tasks that enabled them to do so. Using ICT contributed effectively to their personal development. In sharing ideas, it helped to develop the skills of working independently and cooperatively. ICT was particularly successful in motivating disaffected boys and improving their attitudes to learning, for example through giving them opportunities to record podcasts in modern foreign languages.

Quality of provision

49. Provision was good or better in over half of the schools visited. It was satisfactory in around a third and was inadequate in around one in five schools, where a sizeable number of students were not taught ICT at Key Stage 4.

50. Where ICT was taught as a subject by specialists, the quality of teaching was usually good, although there were often exceptions in the teaching of higher-level uses of data handling and how to write sequences of executable instructions. Specialist teachers mostly had good subject knowledge and used ICT to good effect in their own teaching. They provided activities of appropriate

difficulty for students with learning difficulties and/or disabilities, and these students were supported increasingly well by well trained teaching assistants.

51. Unsurprisingly, deficiencies in teachers' subject knowledge and expertise were more significant when non-specialists taught ICT as a specific subject, which was sometimes the case at Key Stage 3.

52. The most effective teachers had excellent subject knowledge and high expectations of students. Their learning objectives were explicit, transitions between activities were managed well, and explanations were clear and accurate. Learning was good in these lessons because students were engaged, challenged and required to review, evaluate and improve their work. Teachers used quick-fire question and answer exchanges to elicit knowledge and understanding and clear up misconceptions. Planning took into account the needs of individuals and groups of students, such as the needs of boys and girls, those who were gifted and talented, and those who had specific learning difficulties and/or disabilities. Such lessons incorporated a variety of interesting tasks which tackled the more challenging aspects of the ICT National Curriculum, such as data handling, modelling and programming.

53. During the survey, the best lessons at Key Stage 4 and post-16 were characterised by teachers' detailed subject knowledge and their excellent understanding of the requirements of the examination specifications. The most effective teachers planned exciting and useful activities to improve students' examination techniques and enable them to gain the highest marks in their coursework. Innovative and engaging activities in one of the schools visited were used to introduce Key Stage 4 and post-16 students to specific coursework tasks. For example, the design of an automated accounts system for a sandwich company began with a lesson on how to calculate costs using real sandwich ingredients; a control project began with a line-dancing lesson to improve students' understanding of error checking and precision.

54. Relatively few of the lessons seen, however, were outstanding. This is one example.

> The teacher's planning showed his thorough knowledge of each student's attainment and progress to date. He capitalised on the interactive whiteboard to show how podcasts had been used in the coursework of previous ICT students. A well designed 'Be the teacher' assessment sheet enabled students to work together to evaluate the quality of their peers' presentations and to discuss and record their feedback.
>
> All the students were actively engaged throughout the lesson. They showed high levels of enjoyment and understanding of the effective use of sound files to meet the needs of specific audiences. They benefited greatly from their teacher's expertise. This enabled them to use iPods effectively to record their own sound files and to anticipate potential

sources of error. Their learning was enhanced further by informative and helpful feedback from the teacher and their peers. They made excellent use of the school's online assessment system to record their progress and indicate the steps they had taken to improve.

55. The implementation of the National Strategy for ICT has increased teachers' understanding of ICT capability. Despite this, too many of the lessons seen during the survey emphasised the development of skills in using specific software at the expense of improving students' ICT capability.

    Common weaknesses in the ineffective lessons included:

    ■ teachers' lack of detailed subject knowledge to help students learn

    ■ objectives not being made clear, so that students were confused about what they should be doing

    ■ too much talking by the teacher for too long, so that students became bored or distracted

    ■ little opportunity for independent learning and creative thinking

    ■ superficial questioning with limited challenge.

56. Increasingly, teachers are using ICT to improve learning in other subjects. For example, access to a wider range of software applications has improved and students are using ICT more often for manipulating digital media, composing music and reviewing their performances in dance, drama and physical education. However, during the survey, teachers of other subjects often still did not know what they could expect of students when planning to use ICT in units of work. This led to over-concentration on developing students' presentation and communication skills and too much repetition – for example, in creating software presentations using the same, rather than new, skills.

57. Some schools provided a range of ICT qualifications and guided higher-attaining students to choose a GCSE course and lower-attaining students an appropriate vocational or entry-level qualification.

58. Ofsted has raised concerns, in previous reports on ICT, about the quality of assessment in the subject. It was inadequate in one school in five and around half the schools in the survey had significant weaknesses in their assessment practice. Although there were more examples of outstanding practice in schools seen during the final year of the survey, there was no evidence of a general trend of improvement and assessment overall remains unsatisfactory. This is discussed further in Part B.

59. Most schools have invested substantially in ICT resources, although the demand for access from students working in other subjects continues to outstrip what is available. Schools were still struggling to find effective ways of taking ICT to the students rather than taking the students to the ICT. There were some

excellent examples of handheld technology being used to make ICT resources available on students' desks in classrooms. This kind of approach, however, was the exception. It was far more usual for teachers of other subjects to book their classes into computer rooms when they were available. This hindered many schools from using ICT to improve learning in other subjects beyond presenting work well. This is explored further in Part B.

60. In a substantial minority of the schools visited, the accommodation for ICT was inadequate. The design of some computer rooms hindered good teaching and learning. For example, some rooms were cramped and did not have space for students to work away from computer screens or come together as a class or in groups to talk about their work.

61. In around half the 28 pupil referral units visited by Ofsted for another survey, inadequate accommodation limited what could be taught on site.[5] Where there was provision for ICT on these sites, it was generally good but sometimes hindered by a paucity of resources.

62. As with some of the primary schools, several of the secondary schools visited had conducted an audit to identify students who might be disadvantaged by not having access to ICT at home. They sought to redress any imbalance by providing such students with extra time for using computers in school.

63. In the most effective schools visited, the ICT curriculum was carefully planned and regularly reviewed to include interesting activities matched to the needs of all students. For example, one school had created a virtual office environment to enable students to compare their own use of ICT with its use in the wider world, as required by the Key Stage 3 programme of study. Many schools provided weekly ICT lessons for all students in Years 7 to 9, using units from the ICT strand of the National Strategy. Students' application of the ICT skills learnt in these lessons across other subjects, however, was rarely planned for; what took place was often haphazard and uncoordinated.

64. Ofsted's reports on ICT have raised concerns about the secondary curriculum, particularly at Key Stage 4. Her Majesty's Chief Inspector's Annual Report for 2006/07 noted:

> 'The curriculum for information and communication technology (ICT) in Key Stage 4 is not improving, and the development of ICT skills to support

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[5] *Pupil referral units: establishing successful practice in pupil referral units and local authorities* (070019), Ofsted, 2007; www.ofsted.gov.uk/publications/070019.

learning across the curriculum remains too dependent on the expertise of individual subject teachers.'[6]

Little improvement is evident. Almost one in five of the schools visited made no provision for students who did not opt to study for an ICT qualification at Key Stage 4. Access to ICT through work in other subjects was mostly not monitored and nor was the work assessed. In a few of the schools visited, this group represented the majority of the students. It is a concern that, in these schools, acquiring skills which are crucial to students' future economic well-being is left to chance.

65. Where the programmes of study were available to all students, there was, nevertheless, a tendency to focus on some aspects of the ICT National Curriculum at the expense of others. As noted earlier, students had plentiful opportunities to use ICT for presenting their work well and communicating their ideas. They made increasing use of software for editing digital photographs and video, composing music and building animations. Spreadsheets were used widely for laying out data, performing calculations and drawing graphs but less use was made of the more complex functions such as those with conditional operators or 'look up' capabilities. Coverage of control, sensors and databases was limited in many of the schools, as was the provision for students to learn the logical thinking necessary to program, write scripts or macros, which was cursory and superficial. There were, however, some notable exceptions.

Provision in a rural secondary school for students to collect and analyse data was outstanding. The Eco-centre was purpose-built and designed specifically to educate young people in sustainable technologies. At the time it was built, a number of sensors were incorporated into the structure. These, in addition to controlling the environment automatically, were used by students for data-logging experiments. For example, as part of the science course, Year 9 students used data-logging software to compare thermal energy transfer [heat loss] within the Eco-centre with heat loss in other buildings in the school. Scientists and geographers used a computerised three-dimensional world map as a valuable teaching aid for students to observe the formation of weather patterns, such as the path of hurricanes. Students also used the video-conferencing facilities to take part in an 'e-mission' project about a simulated volcanic eruption. Working in teams, students made decisions in the aftermath of an eruption under the watchful eye of an online expert.

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[6] *The Annual Report of Her Majesty's Chief Inspector of Education, Children's Services and Skills 2006/07* (HMI 20070035),), TSO, 2007; www.ofsted.gov.uk/publications/20070035.

66. Schools are beginning to respond to the requirement to provide a virtual learning environment, although only two of the secondary schools visited had one up and running. Schools that had implemented a virtual learning environment were still considering how to use its functionality effectively beyond simply moving files between home and school. The use of school websites and intranets as a source of information for parents, students and staff was variable. Schools did not often capitalise well on these kinds of resources to enable planning and teaching resources to be shared. Access to ICT facilities at lunch times and after school was generally good. The technical problems of the past have been largely overcome, with the vast majority of schools visited providing reliable ICT systems.

Leadership and management

67. Evidence over the period of the survey from the sample of schools visited suggests that leadership and management are improving. At the start of the survey, leadership and management were inadequate in one in five of the schools visited. In the schools visited during 2007/08, however, leadership and management were good in over half the schools, satisfactory in two fifths and inadequate in one in 20. A common weakness was a failure to evaluate the impact of using ICT to improve learning in other subjects, despite the considerable investment some schools had made in it.

68. Ofsted reported in 2005 that 'the involvement of senior managers, especially the headteacher, was the most critical factor in good ICT leadership.'[7] In the schools where ICT had the greatest impact, a strong commitment to improve staff and students' use of ICT was evident among headteachers and governors. This resulted in a clear and coherent vision for the place of ICT and an expectation on all subject leaders that ICT should be used to improve learning in their areas. Where leadership and management were most effective, teachers used ICT creatively in many different subjects and there was good evaluation of its impact on raising standards.

69. Such schools articulated their vision for ICT through detailed strategic plans and subject action plans. These specified how the impact of ICT on raising standards would be monitored and evaluated. Strengths and weaknesses of the ICT provision were accurately identified using nationally available evaluation tools such as Becta's self-review framework.[8] Training for ICT was integrated well into the school's cycle of planning and senior leaders had a good overview of what training had been completed and what was still needed. The approach

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[7] *Embedding ICT in schools – a dual evaluation exercise* (HMI 2391), Ofsted, 2005; www.ofsted.gov.uk/publications/002391.
[8] The Becta self-review framework allows schools to benchmark themselves against established best practice and helps schools create an action plan for improvement.

to ensuring that training met the school's priorities was systematic and there was a clear evaluation of the outcomes.

70. A very small number of these schools consulted students about what they liked and disliked in ICT teaching and about the resources available; their views were taken into account in strategic planning.

71. Sometimes, despite an underlying commitment from the headteacher, shortcomings remained in strategic leadership. In such schools, where the overall leadership of ICT was satisfactory rather than good, pockets of better practice were seen in using ICT in other subjects, but this was attributable to teachers' individual initiative rather than an outcome of strategic intent. In these schools, although the strategic plans may have included ICT, they did not focus sharply enough on the intended outcomes for students and rarely reflected the school's practice and aims. There was investment in resources, particularly interactive whiteboards, but this was rarely the result of evaluated need. Similarly, audits of staff training needs were rare and, despite training being available, there was usually no formal system for measuring its impact on improving teaching and learning.

72. Importantly, in the few schools in the survey where the strategic leadership of ICT was inadequate, senior leaders had not ensured that the Key Stage 4 curriculum met statutory requirements. In some cases, even though it complied with requirements, the curriculum was narrow and did not offer sufficient opportunities for students to extend the range of their skills and transfer their capability to different contexts. There was little clarity about the choice of particular qualifications at Key Stage 4 and the proportion of timetabled lessons allocated to them.

73. Good strategic leadership of ICT by senior leaders is essential for ensuring that ICT is used widely and effectively to improve learning; subject leadership is also very important, particularly in promoting good-quality teaching and high standards, as in this example from a large, urban comprehensive school that serves an area of social deprivation.

> The head of the ICT department provided outstanding leadership which ensured that standards continued to improve in ICT. Roles and responsibilities within the department were clear and, as a result, the management of ICT was also outstanding. All documentation for the subject was extremely comprehensive and informative. It provided excellent guidance on policies, procedures and protocols to enable new staff in particular to feel confident and well supported.
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> The vision for using ICT across the curriculum was excellent. All departments were required to identify targets for integrating ICT and these were also embedded in the school development plan. There were innovative ideas to improve access to ICT and tackle the enormous

> constraints presented by the design and fabric of the school buildings. Departmental self-evaluation was effective and showed an excellent understanding of the team's strengths and weaknesses in ICT. Areas for improvement were well communicated and demonstrated a clear emphasis on continuing to raise standards and improve achievement in the subject.

74. A few of the schools visited had experienced turbulence in their staffing. Where this involved the head of department, good strategic leadership of ICT was instrumental in helping the new head of department to accustom him or herself quickly to what was needed.

> The headteacher was the driving force behind implementing the vision for ICT across the school. In developing a team of staff keen to use ICT in their subject teaching, he was informed by a clear picture of strengths and weaknesses. A new head of department was well supported by the headteacher's good planning that enabled further improvements to the curriculum to be implemented smoothly. Planning focused firmly on how students learn and on helping them to become independent and creative users of technologies. Most subjects were using ICT to improve learning.

75. Generally, schools were well resourced with extensive networks and high-speed internet access. A majority of those visited had installed wireless networks and that meant teachers could use their laptops and handheld computers in their classrooms. Technical problems had largely been overcome, with the vast majority of schools having secured good-quality technical support to provide reliable systems. Where this was not the case, staff and students expressed frustration with unreliable hardware or systems and support that did not allow innovation, experimentation or flexibility.

76. Many of the secondary schools visited were using the additional funding for their specialist status to invest in ICT resources and infrastructure; they saw ICT as an important vehicle for raising standards in the specialism. Some sports colleges, for example, had sophisticated software for evaluating the performance of individuals and the team as a whole; an arts college made good use of video editing and digital sound production; a science college had invested in high-quality simulations; and a technology college had specialised three-dimensional design software that could drive machines to manufacture students' artefacts directly.

> A technology college used strengths in its specialism very effectively to raise standards in other subjects. Extra resources and training were provided for the mathematics and design and technology teams to enable them to hone their expertise in using ICT to improve learning. Over two years, these teachers became highly proficient in using interactive whiteboards and other ICT resources, such as wireless voting handsets. At the same time, a virtual learning environment was established so that

teachers and students could access the lesson plans and learning resources from within school and from home. Monitoring by the head of mathematics showed the quality of teaching and learning to have improved after two years so that nearly all the lessons seen were at least good and, of those, around one third were outstanding.

Teachers from the mathematics and design and technology teams worked closely with teachers from other subject teams to help them improve their use of ICT. The lesson objectives and learning activities were carefully analysed to identify where and how ICT might improve learning and coaching was provided to support its implementation. The virtual learning environment enabled teachers to share good practice and resources more widely. The school believed that making learning resources more accessible to students was improving the quality of homework tasks, encouraging higher attainers to go further and engaging lower-attaining students more effectively.

77. Schools applied the four principles of best value (challenge, compare, consult, and competition) inconsistently in informing strategic purchases, even though governing bodies receive delegated budgets on the condition that they adhere to these principles. Financial regulations ensure that procurement is competitive and this principle for achieving value for money was applied universally. However, it was more unusual for managers to consult staff, students and parents on planned investment in infrastructure, to challenge why they were purchasing a particular operating system and software or to benchmark the quality and cost of the services they provided. Hence, most schools were not obtaining the best value for money from a considerable investment in ICT resources. This subject is explored further in Part B.

78. Around half of the self-evaluation forms completed by the schools visited commented on the provision for keeping students safe when using ICT. Most of these schools had an agreement on acceptable use signed by students and their parents or carers. Typically, breaches of the agreement resulted in the temporary suspension of access rights. These schools sought to ensure students were aware of how to keep themselves safe when online. Internet access in the vast majority of the schools visited was filtered to block attempts to visit known inappropriate websites and monitoring by staff provided a further deterrent.

79. A 2008 survey by the Children's Rights Director of more than 300 children who live away from home revealed that over a third of them had experienced some form of cyberbullying. [9] For some this included:

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[9] *Children on bullying: a report by the Children's Rights Director for England* (070193), Ofsted, 2008; www.ofsted.gov.uk/publications/070193.

- the circulation of embarrassing video clips about them
- the deliberate infection of their home computer with a virus
- having false reports made about them, so that social networking sites excluded them
- having their online identity stolen.

80. In a survey of schools' self-evaluation forms, around a third of schools said they banned or blocked mobile phones, messaging software and social networking websites, mainly because of concerns about cyberbullying.[10] A few of the schools visited in this survey had installed automated monitoring systems that checked internet and network traffic for the use of specific key words and alerted a member of staff if there was evidence either that a student was at risk or, possibly, was abusing others. It is clear that schools take seriously their responsibilities for keeping students safe, but very few of the schools evaluated the actual impact of such these measures. Only one of the schools in the survey reported the number of incidents it had had to deal with.

81. The vast majority of the schools visited used ICT well for efficient administration and effective management of the institution. Increasingly sophisticated school websites have improved communication with parents and carers. Some schools used ICT to automate tasks that were previously carried out by school staff, for example: to register attendance at individual lessons and to check for truants; to alert parents automatically to students who had not arrived at school; or to publish online details of students' good or unacceptable behaviour for parents to monitor. Most secondary schools had an appetite for exploring the myriad ways in which ICT might help them to fulfil their functions more effectively.

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[10] *School self-evaluation: a response to the Byron Review* (080203), Ofsted, 2008; www.ofsted.gov.uk/publications/080203.

The importance of ICT

Part B. Issues in ICT

82. In general, ICT provision in schools has improved since 2004 when Ofsted last reported on it.[11] There is a will to make better use of ICT and schools have found ways to manage budgets strategically so that current levels of resourcing are sustainable. While Part A acknowledges the progress that has been made, Part B explores the areas which need to be tackled next to increase engagement and raise achievement.

Assessment as a driver for improving ICT capability

83. In the sample of schools visited since 2005, the quality of assessment has continued to be the weakest area of provision. One in five of the schools inspected had no systems for assessing levels of ICT capability. They rarely had a formal system for tracking the progress of individual pupils and students, and they were unaware of how well they were doing. Consequently, there was little formal transfer of information about ICT capability at the end of each year or key stage; this led to work being repeated which, in turn, limited achievement. In the majority of the primary and secondary schools visited, teachers did not evaluate specifically how well pupils and students applied and used their ICT skills when working in other subjects.

84. In the primary schools visited, assessment was generally weaker than other aspects of teaching and learning. This goes some way to explaining the unevenness of pupils' progress in different aspects of ICT and some underachievement. In the majority of the primary schools, teachers marked work in ICT but assessment lacked the rigorous moderation and standardisation necessary to produce a reliable picture. Few teachers had a formal system for recording pupils' progress or a clear picture of the level of individual pupils' ICT capability. Often, pupils were uncertain about how well they were doing in ICT or what they needed to do to improve their work. Assessment data were rarely used well to track pupils' progress, for benchmarking or to evaluate the impact of strategies for inclusion.

85. Most of the primary schools visited missed opportunities for pupils to become involved in peer or self-assessment and to create informative portfolios of their work. Where this was done well, pupils evaluated their work against the learning objectives and were able to identify strengths and weaknesses in what they had done; pupils' self-evaluations were then closely linked to teachers' and teaching assistants' detailed summative assessments to inform the planning of further work.

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[11] *ICT in schools 2004: the impact of government initiatives five years on* (HMI 2050), Ofsted, 2004; www.ofsted.gov.uk/publications/002050.

86. The teachers observed rarely showed pupils examples of how to apply and extend their ICT skills across the curriculum and this exacerbated the underachievement of potentially high-performing pupils. It was the exception to find primary teachers who set homework in ICT.

87. Whilst teachers in primary schools usually checked work completed as part of taught ICT activities, it was rare to find they assessed pupils' use of ICT in other subjects. Hence, the extent to which pupils were able to apply what they had learnt in taught ICT lessons to their work elsewhere went unnoticed. Combined with the absence of tracking systems, primary schools' monitoring of pupils' development and wider use of ICT skills was incomplete and ineffective.

88. The secondary schools with well developed assessment procedures established students' attainment in ICT when they transferred from their primary schools or shortly afterwards. Extensive assessment of work completed in ICT lessons and in other subjects took place, providing teachers with an excellent picture of individual students' capabilities in ICT. Targets were set and students received good guidance on how to improve their work.

89. However, this was not the case in the majority of the schools visited. Few of the schools established attainment on entry or tracked students' progress in ICT with sufficient rigour. Whilst assessing work completed as part of ICT courses was satisfactory, assessment of the use of ICT in other subjects was insufficient, reflecting the fragmentary nature of provision. ICT departments were often unaware of how well students applied in other subjects the skills they had taught them and so this important measure of effectiveness was missing from their self-evaluation. Furthermore, schools took little account of students' ICT achievements outside school, leading to an incomplete picture of their overall attainment and insufficiently challenging work for the highest-attaining students.

90. Getting assessment right is vital if standards in ICT are to improve. It is estimated that 77% of the workforce now use information technology (IT) in their job and the demand for such skills is likely to continue to increase.[12] Schools must equip young people with the 21st century skills necessary to ensure their employability. ICT therefore needs to be given high status, both by the government and in individual schools, commensurate with its importance in young people's future economic well-being.

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[12] *Technology counts: IT and telecoms insights 2008*, e-skills UK, 2008; www.e-skills.com/Research-and-policy/Insights-2008/2179.

Re-thinking ICT qualifications and progression routes

91. The ICT strand of the Key Stage 3 National Strategy was introduced in 2002. Although they are not statutory, schools have welcomed the 14 units of work. They cover the National Curriculum programme of study for ICT, albeit with an emphasis on aspects of communication and presentation.

92. At Key Stage 4, the past decade has seen the rise of a succession of vocational qualifications in ICT set against the relative decline of GCSE. The two most popular vocational qualifications both offer accreditation at levels 1 and 2, equivalent to GCSE grades D–G and A*–C respectively. Both qualifications offer options for students to submit work equivalent to anything between one and four GCSEs. Typically, however, where students are pursuing a qualification equivalent to four GCSEs, they do so in around half the number of timetabled lessons usually allocated to that number of GCSEs in other subjects. Students can gain approximately double the number of GCSE points from vocational ICT qualifications than they can in the same time from studying GCSEs in other subjects. The implications of this are explored below.

93. Both of these vocational courses are modular. They offer a wide choice, including computer graphics, creating multimedia products, music technology and even computer gaming. While both courses have been successful in engaging and motivating students in communicating and presenting their ideas using ICT, most of the competencies related to spreadsheets and databases that students are required to demonstrate for accreditation have already been covered at Key Stage 3. Many students therefore repeat work; the expectations for progressing further in using control, data logging, spreadsheets and databases are low. For instance, in one of the vocational qualifications, students are expected to demonstrate how to format cells, how to use print options effectively and how to add headers and footers. The requirement to demonstrate anything beyond that which they learnt about spreadsheets at Key Stage 3 is minimal. Similarly, in working with databases, the only extra requirement at Key Stage 4 is that students should be able to print the data in table, list and label formats.

94. Accreditation of the vocational qualifications is based mostly on the assessment of coursework. Students spend considerable time completing tasks to meet the assessment criteria. Consequently, they are often demonstrating what they can already do rather than being taught new and more difficult skills. Sometimes, teachers direct students' work too much. In some of the lessons observed during the survey, teachers led their students through the steps necessary to demonstrate that their work met the accreditation criteria. Students were able to meet the criteria, whether or not they had understood what they had done.

95. Whereas GCSE ICT places equal emphasis on all aspects of the National Curriculum programme of study, so that schools can be sure that students following that course will receive their full statutory entitlement, vocational

courses do not. Although they include a small element of compulsory study, depending on the units chosen, most students do not cover all aspects of the Key Stage 4 National Curriculum. For example, the requirement that students must 'apply, as appropriate, the concepts and techniques of using ICT to measure, record, respond to, control and automate events' may be missed at the expense of popular units on topics such as web page creation and creating video. As a result, some vocational qualifications limit the achievement of higher-attaining students and fail to develop the vital skills for the UK, and indeed global, economy, such as manipulating data and programming.

96. Over the past decade, schools have moved away from GCSE ICT, which is perceived to be more difficult, to take on vocational courses. Increasingly, the schools have turned to qualifications that are seen to be less demanding. A proper evaluation of the challenge posed by vocational qualifications is necessary if they are to retain credibility with students, parents and employers.

97. The predominance of vocational GCSEs also has ramifications for post-16 study. The vocational courses are poor preparation for the demands of A-level computer studies and ICT courses. Consequently, the number of students choosing these sixth-form courses is low. Compared to 2004, in 2007 around 25% fewer students were entered for A-level ICT, with the decrease comprising boys and girls equally. Over the same period, the decline in A-level computer studies was more severe with a 32% drop in entries (45% drop in girls' entries and 31% for boys).

98. Vocational qualifications have been successful in attracting girls to choose an ICT course at Key Stage 4. The heavy emphasis on tasks based on using ICT for communicating and presenting, aspects which are assessed entirely through coursework, has been an important factor in recruiting them. Perversely, this very emphasis is potentially limiting the achievement of higher-attaining students and has not reversed the decline in the number of girls choosing to pursue ICT in the sixth form.

99. The organisation e-skills UK and others have undertaken much research into the growing gender imbalance in ICT. Fewer girls than ever are studying for formal qualifications in the subject in the sixth form and the number continues to decline. Less than one quarter of IT graduates are women. This has serious implications for the IT industry, where just one in five workers is female. An e-skills UK report indicates that, in 2007, only 18% of IT and telecoms professionals were women and the number of female ICT professionals is actually falling.[13]

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[13] *Technology counts: IT and telecoms insights 2008*, e-skills UK, 2008; www.e-skills.com/Research-and-policy/Insights-2008/2179.

100. Computer Clubs for Girls (CC4G) is an initiative, funded by the Department for Children, Schools and Families, for maintained schools in England.[14] It consists of after-school clubs exclusively for girls aged 10 to 14 and has been developed to encourage more girls to pursue a career in IT and, generally, to raise their achievement in ICT at school. Around 3,000 schools currently run Computer Clubs for Girls, with a membership of more than 100,000 girls. The aim is for 150,000 girls in 3,600 schools to eventually benefit from the clubs.

101. The software used for Computer Clubs for Girls is designed to appeal particularly to girls, with subject matter for projects chosen to encourage them to develop their skills. Through collaborating on projects, they also develop interpersonal skills such as leadership and team working. For example, at one participating primary school visited, the girls spoken to were enthusiastic about the scheme. The evaluation of the project by e-Skills UK suggested that 95% of club facilitators claim that Computer Clubs for Girls improves girls' performance across the curriculum. A survey of girls attending the clubs indicated that 66% of them would be more likely to consider a career in technology as a result of Computer Clubs for Girls. While this and the introduction of the new diploma in ICT from September 2008 may help to increase girls' participation in ICT, the current pass rates in sixth -form examinations might deter them from undertaking these higher level courses.

Is it worth it? Value for money judgements on ICT

102. Approaching £2 billion has been spent on ICT in schools during the past decade. As noted earlier, governing bodies are expected to apply the four principles of best value in ensuring the school and the country gets value for money from this significant investment. Local authority financial procedures and auditing ensure that the principle of 'competition' is well met. This is not always the case for the other three principles which, as the examples below illustrate, means that some schools do not obtain good value for money.

103. '**Compare performance with others to see where improvements could be made.**' The vast majority of schools have invested heavily in computer networks, running expensive commercial operating systems and standard 'office' suites of software. In these schools, the annual licensing costs for each networked computer are eating up a significant proportion of the ICT budget, restricting further expansion. In a few of the schools visited, ICT managers, following guidance from Becta and the National Audit Office, had benchmarked the procurement and support costs of commercial software against what was more cheaply or freely available. For instance, open source operating systems and software are now a reliable and cost-effective solution, enabling the few

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[14] www.cc4g.net/public/index.html.

schools that choose this route to achieve excellent value for money.[15] A few schools have used open source software for establishing a virtual learning environment, enabling them to obtain several years' worth of development with no licensing costs.

104. '**Challenge why and how a service is being provided**.' All the schools in the sample had chosen to purchase a package of 'office' software that is standard in the business world. On the one hand, this has the benefit of introducing students to software they are likely to encounter in the future; on the other, it may actually be hindering the development of their skills. Sometimes students are not aware of the range of other software types beyond the common four of word processing, spreadsheet, presentation tool and database found in the standard 'office' package. This may lead them to attempt to complete tasks using inappropriate tools. For instance, inspectors saw students struggling with page layout tasks in word processing and presentation software which could have been achieved more easily with publishing software. The standard database software provided as part of 'office' packages is difficult to access and inappropriate for learning relational database work. Its widespread deployment for teaching and learning about databases is limiting students' capability. Schools do not challenge sufficiently the value of deploying a set of adult productivity tools to help pupils and students develop their ICT capability. In the small number of schools that had deliberately chosen to provide a mixture of operating systems, students met a greater variety of software and were better equipped to cope with rapidly changing technologies.

105. '**Consult stakeholders**.' In the schools visited, it was unusual to find that students, staff and the community had been consulted on their requirements for ICT system services, capabilities and their consequent training needs. Consultation is an important element of self-evaluation and of achieving value for money. In the rare instances where ICT managers had consulted systematically, teachers were able to develop their skills in teaching, planning, research and subject knowledge. The impact was seen in improved standards and students' achievement. In the most effective schools visited, an ICT element was included in the performance management reviews of all staff. In a large proportion of the schools, however, there was little or no systematic consultation or identification of the individuals' resource and training needs. This limited the value for money obtained from investments in ICT.

106. Schools were mostly falling behind the national timescales for having a virtual learning environment up and running. Even the minority of schools that had managed this were still thinking through the role of a virtual learning

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[15] 'Open source' means that the program code has been made freely available to facilitate collaborative development work. The software and operating systems that result from this work are available to all at no charge.

environment in improving learning. By the time all schools have established virtual learning environments, the technology may well have moved on, making them an expensive irrelevance. Further consideration should be given to the value for money provided by this national initiative.

Getting ICT to the learning

107. A few of the schools visited had made 'using ICT' the centrepiece of their curriculum development work – with striking outcomes, as in this example.

> Over the past ten years, a forward-thinking specialist media college has made using ICT – and moving imagery, in particular – central to learning in all subjects. Lessons are planned to provide regular, extended opportunities for students to learn using their creative skills. Teachers have been well supported in acquiring skills in ICT and are encouraged to become experts in specific aspects of using ICT to make moving imagery. They are expected to research, experiment and keep their skills up to date. A good investment has been made in laptops to ensure that there are sufficient ICT resources for students to use in classrooms. Teachers give students time to complete practical tasks, encourage collaborative and independent learning and trust them to use expensive equipment sensibly. Students are highly motivated by this approach to learning and are aware of how they can transfer skills developed in one subject to another. The curriculum is constantly under review and schemes of work are updated to ensure that teaching keeps pace with developments in the media industry. Schemes of work and associated learning resources are now provided only from the virtual learning environment, making paper print-outs unnecessary. The focus on getting ICT to the learning has seen achievement at the college rise sharply to be in the top 10% of similar schools for the past three years.

108. Nationally, however, although the use of ICT in other subjects is generally improving, the picture this survey establishes is one of patchy provision and inconsistent progress. In most schools, more resources are available and these are more reliable. Teachers' greater familiarity with the resources in their classrooms is enabling them to become more confident and competent in using ICT to improve their teaching. For example, over the past few years, interactive whiteboards and data projectors have proliferated, so that they are now installed in most primary classrooms and are commonplace in secondary schools. They are widely used to improve teaching by making the presentation of work more immediate and eye-catching. More teachers are accessing online ICT resources to use on their interactive whiteboards, such as those provided by professional subject organisations, and this is increasing the variety of experiences in lessons.

109. A strong link exists between a school's specialist status, the kinds of ICT resources it has invested in, and the training it has provided. There are

instances where this has opened up a gap between the quality and range of resources for the specialist subjects compared to those for other subjects. For instance, in performing arts schools, access to digital instruments and recording software in music can help to overcome students' limitations, enabling them to perform and compose where they may not have succeeded when using traditional instruments. In technology colleges, modern design and technology equipment allows students to try out different ideas and realise their finished product much more quickly than would be the case using traditional methods. However, if the school's specialism is in another area, modern equipment is not necessarily available in these subjects and students are sometimes disdainful of the old equipment and outdated software which is provided.

110. Progress in using ICT to improve learning in other subjects is sometimes limited because its use was not sufficiently considered when planning the work or because of individual teachers' lack of understanding of when and where ICT might make a difference. Sometimes it is because a teacher simply does not know how to use a particular piece of equipment. Most often though, subject teachers say it is because they are frustrated by the school's inability to give their students sufficient access to ICT. Their teaching has improved precisely because interactive whiteboards are installed in the classrooms where the lessons take place. Learning has not improved to the same extent because the ICT resources to which students need immediate access are mostly in computer rooms elsewhere.

111. Schools have successfully created a demand from teachers to be able to use ICT to improve learning in other subjects but are rarely able to meet it. Most primary and secondary schools have chosen to centralise the bulk of their ICT resources in networked computer rooms. This is necessary for whole-class teaching of ICT but the result is that resources are often extremely limited elsewhere for work in other subjects. It is still common to see students taking work from other subjects to the computer room where they are using ICT, in effect, only to present their ideas well. When ICT is unavailable to students in their classrooms when they are studying other subjects, it is unable to contribute to improving learning.

112. Many secondary schools and some primary schools have attempted to solve this by installing wireless networks, making laptop computers available in other subject areas. This is a step in the right direction in getting ICT to the learning but it is still a relatively slow, cumbersome and expensive solution. Small, powerful and portable devices are now becoming available and are starting to be used by a few schools. In these schools students integrated such devices seamlessly into their classroom work and on field trips to good effect.

> In a Year 8 science lesson, the teacher presented the learning objectives at the start of the lesson; students downloaded these onto their handheld computers. They were highly proficient: they really enjoyed using them

and said that they helped them to learn. Boys found them highly motivating and said that they showed them off to their friends from other schools! The teacher monitored the collaborative work of small groups as the students entered information into their computers and used specialised software that enabled him to observe the screens of the handheld devices. He chose one group to describe its work to the class and projected the screen of their handheld computer onto the interactive whiteboard to facilitate this. Later, he demonstrated a science investigation to the class that students videoed with their computers. The video clips were stored by students on the virtual learning environment for later use.

113. Several current initiatives offer opportunities to tackle the issues identified in Part B. First, the 'Harnessing Technology, Next Generation Learning 2008–2014' strategy, led by Becta, is aiming to bring about a step change in the way technology is used in schools. In conjunction the Department for Children, Schools and Families has recently announced plans which have the potential to tackle aspects of social disadvantage by getting ICT resources into the homes of families on low incomes. This is something that schools acting by themselves are unlikely to be able to deliver. Second, the new diploma in ICT offers the possibility of resolving concerns about the level of challenge posed by some Key Stage 4 qualifications while also finding ways to encourage more girls to study ICT in the sixth form. Third, it is up to school leaders to find ways of getting ICT into their classrooms, to ensure it is well taught and assessed, to promote higher standards and to get good value for money from the investments they make.

Notes

This report is based on ICT subject surveys of a national sample of 85 primary schools and 92 middle and secondary schools, conducted between 2005 and 2008. The schools were selected to represent geographical locations, variations in school size, and urban and rural contexts. Schools which were judged to be inadequate at their last whole-school inspections were excluded from the sample. The report also draws on evidence from the first three years of section 5 whole-school inspections which began in September 2005, as well as taking into account the findings of separate surveys on the use of ICT in other subjects over the same period.

Other sources of evidence include the findings from a random sample of recently completed self-evaluation forms from an additional 25 primary and 25 secondary schools undertaken in 2008 and reported on separately in our publication, *School self-evaluation: a response to the Byron Review*. The findings of a consultation exercise, *Children on bullying*, which probed the views of 319 children on the impact of technology on their lives, are also referred to.

During the above inspections inspectors held discussions with pupils and students, senior school leaders, and organisations and individuals responsible for national policy.

Further information

Publications

Children on bullying: a report by the Children's Rights Director for England (HMI 070193), Ofsted, 2008; www.ofsted.gov.uk/publications/070193.

Embedding ICT in schools – a dual evaluation exercise (HMI 2391), Ofsted, 2005; www.ofsted.gov.uk/publications/002391.

ICT in primary and secondary schools: Ofsted's findings 2005/07 (HMI 070214) (leaflet), Ofsted, 2008; www.ofsted.gov.uk/publications/070214ict.

Pupil referral units: establishing successful practice in pupil referral units and local authorities (HMI 070019), Ofsted, 2007; www.ofsted.gov.uk/publications/070019

School self-evaluation: a response to the Byron Review (HMI 080203), Ofsted, 2008; www.ofsted.gov.uk/publications/080203.

Technology counts: IT and telecoms insights 2008, e-skills UK, 2008; www.e-skills.com/Research-and-policy/Insights-2008/2179.

The Annual Report of Her Majesty's Chief Inspector of Education, Children's Services and Skills 2006/07 (HMI 20070035), TSO, 2007; www.ofsted.gov.uk/publications/20070035.

Organisations

Becta

Becta is the government agency leading the national drive to ensure the effective and innovative use of technology throughout learning. Guidance to schools on software licensing costs, open source software and further information on the ICT Self Review Framework and the Harnessing Technology strategy can be found at:

www.becta.org.uk

Computer Club For Girls (CC4G)

www.cc4g.net

Department for Children, Schools and Families

The website provides links to many aspects of school policy, guidance and performance, including the deployment of virtual learning environments.

www.dcsf.gov.uk

e-skills UK

e-skills UK is a not for profit, employer-led organisation, licensed by the government as the Sector Skills Council for IT and Telecoms. Its aim is to ensure that the UK has the skills it needs to compete in the global economy.

www.e-skills.com

Naace

Naace is the professional association for those concerned with advancing education through the appropriate use of ICT.

www.naace.org

National Audit Office (NAO)

The website of the NAO provides information on obtaining value for money, including applying the principles of best value, evaluating the cost of software licences and the requirement on public bodies to consider deploying open source software.

www.nao.org.uk

National College for School Leadership (NCSL)

The NCSL's website has information about its Strategic leadership for ICT courses. Please note that the courses are now closed, but elements from them are used in new courses.

www.ncsl.org.uk/programmes-index/slict-index.htm

National Strategies

The Primary and Secondary National Strategies are part of the Government's programme for raising standards in schools, including through using ICT.

nationalstrategies.standards.dcsf.gov.uk

Office of the Qualifications and Examinations Regulator (Ofqual)

Ofqual is the new regulator of qualifications, exams and tests in England.

www.ofqual.gov.uk

Qualifications and Curriculum Authority (QCA)

The QCA maintains and develops the national curriculum and associated assessments, tests and examinations.

www.qca.org.uk