A Review of Information and Communications Technology Provisions in Schools and its Impact on Raising Standards

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INVESTOR IN PEOPLE

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1. Introduction

Promoting the use of information and communication technologies (ICT) is central to the Welsh Assembly Government's strategy for transforming the economy, communities and environment of Wales. It is seen as key to removing barriers to lifelong learning and combating social disadvantage. The place of education and training within this strategy is set out in 'The Learning Country' (August 2001).

2. Background

Since 1998, the Welsh Assembly Government has provided £60m to help improve ICT facilities and equipment to raise standards in schools across Wales through a range of strategies that address education and economic development priorities. The main educational priorities have been the National Grid for Learning (NGfL) and the 'ICT for Learning Strategy'.[1] Additional funding has been made available for further, smaller-scale projects.

The National Grid for Learning (NGfL), funded through the Grants for Education Support and Training (GEST), was developed between 1998 and 2002. The main outcomes were training for teachers and other school staff and support for collaborative projects between local education authorities to develop innovative approaches to the use of ICT in schools. Funding supported the development of computer networks in schools and provided hardware and software for these networks. The Welsh Assembly Government's investment has helped ensure that all schools in Wales are now connected to the Internet.

In 2001 the Welsh Assembly Government launched the 'ICT for Learning Strategy' to ensure that the developments initiated by the NGfL were sustained and continued to meet the needs of Wales. The 'ICT for Learning Strategy' received £18m from the Capital Modernisation Fund. A key part of the strategy was the opening of ICT Learning Centres in over 400 school and community venues. Working in partnership with local education authorities and schools the Welsh Assembly Government have extended the availability of ICT resources to learners across Wales and in particular to disadvantaged communities.

In addition to strategies which are funded from the Welsh Assembly Government's education budget; the Welsh Assembly Government has introduced a strategy called 'Cymru Ar-lein - Online for a Better Wales' . This is funded from the Welsh Assembly Government's economic development budget and it exploits ICT to deliver sustainable improvements in social, health and economic prosperity to achieve a better quality of life for all its citizens. The 'Broadband Strategy for Wales' forms an important part in implementing the 'Cymru Ar-lein - Online for a Better Wales' strategy.

[1] Cymru Ar-lein: Online for a Better Wales' National Assembly for Wales; July 2001

Broadband connectivity offers high-speed access to the Internet using a bandwidth of at least 2Mbps (megabits per second). The broader bandwidth enables a large number of learners to use the Internet on a school network at the same time and provides access to facilities such as full-screen real-time video.

The Welsh Assembly Government has a target to connect schools and libraries to a high-speed broadband network by 2006 so that they can make best use of computers and interactive whiteboards to access digital curriculum resources in the classroom.

In 2002, £10m was allocated from the education budget to local education authorities to provide interactive whiteboards and other multimedia equipment. A further £1m was allocated through the Grants for Education Support and Training (GEST) to support interactive whiteboard training for teachers.

The Welsh Assembly Government is providing additional technical support and training posts to every local authority in Wales in order to support the roll-out of the Welsh Assembly Government's broadband strategy. The focus of these posts will be on developing a broadband network to support lifelong learning in the community, but they should also help strengthen local authorities' capacity to provide support for schools.

The Welsh Assembly Government is also planning for the future strategic direction of ICT in education via a special 'Advisory Panel on ICT in schools' that includes representatives from local authorities, schools, teachers and the ICT industry. The Advisory Panel will oversee the work of an ICT Task Force and an updated National Grid for Learning (NGfL) Cymru website.

A £1.02m contract was awarded in August 2002 to form an ICT Task Force. The ICT Task Force is developing strategic initiatives and providing advice to the Welsh Assembly Government on ICT procurement and is compiling data on the ICT provision in schools. It is also looking at the development of video-conferencing facilities in sixth forms to support the teaching of small classes and minority subjects.

The updated National Grid for Learning (NGfL) Cymru website is being developed through a partnership between the Welsh Joint Education Committee (WJEC), the 22 local education authorities in Wales, BT Wales, Learn.co.uk, and supported by BBC Wales. The aim of the service is to provide bi-lingual learning resources and share high quality materials from teachers in Wales. The partnership receives £2.3m through a three-year contract.

2.1 The evidence base of the review

In autumn 2002, Estyn conducted a survey of the use of ICT in local education authorities and schools. The purpose of the survey was to identify good practice and the factors that contribute to the effective use of ICT in raising standards. This report is intended to inform national policy and to help local education authorities and schools evaluate and improve their provision.

During the survey inspectors visited all 22 local education authorities across Wales and a sample of 50 schools from all phases. In many schools, inspectors observed sessions in which ICT supported learning and teaching. They examined documents and held discussions with officers from local education authorities, with schoolteachers and headteachers, and with technical support staff from schools and local authorities. The report also draws on evidence about the use of ICT in schools from the Estyn report on the New Opportunities ICT Training for Teachers[2] and evidence from 320 school inspections, undertaken in the year 2001-2002.

The term ICT is used in this report to mean the range of tools and techniques (telecommunications, networking, hardware and software) that support teaching and learning.

The term 'information technology' (IT) refers to the National Curriculum (NC) subject that deals with the knowledge, understanding and skills that pupils need in order to make effective use of ICT in contexts across the school curriculum.

The National Curriculum has the common requirement that, within every NC subject, pupils should be given opportunities, where appropriate, to develop and apply their information technology skills in their study of that subject.

This report deals with the skills in using ICT that pupils develop and apply through their work in subjects across the curriculum.

[2] NOF Information and Communications Technology Training for Teachers, Evaluation Report, June 2001, Estyn

3. Main Findings

Standards

- Standards of achievement in information and communications technology (ICT) in primary schools have improved significantly over the last four years.
- In secondary schools, standards of achievement in ICT are improving, but they are doing so more slowly than in primary schools. During the year 2001-2002 there was a more marked improvement. Despite this, almost one third of classes have unsatisfactory standards in ICT.
- Few schools achieve adequate progression in ICT, especially from key stage 2 to key stage 3.
- Using ICT substantially increases pupils' motivation to learn and helps develop their self-esteem and confidence.

Planning

- Too often, schools' ICT development plans do not make a clear link between intended improvements in standards and plans for continuing professional development of staff and resources.
- Schools and local education authorities do not collect enough data on standards of achievement in the key skill of using ICT and in National Curriculum IT to make effective evaluations of the impact of ICT on standards.
- There is increasing effective use of ICT in teaching subjects across the curriculum, but good practice is not shared well within and between schools.
- There is appropriate, increasing use of ICT, including interactive whiteboards to support the teaching of literacy and numeracy.

Management

- Schools where senior managers themselves use ICT extensively have generally invested in high levels of resources and staff development, and show greater use of ICT in subject teaching.
- Support and guidance from local education authorities for schools' ICT development planning are unduly variable. Often, small local education authority ICT support teams are too stretched to meet the demands of implementing national initiatives and providing support for schools.

Accommodation and resources

- There is wide variation between local education authorities in the availability and quality of technical support for schools.
- ICT suites in primary schools have led to improvements in teaching and learning and in pupils' ICT skills.
- ICT learning centres, funded by the Welsh Assembly Government ICT for Learning strategy, are operational in almost all secondary schools, but have not been in operation long enough to enable their impact on standards of achievement to be evaluated.
- There is as yet little community use of school ICT learning centres.
- The use of interactive whiteboards and data projectors is having a positive impact on teaching and learning in most schools, although it is too early to see the results of this in improved standards of pupils' achievement.
- The potential of interactive whiteboards is limited by the cost and availability of good-quality software, especially Welsh-medium materials.

4. Standards

4.1 ICT key skills and National Curriculum Information Technology

Standards of achievement in using information and communications technology (ICT) in primary schools have improved significantly over the last four years. The proportion of classes in which standards are satisfactory or better has risen from 74% to 88%. Four years ago, good or very good standards were found in 29% of classes. Standards have risen so that good or very good work is now achieved in almost 50% of classes. While this improvement is significant, there is still ample scope for further improvement. Standards of attainment in using ICT are still lower than in the other key skills.

In secondary schools, standards of achievement in ICT are improving but they are doing so more slowly than in primary schools. During the year 2001-2002 there was a more marked improvement. There was a significant increase in the proportion of good and very good standards in using ICT, but this was not accompanied by a similar decline in unsatisfactory standards. The proportion of classes in which standards are satisfactory or better has risen from 39% to 61%. Good or very good standards are achieved by 22% of classes, compared with 8% four years ago. Almost one third of secondary classes have unsatisfactory standards. This is by far the most unsatisfactory performance across the key skills of speaking, listening, reading, writing, numeracy and using ICT.

Where standards are good, pupils:

- regularly use ICT to research information from the Internet, CD-ROMs, DVD and data files prepared by the teacher;
- enhance the presentation of their work by using text, pictures and graphs through word-processing packages and presentation software;
- apply ICT imaginatively to support their learning in a range of subjects; and
- talk confidently about the way they use ICT and understand its limitations.

Good practice: using ICT to enhance teaching

What we saw

A Year 7 class had their first French lesson after half term. The teacher had worked with the local education authority advisory service to develop a series of lessons for teaching and later revised topics in the scheme of work. She used an interactive whiteboard very well to revise numbers, dates, birthdays and other simple vocabulary. The materials contained text, numbers, pictures and sound. These were used to good effect to provide a stimulating and interesting lesson. The pupils were happy to contribute and use the interactive whiteboard confidently. The teacher did not rely only on the interactive whiteboard, but also used other resources effectively eg a textbook and cassette recorder.

Key benefits

This use of ICT enhanced the quality of teaching because:

- it had helped the teacher to prepare imaginative lessons and build them into the scheme of work for French;
- it was well integrated with a variety of other teaching resources such as a cassette recorder and printed materials; and
- it did not dominate as the focus for the lesson but served to enhance the pupils' experience of using French vocabulary.

Chart 1. Standards in key stage 1, 2, 3, and 4

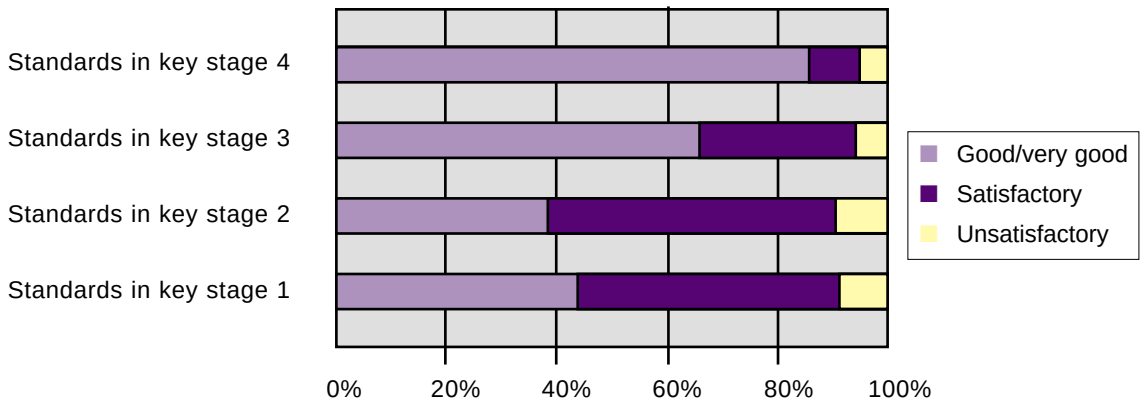

Chart 1 above shows improving standards in the National Curriculum subject of Information Technology as pupils move through the key stages.

The overall trend for the subject Information Technology is that standards of achievement improve as pupils move through key stage 1 to key stage 3. Data for key stage 4 are not comparable with data from other key stages because pupils choose to take the subject as one of their options, usually entering a GCSE examination in Information Technology or Information Systems. Specialist teachers who will have a background in computing or information technology usually teach these options.

National curriculum assessments and public examination results reflect this trend towards improvement. The proportion of key stage 3 pupils gaining level 5 or above in information technology has gradually increased year on year, from 57% in 1999 to 62% in 2002. The rate of improvement has been greater than that made in all other National Curriculum subjects with the exception of modern foreign languages. Examination performance in GCSE Information Technology has also improved. In 2001, 62% of pupils entering GCSE Information Technology achieved grades at A*-C while the comparable figure for 1999 was 57%. The proportion of the cohort entered for GCSE Information Technology has risen by four percentage points from 23% in 1999 to 27% in 2001. This compares well with increases in both the entry rates and A*- C grades in other foundation subjects.

While the overall figures indicate that ICT and IT are improving, standards of achievement vary unduly from school to school and, to lesser extent, between classes within the same school.

There are several factors that contribute to under-achievement in the use of ICT. These include:

- ✗ too few opportunities for pupils to access ICT;
- ✗ too little direct teaching of ICT skills;
- ✗ too few opportunities for pupils to use their ICT skills in suitable contexts across the curriculum;
- ✗ ICT activities that are unrelated to the objectives of the lesson;
- ✗ not enough challenge in the work involving the use of ICT;
- ✗ lack of adult guidance to support, challenge and question pupils to help them gain more understanding from the work;
- ✗ undemanding lessons stemming from teachers' lack of confidence and knowledge in technical matters;
- ✗ too little teacher intervention, resulting in pupils working for too long at a computer without the opportunity to discuss and reflect on their work;
- ✗ too little account taken of pupils' experiences of ICT outside school in the planning of ICT sessions; and

- ✗ ineffective assessment of pupil's progress against National Curriculum level descriptions.

Despite the New Opportunities Fund (NOF) ICT training programme, many teachers are still not familiar enough with the level of IT capability they should expect of pupils of different ages and abilities. A better understanding of the standards, exemplified by the level descriptions, in the National Curriculum for IT would help teachers judge this better. It would also help teachers to provide pupils with more detailed feedback on how to improve their IT skills.

Local education authorities and schools report that the use of ICT has been most beneficial in English, Welsh, mathematics, geography, history, music and art, although there are wide variations between schools. Science is the subject least likely to use ICT.

Good practice: using ICT to develop subjects across the curriculum

What we saw

In one primary school:

In a mixed Year 4 and Year 5 class, several pairs of pupils used the Internet as a source for researching information related to a World War Two theme. Pupils displayed ease and self-confidence during the work. One pair were able to outline the key features of different kinds of air raid shelters used in the UK. Another pair looked at propaganda posters and discussed their meaning with the teacher. The high level technical skills of another pair of pupils enabled them to move quickly through an activity without focusing adequately on the historical idea that the activity sought to develop, as their excitement at using the technology quickly took their attention from the concept to be covered. The teacher noticed this and intervened appropriately to draw pupils' attention back to the key historical ideas in the work.

Year 6 pupils worked on a project based around British composers. They used the software package confidently to prepare an information system involving a multi-media presentation. The presentation included graphics taken from the Internet, music from a CD-ROM and text (poems and descriptions) prepared by the pupils themselves. They were confident in designing the system, understanding the use of links and how to create and copy them. Their ICT skills were very good.

In another session, pupils used the interactive whiteboard in a Welsh lesson. They were confident in using the whiteboard to identify parts of speech, punctuation and structures within the text they were studying. They used the whiteboard effectively to highlight relevant pieces of text or individual words and copied them to the relevant columns under the correct headings. The pupils' ICT skills were good, they worked well to support each other and developed their understanding of grammar.

One Year 6 pupil worked on a project on the weather. He used the Internet to access BBC weather reports and captured images at four-minute intervals from the London web cam. He then linked these images in a PowerPoint presentation to show the sequence of changes over a period of time from sunset through to next morning.

Key benefits

These activities enhanced the quality of teaching and learning because pupils:

- were given regular opportunities to research information from the Internet and CD-ROMs ;
- used the information they collected from the Internet and CD-ROMs to make their own presentations using text, images and sound; and
- had gained confidence in using ICT in imaginative ways.

What we saw

In a secondary school:

Year 10 pupils prepared group presentations on 'Our school' in a French lesson. They used a digital camera to take photographs of staff, facilities and interesting features. They imported these into PowerPoint, added suitable captions in French and created their own presentations. The presentations varied in quality, but most included good use of text, sound effects, music clips, art and digital images. The lesson required each group to present their findings to the class. The teacher commented on the quality of the pupils' research into French terminology, the good standards achieved in written French and the overall quality of the presentations. The pupils were confident in using ICT and were well motivated, especially the less able pupils.

Key benefits

This lesson used ICT to enhance the quality of teaching because:

- it provided stimulating visual and audio resources for topic;
- it developed pupils' presentation skills using multimedia presentation software; and
- pupils of all abilities were motivated and engaged by the task.

The effectiveness of ICT in the classroom is often demonstrated by the extent to which it motivates pupils and maintains their attention, and in its ability to develop the self-esteem and confidence of pupils who might otherwise not benefit so well from the work set for them.

The effective use of ICT to teach subjects across the curriculum is increasing. However, good practice is not shared well within individual schools and between schools.

4.2 Impact of ICT on literacy and numeracy

The impact of improved ICT provision on standards of achievement in literacy and numeracy is yet to be fully evaluated by local education authorities and schools. This is because neither schools nor local education authorities have well developed processes for monitoring and evaluating the impact of ICT on overall standards.

Almost half of primary and secondary schools use integrated learning systems to deliver aspects of literacy and numeracy. The extent to which the integrated learning system is used varies significantly between schools. There is often a lack of connection between the programme and the rest of the work that pupils do in their class. Most schools use integrated learning systems with lower-attaining pupils to support the development of their literacy and numeracy skills. The programmes have built-in assessment and reporting systems that schools use to monitor pupils' progress. Schools that use the built-in assessment system or other measures report that pupils make rapid improvements initially, but then tend to reach a plateau as the initial impact of the software decreases.

Several local education authorities are developing methods for measuring the impact of ICT on standards using National Foundation for Educational Research (NFER) tests for reading and numeracy and National Curriculum assessment information. They are working in partnership with groups of teachers to consider how best to isolate the impact of ICT from other contributory factors such as well-repared and dynamic teaching, stimulating curriculum materials and challenging classroom activities. This work is at a very early stage.

The use of ICT to support literacy and numeracy is increasing through the use of interactive whiteboards. Many teachers find classroom management easier when using an interactive whiteboard, or a data projector and screen. Typically pupils use classroom computers in pairs or individually to follow whole class activities, such as shared reading or writing, oral and mental mathematics or spelling. The use of an interactive whiteboard for a whole class activity encourages pupils to listen to others, respond to what they say and learn to explain their own ideas.

Carefully planned activities for individual pupils or pairs of pupils working at a classroom computer or in an ICT suite can extend pupils' competence in literacy. Word-processing tasks require drafting and re-drafting skills that can be creative and encourage pupils to be critical of their own composition. Pupils researching for information on the Internet, CD-ROM or DVD have to read material that extends their understanding of vocabulary. In the best practice, pupils learn to be critical of what they access on the Internet and do not just print out large volumes of irrelevant information.

A minority of schools tend to rely on commercially-published software programmes for numeracy that can be expensive to license and either require an interactive whiteboard or an ICT suite to make them cost-effective. Opportunities for pupils to use ICT to extend their achievement in numeracy are less common than in other areas of the curriculum.

The use of spreadsheets makes a helpful contribution to developing numeracy skills but there is an undue variation in their use. In the best practice, an ICT activity using spreadsheets based on real-life data is more meaningful to the pupils and contributes to learning in other subject areas, such as analysing data on stream depth, width and water flow from a geography fieldtrip. Pupils are able to explore ideas quickly and efficiently using spreadsheets.

Good practice: teachers evaluating the impact of ICT

What we saw

In one primary school, the ICT co-ordinator monitored all teachers using the whiteboard to teach English and gave them constructive feedback. Teachers met every fortnight to evaluate lessons and discuss issues arising from their practice. The school will analyse National Curriculum assessment results in May 2003 to find evidence of the impact of whiteboards on standards of English.

An ICT co-ordinator in another primary school undertook an action research project into the impact of interactive whiteboards on standards of achievement, funded through the local education authority and a General Teaching Council for Wales (GTCW) grant.

Key benefits

Both of these examples highlight the importance of teachers reflecting upon and evaluating the impact of new technologies on the effectiveness of their teaching and pupils' learning. In both schools, the teachers undertaking the evaluation were supporting the sharing of good practice with colleagues.

5. Planning

5.1 Local education authority ICT development planning

The effectiveness of local education authorities' strategic planning for ICT varies greatly. At best there is a clear strategy, led and managed by a senior officer, and developed in consultation with schools to ensure that they are clear about its purpose and committed to its delivery. Some local education authorities have consultative working groups with representative headteachers whose role is to develop and monitor the progress of the ICT strategy.

Appropriately, the targets for ICT development are often stated in the local education authority education strategic plan priorities. A few local education authorities set targets for the proportion of pupils who will achieve specified National Curriculum levels of attainment at all key stages, while others do not have any measurable targets.

Local education authorities collect hardly any data on pupils' standards in using ICT. Many local education authorities are not aware of the information on the proportion of pupils achieving National Curriculum level 5 or better in IT, published by the Welsh Assembly Government. Most local education authorities gain an overview of ICT standards in their schools through an analysis of school inspection reports by Estyn and visits to schools by an local education authority adviser or advisory teacher. Several local education authorities have a target in the education strategic plan that no school will receive a poor or unsatisfactory judgement for ICT or IT in an Estyn inspection.

In nearly all local education authorities and schools, the inadequate collection of data on standards of achievement in ICT key skills and National Curriculum IT makes it very difficult for them to monitor and evaluate the impact of ICT. Much of the evidence for the impact of ICT on standards is anecdotal.

Good practice: using data to target support for schools

What we saw

In one local education authority, the advisory team for ICT analysed all Estyn Section 10 inspection reports and compiled a spreadsheet of grades and comments for National Curriculum IT and the key skill of using ICT. The team used this information to target advice and support to those schools that needed it most and identified common weaknesses that needed to be addressed in schools as a whole.

Benefits

This was an appropriate first step, in developing a system to analyse data on pupils' standards in using ICT and use the information to target support for school improvement.

Local education authorities and schools greatly value the funding provided for ICT by the 'ICT for Learning' and Broadband strategies, but local education authorities' ability to plan effectively is closely linked to the direction of long-term planning from the Welsh Assembly Government. Local education authorities and schools find that they are responding to ICT initiatives from government that may cut across their existing plans and have to be delivered to schools to very tight deadlines such as the Interactive Whiteboard initiative.

Just over half of local education authorities provide schools with models for school ICT policies, ICT development plans and schemes of work for key stages 1, 2 and 3. This document is often available electronically on disc or CD-ROM, or may be downloaded from a local education authority intranet. Almost a quarter of these local education authorities developed schemes of work that adapted the Qualifications and Curriculum Authority (QCA) scheme of work to the Welsh context.

Several local education authorities produce guidance documents that break down the National Curriculum level descriptions into smaller steps that help schools plan ICT activities for each year through key stages 1 and 2. These 'lines of progression' documents help ICT co-ordinators plan progression and continuity in schemes of work for IT or other subjects in which ICT is used. A great strength of the best of these schemes is that they identify ICT activities in every subject of the primary curriculum.

The quality of schools' ICT development planning remains variable, despite the requirement for local education authorities to monitor plans before releasing money from the National Grid for Learning and the New Opportunities Fund to schools. In the best practice, local education authority advisers or advisory teachers discuss the ICT plan and how it might be improved with each school.

There is wide variation between local education authorities in their approach to supporting ICT in schools. The larger local education authorities have an adviser with overall responsibility for a team of advisory teachers, who provide specialist advice, support and training. These local education authorities have five or six advisory teachers. About a quarter of local education authorities have two specialist advisory staff for ICT, one for primary schools and the other for secondary schools. Several of the smallest local education authorities have one adviser or advisory teacher who covers all phases. A few local education authorities arrange part-time secondments for good teachers from their schools to join the advisory service to deliver classroom support and in-service training. Some areas of Wales have joint arrangements for advisory support in ICT between neighbouring local education authorities or from jointly managed advisory services. This arrangement is effective in offering schools access to a wide range of specialist advice and support.

5.2 School ICT development planning

A small but growing number of local education authorities are encouraging their schools to move from a separate ICT development plan to integrating ICT into the whole school development plan. The ICT guidance given to schools reflects this approach. Most schools still have a separate ICT development plan, but the whole school development plan includes references to hardware development and teachers' training.

Too often, schools' ICT development plans do not make a clear link between intended improvements in standards on the one hand, and resources and continuing professional development of staff on the other.

Typically, plans are written by the ICT co-ordinator and discussed with a member of senior management team before being shared with teachers.

Nearly all of the schools surveyed review their ICT plans annually and evaluate progress on targets.

All local education authorities consult their schools about the implications of national ICT initiatives for development planning. A wide range of effective methods is used, including; headteacher cluster meetings, headteacher user groups, specific briefings for ICT co-ordinators and headteachers and discussions with individual schools.

The majority of schools surveyed consider that consultation is a strength of their local education authority. They noted also, however that full consultation is sometimes compromised by the very tight deadlines that local education authorities have to plan and deliver national ICT initiatives within a financial year.

5.3 Schemes of work

In nearly all schools, there is a scheme of work for ICT and there are separate references to ICT in the schemes of work for National Curriculum subjects. Most schools have based their ICT scheme of work on a local education authority scheme, or have adapted the Qualifications and Curriculum Authority (QCA) scheme to the needs of their school. The quality of schemes of work for ICT is at least satisfactory in most schools.

The best schemes of work for ICT:

- are explicit enough to show exactly what skills pupils will be gaining from an activity;
- describe activities in enough detail for teachers to understand the quality of work expected of pupils;
- promote progression in pupils' ICT skills from one year-group to the next through a programme of challenging activities;

- identify activities in which pupils use a broad range of ICT applications to support their learning in subjects across the curriculum;

- list the resources pupils will be using and identify the features of programs that pupils should learn to use; and

- take account of both the National Curriculum Programmes of Study for IT and the references to using ICT in the Orders for other National Curriculum subjects.

Teachers do not always distinguish between using ICT as an aid to learning a subject and using ICT to extend pupils' IT skills. They may therefore fail to link lesson objectives clearly to the tasks they set for pupils. Teachers plan lessons using ICT better when they collaborate with the school ICT co-ordinator. When they do this, they check how the lesson fits with the school's long-term ICT strategy and are more likely to consider how the use of ICT would:

- interest and motivate pupils;

- enhance and extend pupils' learning in the subject; and

- develop pupils' IT skills.

The following example shows a lesson that did not carefully enough match the task to the abilities of the pupils.

In a Year 2 class, pairs of pupils, in succession, used the interactive whiteboard to investigate the use of a graphics package to infill a prepared picture with colours. The pupils used the interactive whiteboard confidently and quickly mastered the relevant features. However, the activity did not extend many of the abler pupils sufficiently who were capable of quickly gaining expertise in more advanced features of the software.

A few secondary and primary schools are addressing progression and continuity between key stage 2 and key stage 3 through 'bridging' projects. These projects help pupils have an easier transition from Year 6 to Year 7 by building on the work that they have done in the primary school. They develop a mutual understanding by teachers of the expectation for ICT in both primary and secondary schools.

Very few schools exchange their schemes of work for ICT between Year 6 and Year 7. Continuity between Year 6 and Year 7 is often poor, with some Year 7 pupils being taught ICT skills they have already mastered in key stage 2. Too often, secondary schools do not build effectively on what pupils already know and can do. The variation in pupils' ICT standards between primary schools poses a challenge to planning for ICT in key stage 3, but in most cases there is very little communication between the secondary school ICT co-ordinator and primary school ICT co-ordinators.

In almost half of local education authorities the link adviser monitors schemes of work in schools either as part of an annual review of secondary subject departments or as an overall performance review of primary schools. In the remaining local education authorities it is the ICT subject adviser who does the monitoring. A few local education authorities do not monitor schemes of work.

6. Management

6.1 Curriculum organisation

All schools have a member of staff with the role of ICT or IT co-ordinator. This person has overall responsibility as a subject leader. Often, the role extends to arranging and brokering the purchase and maintenance of hardware and software. It is an inappropriate use of time for the ICT or IT co-ordinator to carry out maintenance tasks because their role is primarily curriculum development.

In the best practice, the ICT co-ordinator works alongside other subject leaders to help them plan and develop the use of ICT in their subject. This is most effective when the ICT co-ordinator is a member of the senior management team and has an overview of the whole school curriculum, or when a member of the senior management team actively supports the ICT co-ordinator.

About 40% of primary schools have a dedicated ICT suite, although this figure ranges from 10% to over 60% in different local education authorities. Primary schools with ICT suites usually have a timetable that allows time for all classes to access the facilities. Sessions in the ICT suite are used either for teaching ICT skills to a whole class or group of pupils, or for pupils to carry out class projects in other subjects using ICT. In most cases, schools have placed an interactive whiteboard in their ICT suite. ICT suites are most effective in schools that have made little progress to date in teaching ICT skills and wish to give greater pace to their ICT lessons. Better-resourced schools use the ICT suite to complement their classroom-based computers and to undertake whole class activities in other subjects using ICT.

Most secondary schools use one of two models for the delivery of ICT, one is cross-curricular; the other is based mainly on discrete lessons.

The strengths and drawbacks of cross-curricular and discrete models for the delivery of ICT in secondary schools are summarised below:

Cross-curricular model

Strengths

- ✓ Pupils learn and apply ICT skills in relevant subject contexts;
- ✓ Core subject departments can be given key responsibility for teaching the ICT skills;
- ✓ Foundation subject departments can reinforce ICT skills appropriate to their subject; and
- ✓ ICT is well integrated into the planning and delivery of subjects.

Drawbacks

✗ Demanding of the ICT co-ordinator;

✗ Requires careful monitoring of progression and continuity;

✗ Need to monitor consistency of teaching within and across departments; and

✗ All teachers need to be sufficiently trained in ICT and are able to deliver the ICT skills to pupils.

Discrete model

Strengths

✓ Pupils are taught ICT skills by specialist teachers in an IT department;

✓ Progression and continuity are easier to monitor within IT department;

✓ It is easier to monitor consistency of teaching within IT department; and

✓ ICT is well integrated into the planning and delivery of IT.

Drawbacks

✗ Pupils do not learn and apply ICT skills in relevant subject contexts;

✗ Opportunities for the reinforcement of ICT skills are limited;

✗ ICT is less integrated into the planning and delivery of subjects; and

✗ Teachers have fewer opportunities to apply any ICT training they have received to their own teaching.

The majority of secondary schools in key stage 3 have a mixture of discrete ICT skills lessons and some cross-curricular delivery by subject departments. The balance between the time given to discrete lessons and cross-curricular delivery varies between schools, but the amount of time is generally appropriate. The most popular model has discrete ICT skills lessons in Year 7 taught by specialist IT teachers and some cross-curricular work in a limited range of subjects. By year 9, the discrete lessons have been replaced by cross-curricular work in a wide range of subject areas. For the majority of schools this is the more effective approach to the teaching and application of ICT skills.

6.2 Management of resources and technical support

The management of ICT and resources is mainly the responsibility of ICT co-ordinators, with support from headteachers and deputy headteachers.

Headteachers who show high levels of ICT literacy generally have greater commitment to ensuring that their schools are very well resourced with ICT equipment and that all teachers have high levels of computer literacy. These headteachers are more likely to provide laptops for teachers' use.

Most secondary schools employ a full-time ICT technician to provide technical support and some also receive further support from the local education authority. Schools face difficulties in recruiting and retaining appropriately qualified ICT technicians. Most primary schools receive technical support through a service level agreement with the local education authority. However, they are often unclear as to how much support they are entitled to receive. Some schools have arranged for technical support to be provided by a local company and report a high level of satisfaction with this arrangement. In practice, schools decide on the most appropriate mix of technical support depending on the cost of service level agreements, the quality of technical support and availability of ICT technicians in the area of the school.

In primary schools in particular, the ICT co-ordinator is often called upon to carry out trouble-shooting tasks such as ensuring that printers, mice and keyboards work properly. In addition, in schools with networks, the ICT co-ordinator manages the network. Too many ICT teachers spend inappropriate amounts of time on this kind of work and too little on curriculum development.

In secondary schools, the ICT co-ordinator often acts as network manager, which reduces the time available to co-ordinate effectively the development of ICT in the school.

In nearly all schools, responsibility for the procurement of ICT hardware and software lies with the ICT co-ordinator and a senior manager, either a deputy headteacher or the headteacher. Although this is a similar arrangement to the procurement of other curriculum resources and materials, schools often rely on advice about compatibility and technical specifications from their local education authority IT adviser or technical support team prior to making a purchase.

Almost half of local education authorities undertake some form of monitoring and evaluation of the quality of the technical support provided, but there is little evidence of the use of clear performance indicators to measure improvements in the quality of service delivery. In the best cases, the local education authority clearly describes the level of service in a service level agreement (SLA). It sets and monitors clear targets for the provision of support, response times and time taken to resolve complaints.

In a third of local education authorities, schools report dissatisfaction with the availability and quality of technical support from local education authority technical support teams or from local authority corporate ICT teams. Over recent years technical support for schools has moved from dedicated local education authority teams to corporate ICT teams. In 40% of local education authorities schools receive their technical support from these larger corporate teams. This has benefits for support with Internet connections, networks and PC repairs but is limited in supporting educational software.

In the best practice, schools have access to a comprehensive technical support service, managed through the local authority corporate ICT team, within which there are dedicated specialists familiar with educational software packages and equipment such as roamers and data-loggers. The corporate ICT team has robust quality assurance systems and a rapid response time to requests from schools for support with classroom computer problems.

6.3 Access to ICT

Almost all secondary schools provide after-school clubs and lunchtime clubs to enable pupils to have greater access to ICT equipment. These arrangements occur in only a minority of primary schools. A few secondary schools run breakfast clubs, if they can find funding to support the cost of staff supervision. Typically pupils have supervised access to ICT equipment between 8.00 a.m. and 5.00 p.m. Beyond these times, schools have difficulty in finding appropriate adults to supervise the pupils and the funds to pay for the supervisors. In the best cases, the school or the local education authority have made arrangements for supervision by community education tutors.

Very few schools allow access to ICT equipment by the local community at present. Headteachers express concern over security and child protection issues, such as unknown adults gaining access into the main school buildings, or adults who have not been police-checked working with pupils after school hours.

Good practice: providing access to the community

What we saw

One local education authority has a project called ‘Cyberlink’ that used ICT for learning, NOF and funding from other sources to provide a bus that could take ICT training facilities to places where need is greatest and access poorest. ‘Cyberlink’ is a custom-built mobile computer room with six desktop computers, two laptops, a combined printer and scanner and a broadband Internet connection via satellite. ‘Cyberlink’ successfully enables ICT learning opportunities to be delivered to areas and community groups that do not have local access to ICT learning facilities.

Key benefits

The local education authority has developed this project as part of the 'widening participation' and social inclusion agendas to give access to ICT in community areas with very limited facilities. Adult learners and pupils use this facility during the day and evenings respectively. It brings ICT into areas of greatest need in the local community.

Funding for special educational needs (SEN) from the ICT for Learning strategy has mainly been used in special schools to provide additional specialist software and hardware. About one third of local education authorities used the fund effectively to improve the quality and quantity of ICT equipment in special needs units in primary and secondary schools.

7. Accommodation and resources

The use of ICT in primary and secondary schools is increasing and becoming a more regular feature of teaching and learning. The contributions of the National Grid for Learning (NGfL) and the Welsh Assembly Government ICT for Learning strategy have been of considerable importance. As a result of funding from the NGfL and ICT for Learning, many schools have significantly increased their up-to-date ICT resources.

Nearly all secondary schools and many primary schools have computers that are accessed through a school network. In the main these networks are reliable with only a very few schools reporting regular breakdowns.

Some primary school and all secondary schools have ICT suites as well as computers in classrooms. ICT suites are generally appropriate in size and layout, with adequate space for pupils to place text materials next to the computer at which they are working. Many ICT suites have tables further away from the computers, so that half a class at the computers while the other half works on related desk-based activities. This arrangement reduces the number of pupils sharing a computer.

In the best practice, schools have an ICT suite combined with small clusters of computers adjacent to classrooms. This approach enables direct class teaching of ICT skills and for ICT to be used for learning in subject contexts. Classroom management is easier than having one computer in a classroom as all the pupils are undertaking similar ICT activities at the same time. Increasingly primary schools are placing an interactive whiteboard and data projector into the ICT suite to enhance the direct teaching of ICT skills.

Few schools have their own intranet. Where there is good use of an intranet, subject teachers ensure pupils have access to appropriate curriculum software and relevant web pages, and also use the intranet to show examples of pupils' work.

Approximately 50% of schools have funded additional interactive whiteboards and projectors from their own budgets. This indicates that the 'pump-priming' strategy associated with Welsh Assembly Government funding is being implemented effectively.

The proportion of school budget spent on ICT varies widely between schools depending on the current priorities in the school development plan. Of the 50 schools visited, the primary school spend on ICT ranged from £1,000 to £15,000 and secondary schools ranged from £5,000 to £70,000. However these figures do not take into account the size of the school or specific priorities for ICT in the school development plan. In the best practice secondary schools set aside a percentage of the school budget each year to build up a contingency fund for upgrades, renewal and replacement of ICT hardware, software and network equipment.

7.1 School Learning Centres

Almost all secondary schools and some primary schools have developed ICT for Learning centres, using funding from the ICT for Learning strategy and the school budget. These schools allow pupils access to these centres during lunchtimes and after school and have timetabled lessons using the facilities in the centre.

Most schools that received funding for an ICT for Learning centre have absorbed the facility into the existing school ICT resources, either as an additional ICT suite or an enhanced library. Very few schools have dedicated ICT Learning centres with outside access and self-contained toilet facilities that allow members of the community access to the centre without having to go into the main school buildings. Few schools have fulfilled the intention of the ICT for Learning strategy to support lifelong learning and help secure the widest access possible to ICT by the community that the school serves.

Good practice: using an ICT Learning Centre co-ordinator

What we saw

In an inner city secondary school, pupils from the partner primary schools and members of the local community use the learning centre. The centre offers a wide range of activities before and after school hours, during lunchtimes, at weekends and during holidays. A part-time co-ordinator, overseen by a management and development group, runs the learning centre. The centre has a good development plan that is linked to the school development plan.

Key benefits

This school fulfils well the values of the Welsh Assembly Government ICT for Learning strategy well. The ICT learning centre is effectively managed and provides an accessible learning resource for the local community.

School ICT learning centres have become operational over the past 18 months. Very few learning centres have systems to monitor use by pupils or members of the community. Several local education authorities are developing evaluation projects, but these are at very early stages.

Good practice: evaluating the impact of an ICT Learning Centre

What we saw

One local education authority ICT centre ran a project to evaluate the impact of the ICT learning centres on pupils' standards of achievement. The criteria on which the impact was being judged were shared with all the secondary schools. In the year, the criteria focused on access to ICT facilities and learning. Local education authority officers were collecting evidence from site visits to school ICT learning centres and questionnaires to teachers and pupils. The outcomes of the evaluation are yet to be analysed.

Key benefits

The local education authority was developing a good system for measuring the impact of ICT learning centres. It was working in an effective partnership with schools and using a suitable range of measurement tools.

7.2 Internet connectivity

Internet connectivity varies from schools in three local education authorities with at least 10 MB broadband access to a very few schools in rural local education authorities with no Internet access at all. The majority of secondary and primary schools have at least ISDN 64k Internet access. Some schools with ISDN access report slow response times or an intermittent connection when an entire class tries to use the Internet at the same time.

Most schools receive Internet and e-mail connectivity through their local education authority, which provides safeguards against undesirable web and e-mail material. In some schools, pupils are limited to sending e-mails within the school or to other schools within the local education authority only. The class teacher sends all other external e-mails on behalf of pupils. Schools are sensibly cautious about allowing pupils access to e-mail systems that are not protected by local authority safeguards, or those provided by an education Internet service provider (ISP).

Broadband access is gradually being installed by local authorities into both secondary and primary schools, although some local education authorities experience technical problems in connecting to broadband due to the remote rural location of their schools. These local education authorities are exploring satellite and microwave technologies as an alternative to cables and wires as a means of getting fast Internet services to their schools, although these technologies are more expensive.

Good practice: responding to local problems

What we saw

In one rural area, where a large primary school was connected to three smaller primary schools through ISDN links, the local education authority used its own funds, together with GEST funding, to install video-conferencing facilities in all four schools. The links overcame some of the communication problems faced by schools of this kind, where teachers do not meet face to face very often to discuss and share good practice.

The local education authority used the links to develop and share good practice between the schools and for curriculum development. Teachers in the small primary schools who had to act as subject leaders for all National Curriculum subjects benefitted from 'face to face' dialogue, through video-conferencing, with colleagues who had greater specialist expertise. Curriculum materials were shared through e-mail between the four schools involved.

Key benefits

The local education authority had used an imaginative way to overcome some of the problems faced by schools in remote rural locations.

7.3 Interactive whiteboards and data projectors

All schools have received their allocations of interactive whiteboards, data projectors and laptops provided by their local education authorities through Welsh Assembly Government funds. However only a few teachers had received training in the use of the equipment or the appropriate software. Where teachers and pupils have made good use of the interactive whiteboard, pupils are confident in using presentation software to demonstrate their work.

There has been no formal evaluation of the impact of interactive whiteboards by local education authorities or individual schools, but teachers report an increase in pupils' interest and motivation. Teachers have observed a reduction in the time taken up by administration and planning, and report that it is easier to keep teaching resources electronically.

Teachers find that the interactive whiteboard equipment needs to be calibrated each time it is moved and that it is unwieldy to move all the components.

Good practice: sharing good practice and reducing workload

What we saw

In one local education authority, an interactive whiteboard 'user group' was set up to produce materials, share expertise and support other teachers. This reduced the time individual teachers spent on preparing resources and helped develop the evaluation skills of teachers in judging the impact of ICT materials on their pupils.

Key benefit

This example highlighted the importance of teachers sharing resources and good practice, rather than 're-inventing the wheel' through duplicating individual efforts.

Good practice: using the interactive whiteboard to enhance teaching

What we saw

In a Year 10 science lesson, the teacher used the interactive whiteboard skilfully in a whole class exposition on the heart. The presentation included animated diagrams of the working heart, sections of the heart that could be viewed from any perspective, diagrammatic representation of heart functions during one heartbeat and a screen version of the diagram which pupils annotated. The presentation was used skilfully to emphasise key concepts and knowledge.

Pupils were involved in drawing on the board to show the path of blood during a heartbeat cycle.

Key benefits

This enhanced the quality of teaching because:

- it was accompanied by high levels of pupil motivation;
- it enabled the teacher to display photographs and diagrams with animation; and
- it enabled the teacher to move more swiftly through the presentation than would have been possible using conventional resources.

Many schools have purchased additional data projectors and interactive whiteboards with funding from their school budget, or as part of a local education authority project to involve schools in developing interactive whiteboard teaching materials.

7.4 Notebook computers

A few schools have provided notebook computers for all their teachers. These teachers generally become more confident and competent in ICT as a result. Teachers in these schools spend less time completing bureaucratic tasks such as transferring assessment data from marking books onto various forms and rewriting class materials each year.

Good practice: increasing the confidence of teacher to use ICT

What we saw

Several secondary schools have a loan system for equipment for teachers. The schools lease notebook computers purchased from GEST funding and charge teachers a nominal sum annually for the loan. This covers the use of the notebook, maintenance, software and training. To qualify for the scheme, teachers agree to attend after-school training sessions in the use of the notebook software and to demonstrate the use of ICT in their teaching. In these schools, nearly every teacher has taken advantage of the loan scheme and the headteachers report far greater use of ICT in teaching and in preparing teaching materials.

Key benefits

As a result of these initiatives, teachers showed increasing confidence, competence and enthusiasm in the use of ICT equipment. This was reflected in lessons that were more enjoyable for pupils and increased their motivation to learn.

A few schools provide notebooks for pupils' use. In the best instances, the notebooks are used, together with a wireless network facility, to enable them to be deployed throughout the school premises to support the use of ICT in all classrooms.

Good practice: portable computer as a flexible resource

What we saw

Primary schools and secondary special needs departments have provided pupils with a text processor computer that allows text to be drafted, edited, spell-checked and saved. These computers were A4 size and easily portable. They were a quarter of the cost of a notebook, but were limited to text processing only. Pupils downloaded their text into a classroom PC for further editing and formatting. Teachers observed that pupils' keyboarding skills improved and that they were able to use the computers outside the classroom for recording notes during fieldwork and visits.

Key benefits

In the best practice, pupils used the text processors as the initial step in drafting and spell-checking work before transferring it to a more powerful classroom computer for formatting and printing. The text processors allow pupils easy access to a computer, often in situations that might pose too great a risk to more expensive notebook computers, such as a pond study.

7.5 Curriculum resources

The majority of local education authorities have an intranet but the amount of content devoted to curriculum resources and the sharing of good practice vary greatly. A quarter of local education authorities demonstrate good practice in developing curriculum materials. All local education authorities are partners in the National Grid for Learning (NGfL) Cymru, which is working with them to share information and lesson materials.

There is a shortage of ICT materials in Welsh. Several local education authorities are working with schools to address this issue.

Good practice: developing Welsh-medium materials

What we saw

A teacher took part in ICT developments with financial support from a jointly-managed advisory service. She designed bilingual materials for teaching biology to Year 12 and Year 13, using an interactive whiteboard. The package taught about immune systems and had video, animation and diagrams to illustrate the topic. It introduced the primary and secondary immune systems and developed students' understanding of the processes involved in identifying and destroying viruses, bacteria and fungi.

Key benefits

The lesson was good because the interactive whiteboard was used by the teacher to illustrate important points more effectively than using a whiteboard, handouts or a textbook. The lesson was visually stimulating and fully engaged pupils in understanding the biological processes.

8. Key issues for action

The Welsh Assembly Government, local education authorities and schools are making good progress in improving ICT provision in schools.

For further progress at a national level, there is a need to:

- set out broad intentions for any future specific funding for ICT beyond 2005 to ensure that recent advances in ICT resources to schools are maintained;
- develop medium-term and long-term planning for a national ICT strategy for Wales that builds upon the vision of 'The Learning Country';
- plan ICT initiatives so that local education authorities have enough time to fully consult, discuss, plan and deliver them to their schools within the timescale set for the initiative;
- monitor the development of school and community ICT learning centres to ensure that they comply with the intentions of the ICT for Learning Strategy; and
- provide guidelines on assessing the key skill of using ICT.

For further progress in local education authorities, there is a need to:

- promote a clear ICT strategy for education, that matches national ICT objectives and is developed in consultation with schools;
- continue to ensure improvements in the quality and quantity of ICT resources for schools;
- help schools to identify challenging targets for improvement;
- develop advice, guidance and support on procuring technical support for schools;
- monitor, evaluate and review progress in schools in order to make better informed decisions about targeting school improvement support for ICT and resources; and
- work in partnership with teachers to improve curriculum planning and assessment of ICT.

For further progress in schools, there is a need to:

- improve whole school ICT planning in order to make the best use of available resources, and ensure that pupils have regular opportunities to use ICT in suitable contexts across the curriculum;
- monitor and evaluate the progress that pupils make using ICT and the standards they are achieving in IT;
- ensure that progression is built into the work that pupils do when using ICT, in particular during transition between key stages 1, 2 and 3;
- provide opportunities for teachers to share classroom experiences where ICT has been used successfully;
- ensure that learners of all ages and abilities have access to school ICT facilities such as ICT suites, clusters of computers, Internet, intranets and e-mail;
- offer regular training and support to teachers in using school facilities and resources; and
- maximise access to ICT for learners who have little or no access to it outside school.