

The Becta Review 2006

Evidence on the progress of ICT in education







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PREFACE

The 2006 *Becta Review* offers us an opportunity to examine trends in technology adoption and use and assess the progress and impact of technology in education, drawing on evidence from a range of recent surveys and research studies.

Overall there has also been noticeable progress in engagement with technology in education, with rapid growth in the use of technology especially evident in the schools sector. Practitioners, however, identify the need for ongoing training in order that they can make the most of what technology has to offer learning and teaching.

If we are to realise the potential of technology as a critical enabler of educational change it is clear that a number of challenges still need to be addressed. System-wide interventions are required to ensure that

technology is sustainable and affordable and can better support greater effectiveness and efficiency across a range of educational processes. In addition, variations in institutional readiness and capability must be overcome if we are to achieve the greatest value from technology investment.

The noticeable embedding of technology that we are beginning to see will need nurturing. Technology will increasingly be called on to support a more open and accessible education system. This will require not only greater understanding of learner access and capability, but also shifts in related professional educational practice. Becta will play a key role in supporting both the ICT industry and the education system in ensuring these developments are taken forward successfully.

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Director, Evidence and Evaluation



EXECUTIVE SUMMARY

Introduction

It is a year since the Government published its strategy for technology in education in England: *Harnessing Technology; Transforming Learning and Children's Services*. Though the strategy is at a very early stage, we can nonetheless offer some assessment of progress where it can be identified and highlight issues and challenges that may affect further change in the system.

The *Becta Review* seeks to establish a picture of technology provision, practice and impact in the schools and learning and skills sectors, drawing on evidence from recent surveys and research studies which are relevant at a national level.

The main audience for this review is Becta's key partners – including the DfES and education sector agencies – and Becta's key stakeholders, including institutional leaders, local authority policy-makers and advisers, researchers and commercial companies.

Technology infrastructure

Investment continues to deliver improvements in technology and infrastructure – computer:pupil/student ratios have improved and there is faster connectivity and access to the internet.

Computer stocks in schools and colleges have increased, producing a management issue of purchase, disposal and re-use. However, approximately half of primary and secondary schools do not have a policy in place for replacement of workstations, and in those that do, the rate of replacement is not at the level to maintain the longer-term currency of the technology.

Similarly, in FE colleges and institutions there remains a challenge in maintaining the currency of the technological infrastructure whilst at the same time meeting the demand created by the growing

numbers of FTE students. As a result there has been a worsening of student:computer ratios in FE colleges.

In schools, most teachers are happy with the quantity of resources available to them although there has been slight fall in satisfaction with the fitness for purpose of desktops in both primary and secondary schools.

Interactive whiteboards are now prevalent in schools and colleges, with increasing numbers connected to computers with internet access and available for subject teaching.

Mobile technologies are set to play an increasingly important role, with personal ownership of mobile technologies such as laptops, PDAs and mobile phones on the rise in schools.

Although there have been significant improvements in internet bandwidth in schools which can result in improved pace of lessons, increased pupil motivation and better lesson outcomes, many schools are still unclear about the full range of benefits to learning that broadband can bring and have not yet made significant use of applications that specifically require broadband.

In around a third of colleges, demand for internet access has continued to outpace college capability.

The use of technology to support continuity of learning beyond the school is an important facilitator of personalisation. However, few schools yet offer access to school networks from remote locations for staff and pupils and there is still a significant minority of pupils who do not have home internet access.

Interoperability of learning platforms and MIS remains a problem for schools and colleges and a significant number of schools still do not have a combined curriculum and management network. This suggests that we still have some way to go to ensure that the underpinning infrastructure is in place for integrating learner and data services that would enable learner data to flow effectively through the system.

Personalised content and the use of digital resources

In the schools sector the overall quantity of resources is good, as demonstrated by Curriculum Online product registration. E-learning credits have had a major impact on sales and a positive but limited impact on investment and innovation.



Digital content continues to be overwhelmingly delivered and used offline, although the large-scale introduction of broadband may alter this trend in favour of online products. Concerns remain about gaps in a few subjects and key stages.

In colleges the use of e-learning materials appears to have remained fairly static over the last three years, with internet and in-house resources considered by colleges as most important to content provision.

While the market is providing increasing numbers of high-quality products in the schools sector, quality of provision is mixed. It is unlikely that demand will effectively drive improvements to quality, as purchases by schools continue to be concentrated on a relatively small number of suppliers. This is partly because practitioners are finding it difficult to develop effective strategies for identifying appropriate software.

The way in which content and digital resources are used is crucial to personalised learning. Increased adoption has seen some improvements in practitioners' understanding of pedagogy and practice associated with the use of ICT in the classroom, in particular, the way in which teachers select and organise ICT resources and how this use is integrated with other activities in the classroom and beyond.

While some teachers are beginning to report that ICT can save time in lesson preparation through the re-use of learning objects, practitioners in both schools and colleges struggle to find the time to select and evaluate digital resources and then embed them effectively into their practice, including the required changes in planning for learning and teaching.

While learning platforms exist in FE colleges and to a lesser extent in schools and the ACL community, the way in which they are being used to deliver content and courses is unclear. There is evidence that schools are using their local area

network and websites as a repository or shared area for their own learning objects and teaching resources, as well as drawing them from external sources. In colleges different patterns of departmental use and related attitudes and values of practitioners play an important part in the nature and extent of use of digital resources.

Currently only limited systematic research exists on the role of educational games in learning, but what there is has identified their motivational potential, role in developing new cognitive abilities, 'learning by doing' and the promotion of shared learning and communications.

Learner support and information

There is a low level of familiarity among headteachers with the concept of a personalised online learning space. However, those who are aware view them favourably.

Although there has been a significant increase in the uptake of learning platforms in schools and colleges, their adoption in schools remains relatively low, especially in the primary school sector.

There is an increase in the popularity of open-source learning platform products in schools which may be related to the perceived cost barriers involved in investing in learning platform technology.

In schools and colleges there remains a challenge to link learner information management to curriculum delivery.

Teaching staff in schools are less likely to routinely use ICT for administration and management than school leaders and there are still low levels of access to school management information systems from standard workstations in the school. Although there is an upward trend in teachers setting homework that involves use of computers and the internet, overall this is not common practice.

Primary and secondary heads were unanimous in their view that if standardised ICT-based assessment were introduced, it would be most appropriate at age 16 rather than 14 or 11.

While most FE colleges are familiar with records of achievement provided by schools, there is little evidence that this information is transferred across institutions to provide continuity of guidance or that this information is used to personalise learning.



E-Maturity: institutional, workforce and learner capability

Leadership of ICT and e-learning in schools has improved, but variations between schools remain. Schools making progress in using technology to support learning in sustained ways are those where there is strong vision and leadership for ICT from senior management, needs-related centralised resources allocation and whole-school strategies which focus on how ICT can enhance teaching and learning.

In FE colleges, management time to plan and set targets, along with the need to appoint staff at a senior level to facilitate change, are essential for the successful implementation of e-learning. Development is still often left to individual enthusiastic staff and departments.

Significant numbers of headteachers and school managers have now completed the NCSL SLICT programme and there is evidence that completion has had a positive impact on the way heads are integrating ICT in their schools as a result.

Management Information Systems (MIS) have a critical role in developing institutional effectiveness and in reducing the administrative burden, yet evidence of widespread effective use and productivity gains is only to be found in a small number of schools.

Many leaders present their vision for learning as focused primarily on supporting learning within the institution. Learning beyond the institution is currently viewed as a low priority. As a result, independent learning afforded by the technology is not fully supported.

ICT is viewed by teachers as the most common need for future training and CPD. However, headteachers consider that the ICT skills of their staff meet or exceed current needs. ICT and e-learning training for staff in colleges is not as extensive as in schools, although the role and effectiveness of informal training peer support networks are similar in both sectors.

In FE, classroom practice does not appear to have developed significantly as a result of the use of technology over the last two years. However, learners are better supported in independent learning as a result of access to technology and digital learning resources.

There is a growing body of evidence that the use of ICT in education has a positive, if small, impact on learner attainment as measured in national tests. The ICT Test Bed evaluation, for example, found that technology deployment and use predicted an improvement in test performance relative to 'benchmark' comparators.

A recent survey of FE practitioners found that e-learning was reported to have a positive impact on student motivation, retention, attendance and attainment.

Progress, issues and challenges

Overall access to ICT continues to improve in the schools sector, with rapid growth in the adoption and use of whole-class display and other supporting technologies. There has been a related acceleration in the use of ICT by practitioners. It is becoming increasingly the norm for practitioners to prepare and deliver lessons using digital resources. However, in FE the picture of improved access and developing practice is more mixed.

There is still considerable variation between institutions in the level and quality of ICT provision. There are no indications of progress in improving the sustainability and affordability of institutional infrastructure. Survey data suggests that this may in fact be worsening at the moment.

Progress is also notable in the adoption of learning platforms, though adoption is low in the primary schools sector. Related use to support effective learning is limited, however. The effective use of technology to enhance learner information and support is also in its early stages.

The strongest indications of improvements to learning and teaching through the use of ICT relate to learner motivation and inspection data. However, though not unambiguous, there is an accumulating body of evidence which links the use of ICT in learning and teaching to improvements in standards.

There is clearly evidenced potential for technology to support greater effectiveness and efficiency across a range of educational processes, particularly management and administration. Key system-level interventions are required in order to enable this potential to be realised.



Engaging hard-to-reach learners effectively requires an understanding of their diverse needs and how, where appropriate, technology can help meet some of those needs. Learning from innovative projects and enabling the transfer of learning is essential.

The use of technology to support an increasingly open and accessible system is in its early stages. There is a need to address both technical and professional practice issues to make significant progress against this objective.

Key issues and challenges include: overcoming critical variation, supporting whole-institution change, achieving sustainability and affordability, embedding the learner space, promoting e-assessment, using data to support educational decisions, understanding the implications of difference between primary and secondary school sectors, supporting continuity of learning, understanding the implications of current learner access and capability and better supporting discovery and selection of digital resources.



1

INTRODUCTION

It is a year since the Government published its strategy for technology in education in England: *Harnessing Technology; Transforming Learning and Children's Services*. The aim of this strategy is to ensure that technology fulfils its potential as a critical enabler of educational change, supporting greater effectiveness, efficiency, personalisation and choice across education, skills and children's services.

It is also a year since publication of the first *Becta Review*, which established a picture of technology provision, practice and impact in the schools and learning and skills sectors at that time. It is therefore timely to examine trends in key strategic areas and to assess progress and impact over the past year.

Technology-based change is always challenging, and even more so if it is nationally focused. A year into its life, therefore, any national strategy for technology will be in its very early stages and we would not expect to perceive radical development in the deployment and use of technology to support educational processes at this stage. However, we do expect, and are able, to examine trends in key areas and offer an early assessment of progress where it can be identified, and highlight issues and challenges that may affect further change in the system.

As was the case in the *Becta Review 2005*, the evidence and research presented here is from recent surveys and research studies which allow us to draw conclusions which are of relevance at a national level. The primary evidence sources cited in this review are:

- national statistics and large-scale and national-level surveys, such as the DfES survey of ICT in schools and the Becta survey of ICT and e-learning in FE, and including some international comparisons
- national and larger-scale research studies of ICT implementation and use, including the evaluation of the ICT Test Bed¹
- projects to evaluate national ICT programmes, such as the evaluation of Curriculum Online
- inspection data and reports from Ofsted
- systematic reviews of literature relating to ICT in education.

The primary value of a review of this kind is that it brings together a range of sources, providing an overall picture of progress in key development areas. At times, however, it is not possible to offer a complete picture. For example, in sections where we are able only to draw from institutional surveys we are unable to offer a rounded picture on ICT and e-learning practice. However, overall this review presents a reasonably comprehensive assessment in key areas.

The review covers schools and the learning and skills (post-16) sectors. Given the limitations of available evidence, work-based learning is not covered in depth in this review. Becta is currently working with the Learning and Skills Council (LSC), the DfES and other post-16 agencies to develop the evidence base in this area further. Owing to issues of availability of a range of evidence, this report relates primarily to England.

In some parts of the review we have provided international comparison data from the Organisation for Economic Co-operation and Development (OECD). Although only indicative, owing to survey response rates, this complements the picture provided by more detailed evidence from elsewhere, especially with respect to home use, and measures of attitude and learner maturity.

The review is organised under four broad headings:

- Technology and infrastructure provision
- Personalised content and use of digital resources
- Learner information and support
- E-maturity and institutional development

Section 6 considers evidence of impact and outcomes relating to the role of technology in specific areas:

- Transforming teaching and learning, and help to improve outcomes for children, young people, and adults through shared ideas, more exciting lessons and online help for professionals
- Engaging 'hard to reach' learners, with special needs support, more motivating ways of learning, and more choice about how and where to learn
- Building an open, accessible system, with more information and services online for parents and carers, children, young people, adult learners and employers; and more cross-organisation collaboration to improve personalised support and choice
- Achieving greater efficiency and effectiveness with online research, access to shared ideas and lesson plans, improved systems and processes in children's services, shared procurement and easier administration.

The final section offers an analysis and assessment of the key findings and major issues arising from this review in the context of the Government's ambitions for the education and skills sectors.

1 <http://www.evaluation.icctestbed.org.uk/reports>



2

TECHNOLOGY INFRASTRUCTURE

Key points

- Investment continues to deliver improvements in technology and infrastructure – computer-to-pupil/student ratios have improved and there is faster connectivity and access to the internet.
- Computer stocks in schools and colleges have increased, producing a management issue of purchase, disposal and re-use. However, approximately half of primary and secondary schools do not have a policy in place for replacement of workstations, and of those that do the rate of replacement is not at the level to maintain the longer-term currency of the technology.
- Similarly, in FE colleges and institutions there remains a challenge in maintaining the currency of the technological infrastructure whilst at the same time meeting the demand created by the growing numbers of FTE students. As a result there has been a worsening of student:computer ratios in FE colleges.
- In schools, most teachers are happy with the quantity of resources available to them although there has been a slight fall in satisfaction with the fitness for purpose of desktops in both primary and secondary schools.
- Interactive whiteboards are now prevalent in schools and colleges, with increasing numbers connected to computers with internet access and available for subject teaching.
- Mobile technologies are set to play an increasingly important role, with personal ownership of mobile technologies such as laptops, PDAs and mobile phones on the rise in schools.
- Although there have been significant improvements in internet bandwidth in schools which can result in improved pace of lessons, increased pupil motivation and better lesson outcomes, many schools are still unclear about the full range of benefits to learning that broadband can bring and have not yet made significant use of applications that specifically require broadband.
- In around a third of colleges, demand for internet access has continued to outpace college capability.
- The use of technology to support continuity of learning beyond the school is an important facilitator of personalisation. However, few schools yet offer access to school networks from remote locations for staff and pupils and there is still a significant minority of pupils who do not have home internet access.
- Interoperability of learning platforms and MIS remains a problem for schools and colleges and a significant number of schools still do not have a combined curriculum and management network. This suggests that we still have some way to go to ensure that the underpinning infrastructure is in place for integrating learner and data services that would enable learner data to flow effectively through the system.

The *Harnessing Technology* strategy sets out a vision whereby every learner has access to digital learning resources to support and enhance their learning, whenever and wherever appropriate. Achieving this ambition requires an ICT infrastructure which is ubiquitous, reliable, affordable, secure, cost-effective and available at the point of need. Progress in this area is dependent upon both institutional management of ICT resources to meet educational need and effective system-wide provision and procurement frameworks, such as a high-quality national broadband network.

The *Becta Review 2005* reported that institutional provision of technology in both the schools and learning and skills sectors was highly variable. There have historically been problems of uneven quality, including ongoing issues relating to lack of reliability

and interoperability between technology systems. Many institutions have also reported problems in sustaining their infrastructure provision. The *Becta Review 2005* reported that in 2004 a minority of institutions had achieved sustainability.

Initiatives in this area include national infrastructure standards in the schools sector and centralised support for aggregated procurement to improve value for money. The Building Schools for the Future (BSF) programme, initiated in 2005, will see Government support for capital investment in school buildings reach £5.1 billion in 2005–06. A proportion of this figure will be devoted to ICT infrastructure. In the Learning and Skills and Adult and Community Learning (ACL) sectors, providers and specialist institutions will be working towards adoption of technologies that facilitate access to learning and flexibility in learning.



DEVELOPMENTS IN SCHOOLS

Access to technology

As we noted in the *Becta Review 2005*, overall, there has been a sustained growth in key areas of infrastructure provision over the last five years. The annual ICT in schools surveys have provided trend data on pupil:computer ratios in secondary and primary schools since 2000. These surveys indicate progressive improvement.

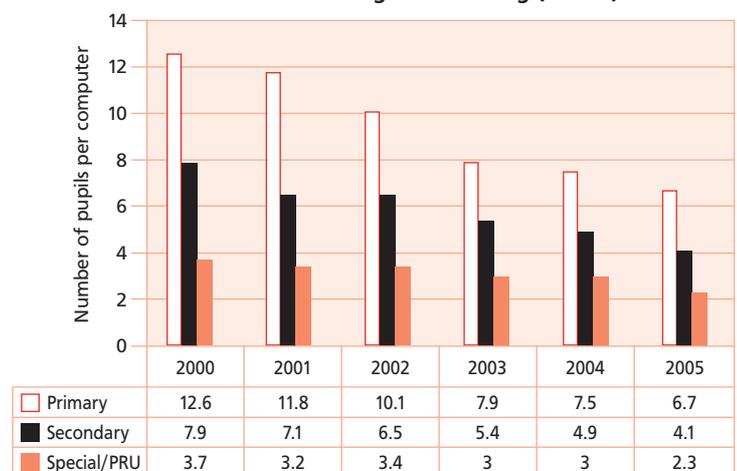
The Department for Education and Skills (DfES) published figures on pupil:computer ratios in schools (DfES, 2005a) on the basis of data provided as part of PLASC (the Pupil Level Annual Schools Census). The 2005 figures indicated that in primary schools the ratio was 6.7:1, in secondary 4.1:1 and in special schools 2.3:1. The figures included all computers that were available for teaching and learning, including desktop and portable computers, and school-owned equipment assigned or loaned to individual staff or pupils. This makes it comparable to the data previously gathered for the ICT in schools surveys (see Figure 2.1).

The second source of pupil:computer ratios for 2005 is the Becta LANs in Schools survey (Becta, 2006a) which was based on field visits and counted only the computers available for teaching and learning purposes. This indicated a pupil:computer ratio for teaching and learning of 7.09:1 in primary, 4.30:1 in secondary and in special/PRU provision, 2.61:1.

Findings from a third survey, the Curriculum Online evaluation (Kitchen, Mackenzie and Butt, 2006) indicated that ratios for the number of pupils per computer (desktops plus laptops) improved in both primary and secondary schools since the baseline survey, which reflected the upward trend in the number of computers available in schools (see Figure 2.2).

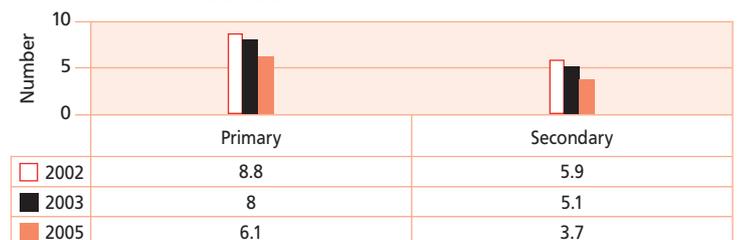
In 2005 the primary schools surveyed had an average pupil:computer ratio of 6.1:1, an improvement from 8.8:1 since the baseline. On average, primary schools saw the number of pupils per computer fall by 2.7 between the baseline and 2005. The average number of pupils per computer varied with school size and was larger in large schools (*ibid*). The improvement in

Figure 2.1: Mean number of pupils per computer used for teaching and learning (PLASC)



Source: *ICT in Schools Survey 2004 (Prior and Hall 2004)* and the *Computer:Pupil Ratio from Pupil Level Annual Survey School Census (2005)*

Figure 2.2: Average number of pupils per computer in schools



Source: *Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)*

pupil:computer ratios was slightly smaller in the secondary schools surveyed, albeit from a stronger base. The computer:pupil ratio fell from 5.9:1 in the baseline survey to 3.7:1 in 2005. On average schools saw the number of pupils per computer fall by 2.2. The pupil:computer ratio did not vary significantly with school size in secondary schools (*ibid*).

However, a good computer-to-pupil ratio does not tell the whole story about access. There can be variation in access between subjects, for example, and Ofsted reported that around 10 per cent of primary schools and 20 per cent of secondary departments had unsatisfactory access to resources (Ofsted, 2004).



Notwithstanding Ofsted's view, the Curriculum Online survey (Kitchen, Butt and Mackenzie, 2006) indicated that among teachers, most were positive about the quantity of resources, with significant reductions over the previous three years in the number reporting that they had fewer resources than they needed (see Figure 2.3). Although there was a slight drop in satisfaction with fitness for purpose of desktops in both primary and secondary schools (89 per cent of primary and 86 per cent of secondary satisfied in 2002, compared to 87 per cent of primary and 80 per cent of secondary in 2005), satisfaction with availability of ICT resources had improved or remained constant (see Figure 2.4).

In some cases, ICT developments have been found to be held back by the physical condition of school buildings (PwC, 2004a, and Comber et al., 2002) and these may in some cases account for some of the variation in access noted in the 2005 *Review*, particularly in primary schools (Becta, 2005a). Leadership and planning are also factors in variability of learner access and quality of provision, as highlighted in the section on e-maturity later in this report. Achieving large-scale system-level change in order to embed ICT-enabled access to learning at any time, and from anywhere, remains a challenge and is clearly not something which institutions, especially smaller ones, are able to provide without advice and support.

Supporting technologies

The range of supporting technologies in schools has continued to expand. This in turn has supported progress in embedding ICT in learning and teaching. For example, Ofsted found that the use of ICT as a tool for learning was on the increase, with examples of ICT being used well to enhance teaching and learning in all types of school (Ofsted, 2005a).

Provision and use of digital cameras, projectors and interactive whiteboards continued to rise sharply. Still digital cameras were the most popular supporting ICT tool with over 90 per cent of all schools, irrespective of type, having them. Video cameras were almost as popular with over 70 per cent of primary schools and 90 per cent of secondary schools having one. Some 95 per cent of secondary schools had fixed multimedia projectors, and 93 per cent had mobile units. In primary the figures were slightly lower at 85 and 81 per cent respectively. (Becta, 2006a)

Table 2.3: Teachers' rating of fitness for purpose of resources in schools (% very good/good)

	Primary		Secondary	
	2002 (%)	2005 (%)	2002 (%)	2005 (%)
Desktop computers	89	87	86	80
Laptops	86	87	84	84
Interactive whiteboards	92	97	91	91
Data loggers	78	77	76	73

Source: *Curriculum Online Evaluation: Emerging findings from the third survey of schools* (Kitchen, Mackenzie and Butt, 2006)

Table 2.4: Teachers rating of quantity of resources in schools (% saying "less than we need")

	Primary			Secondary		
	2002 (%)	2003 (%)	2005 (%)	2002 (%)	2003 (%)	2005 (%)
Desktop computers	42	40	35	70	68	68
Laptops	67	55	45	74	67	56
Interactive whiteboards	52	60	29	74	72	53
Data loggers	69	68	62	72	56	58

Source: *Curriculum Online Evaluation: Emerging findings from the third survey of schools* (Kitchen, Mackenzie and Butt, 2006)

Figure 2.5: Mean number of interactive whiteboards per school



Source: *ICT in Schools Survey 2003 and 2004* (The Stationery Office 2003; Prior and Hall, 2004) and *Survey of LAN Infrastructure and ICT Equipment in Schools* (Becta, 2006a)

The rapid spread of interactive whiteboards in schools, reported in our review of 2005, has continued, as can be seen in Figure 2.5. Only 7 per cent of primary schools and 2–3 per cent of secondary schools reported that they do not have interactive whiteboards (Becta, 2006a); the overwhelming majority of those installed were connected to computers with internet access, with 82 per cent and 88 per cent with internet connections in



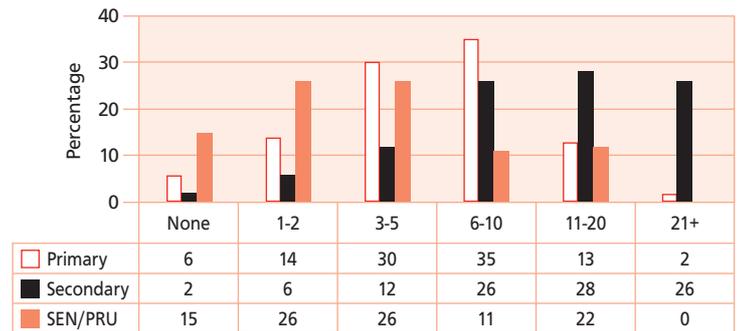
primary and secondary respectively (*ibid*). The third evaluation of Curriculum Online (Kitchen, Butt and Mackenzie, 2006) indicated that the biggest rise in resources was in primary school access to interactive whiteboards. In the schools surveyed, 91 per cent of primary schools reported they had at least one interactive whiteboard, compared with only 39 per cent in the baseline survey in 2002. All secondary schools reported having at least one interactive whiteboard.

Levels of provision of interactive whiteboards within schools that have them are also rising, as can be seen in Figures 2.6 to 2.8. The LANs survey (Becta, 2006a) indicated that 37 per cent of primary schools had 6–10 interactive whiteboards, 13 per cent had 11–20, with only 2 per cent with more than 21. In secondary the penetration was greater, with 29 per cent with 6–10 interactive whiteboards, 28 per cent with 11–20 and 26 per cent with more than 21. It is likely that the rapid uptake of interactive whiteboards will continue. A 2004 survey indicated that medium-term plans to purchase interactive whiteboards were a priority in 65 per cent and 61 per cent of primary and secondary schools respectively (PwC, 2004a).

The availability of interactive whiteboards for subject teaching is also rising, particularly in secondary schools. Findings (Becta, 2006a) suggested that the average number of interactive whiteboards in secondary schools was 17 and in primary schools was 5. Primary schools indicated that 49 per cent of their interactive whiteboards were dedicated to subject teaching (compared to 6 per cent in 2002) and in secondary this was 52 per cent (compared to 12 per cent in 2002) (Kitchen, Butt and Mackenzie, 2006). However, the predominant model for deployment of this technology was in dedicated computer suites, with over 70 per cent of interactive whiteboards in secondary and over 60 per cent of interactive whiteboards in primary schools located there (Becta, 2006a).

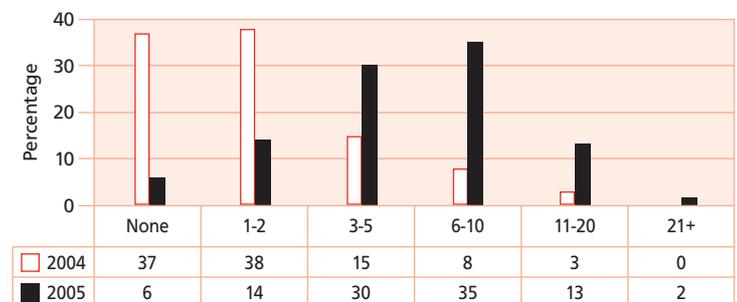
Evaluations of the DfES Schools Whiteboard Expansion programme, due to report in the Summer 2006, will provide the robust assessment of the impact of interactive display technologies which we currently lack. Meanwhile, findings from the pilot evaluation of six LEAs on the impact of the use of electronic or interactive whiteboards in literacy and mathematics lessons in primary schools (Higgins et

Figure 2.6: Number of interactive whiteboards per school (2005)



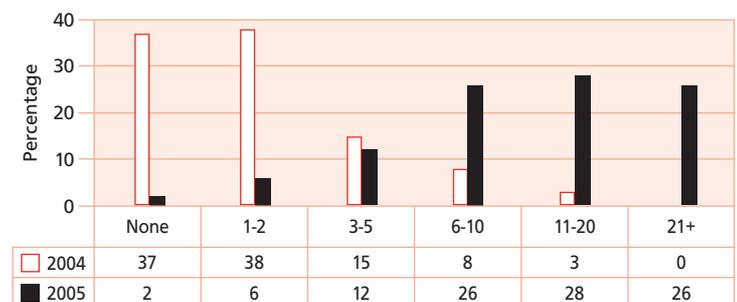
Source: Survey of LAN Infrastructure and ICT Equipment in Schools (Becta, 2006a)

Figure 2.7: Number of interactive whiteboards per primary school



Source: ICT in Schools Survey 2004 (Prior and Hall, 2004) and Survey of LAN Infrastructure and ICT Equipment in Schools (Becta, 2006a)

Figure 2.8: Number of interactive whiteboards per secondary school



Source: ICT in Schools Survey 2004 (Prior and Hall 2004) and Survey of LAN Infrastructure and ICT Equipment in Schools (Becta, 2006a)



al., 2005) indicated that use of this technology was received positively by teachers and pupils, with reports of increased motivation of learners arising from use, and some indications, albeit limited, of positive impact on learning.

The range of technologies now being used within schools has also increased. Recent research (Twining et al., 2006) involving a web based questionnaire of over a hundred respondents from both schools and colleges, indicated that mobile technologies are set to play a substantial role in meeting the organisational visions of schools and colleges. The study also found that 'personal ownership' of a mobile device (laptops, tablet PCs, PDAs, mobile phones, for example) was something that 67 per cent of institutions had achieved or were working towards for teachers or college lecturers (Twining et al., 2006). Some 47 per cent and 34 per cent of respondents' organisations were working towards, or had achieved, laptops for all other staff and students respectively, although there was significant variation within both pre- and post-16 responses (*ibid*).

According to trend data in the LANs in schools surveys (Becta, 2006a, and 2004a) availability and use of video conferencing has remained unchanged, despite the increased availability of broadband in schools. About 10 per cent of secondary schools and 5 per cent of primary schools with video-conferencing facilities used video conferencing between 1 and 5 hours per week, with minimal usage above this figure. More significantly 15 per cent of secondary and 8 per cent of primary schools that had a video-conferencing service did not use it at all.

Connectivity and bandwidth

As we noted previously (Becta, 2005a) there have been significant improvements in internet bandwidth availability to institutions over the last five years. Figures for the last quarter of 2005 indicated that this improvement had continued, with 83 per cent of primary schools connected at broadband speeds and 99 per cent of secondary schools (Becta, 2006a and 2006b).

The plan of the Broadband Stakeholders Group, to have all educational institutions connected at broadband speeds by the end of 2006, is well on target (Broadband Stakeholders Group, 2002; Becta, 2006b). However, regional variations complicate the

picture (Underwood et al., 2005), with some regional broadband consortia (RBCs) already achieving 10Mbps connectivity whilst others are at very early stages of implementation. Although geographical factors contribute to this variation, for example urban versus rural challenges, RBC policy has also been found to be important (*ibid*).

There is still a substantial minority of schools that do not have broadband access and others with lower specification broadband connections (at 2Mbps) where the bandwidth is insufficient for their needs. It seems likely that demand for bandwidth will increase as schools and colleges start to make greater use of learning platforms and multimedia applications (Twining et al., 2006).

As reported in the *Becta Review 2005*, lesson observation in the use of broadband indicates that increased bandwidth can result in improved pace of lessons, increased pupil motivation for ICT work and higher quality lesson outcomes. A study of the educational impact of broadband found that the reliability offered by broadband gave practitioners the confidence to use technology 'live' in class (Underwood et al., 2005), and had a positive impact on the use of the internet to support classroom learning and teaching. However, Ofsted (2004) reported that upgrading connection speeds does not automatically result in users benefiting from an enhanced educational experience. Whilst systems are faster and more robust, schools were still unclear about the full range of benefits to learning that broadband brought, or had not yet made significant use of applications that specifically required broadband. Ofsted identified this as an area of action at both local authority and regional level.

Networked classrooms and wireless networks

As we noted in the *Becta Review 2005*, the pattern of improvement in infrastructure can also be seen in networking. In 2004, 91 per cent of primary schools, 93 per cent of special schools and 99 per cent of secondary schools had a network (Prior and Hall, 2004). The 2005 LANs in school survey (Becta, 2006a) indicated that a greater number had a network, with 97 per cent of primary schools and 98 per cent of secondary schools having a network. The third evaluation of Curriculum Online indicated that not only had networks become more prevalent (see Figure 2.9) but that increased numbers of computers were connected to the network since both the baseline survey and the second survey in 2003 (Kitchen, Butt and Mackenzie, 2006) with 51 per cent of primary and 85 per cent of secondary schools who reported saying that all their computers were networked (compared to 37 per cent of primary and 65 per cent of secondary in the baseline survey in 2003).

Becta has demonstrated the benefits of an integrated network, combining both curriculum and administrative networks. The 2005 LANs survey (Becta, 2006a) indicated that there remains some way to go to for all schools to achieve a combined network, with only 27 per cent of primary, 38 per cent of secondary and 22 per cent of special/PRU schools indicating that they had a combined network.



This means that a significant number of schools do not have a combined network. We noted in our review in 2005 that there was a potential critical network barrier to the integration of curriculum and management information caused by the fact that many networks do not support both curriculum and management functions. Without this underpinning infrastructure in place it will not be possible to integrate the learning and data services that will enable learner data to flow through the system more effectively. However, 28 per cent of primary and 31 per cent of secondary schools stated that they planned to combine networks (Becta, 2006a), which would allow teachers to access management information from any available machine.

In 2004 the predominant model for location of computers in schools tended to be computer suites (PwC, 2004a). 2005 figures are difficult to compare. However, 74 per cent of primary schools' and 84 per cent of secondary schools' computers were located in a combination of computer suites, classrooms and clusters (*ibid*) with 68 per cent of secondary schools reporting they had at least one suite of 25+ machines and 47 per cent at least one suite of 16–25 machines (Becta, 2006a).

Ofsted (2005a) indicates that many secondary schools have benefited from more flexible deployment of resources, for example through the use of laptops wirelessly linked to school networks and clusters of machines in various curriculum areas around the school. This has enabled more use of ICT to take place in other subjects across the curriculum, freed up resources and positively influenced teaching and learning. This has enabled a growing minority of schools to make significant progress.

There has been a considerable rise in wireless networks in schools, suggesting a dual strategy of fixed and portable computer access. In 2004, 21 per cent of primary and special schools and 54 per cent of secondary schools reported that they had wireless networking (Prior and Hall, 2004). In 2006, this had grown, with 41 per cent of primary and special schools and 71 per cent of secondary schools with wireless networking (Becta, 2006a). In the Curriculum Online evaluation (Kitchen, Mackenzie and Butt, 2006), the schools surveyed indicated that there was some form of wireless technology in 66 per cent of secondary and 32 per cent of primary schools. The main reason cited

Table 2.9: Extent of networking in schools

Computers linked	Primary		Secondary	
	2002 (%)	2005 (%)	2002 (%)	2005 (%)
All	32	51	65	85
More than half	33	33	35	16
Around half	6	6	–	–
Less than half	7	4	–	–
None	22	6	–	–

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

for implementing wireless connections was to improve laptop access and portability, along with increasing the number of connected workstations, extending to difficult locations and enhancing pupils' fieldwork (Becta, 2006a).

Access to technology for supporting continuity of learning

The use of technology to support continuity of learning beyond the school, including remote access to schools' networks, is an important facilitator of personalised learning. As we noted previously (Becta, 2005a) the trend data we have on pupils' use of ICT suggests an upward trend in all aspects – both at home and school. However, although a school might be well equipped with hardware, it is the opportunity for pupils to access these resources for independent use outside lesson time which shapes use (Valentine et al., 2005).

There is evidence in the most recent Curriculum Online evaluation survey for 2005 of a relationship between the level of ICT resources available at primary schools and pupil access to resources outside lessons, with schools with the worst pupil:computer ratios being less likely to provide access through formal clubs. Nearly half (47 per cent) of primary schools with ratios of 5.1 or better offered informal access to computers outside lessons compared with just a fifth (19 per cent) with a ratio of 6.75 or worse (Kitchen, Mackenzie and Butt, 2006).

The *Becta Review 2005* found that less than 30 per cent of schools operated networks that were accessible beyond the school premises and that the provision was related to school size. The LANs in Schools survey (Becta, 2006a) found a similar picture with 92 per cent of primary, 68 per cent of secondary and 78 per cent of special schools stating they did not provide connections to the school network from remote locations for staff or pupils. Where access was provided (mainly in secondary schools and special schools or PRUs) it tended to be via an internet-based Virtual Private Network (VPN).

Websites appear to be a common method for providing remote access to learning information. The LANs survey found that 91 per cent of secondary,



71 per cent of primary and 63 per cent of special/PRU provision had websites and that these websites were used to provide access to pupil lesson resources, document access, intranet access and homework upload or download (Becta, 2006a) (see Table 2.10).

In terms of pupils' own access to technology, 27 per cent of the secondary pupils had a dial-up connection and a further 61 per cent had broadband connectivity at home; however, this still left 12 per cent without any home internet access. (Underwood et al., 2005). DfES (Valentine et al., 2005) research noted that families in social classes AB were more likely to own three or more computers, and that children from these classes and those in Year 11 were significantly more likely to have individual access.

Some schools operate schemes which offer assistance to pupils or staff in accessing ICT, with equipment loan being the most popular. However, according to one recent survey, 62 per cent of primary and 51 per cent of secondary schools offered no assistance to pupils (Becta, 2006a), with similarly low levels of intervention for assisting staff in accessing ICT at home.

Since 2003 there has been a small rise in the proportion of primary schools that provide pupils with access to computers through formal clubs, from 54 per cent to 62 per cent. The most common type of formal access to computers was through after-school clubs. Most secondary schools (90 per cent at the third survey) offered access to computers outside lessons through formal clubs and this figure did not change significantly between the first and third Curriculum Online evaluation surveys.

Larger secondary schools were more likely than smaller ones to offer access to computers through formal clubs. Some 95 per cent of secondary schools with more than 1,200 pupils offered formal clubs compared with 82 per cent of schools with fewer than 800 pupils. Unlike primary schools, there was no relationship between the ratio of pupils to computers in secondary schools and the likelihood of offering formal or informal access to computers outside lessons (Kitchen, Butt and Mackenzie, 2006).

In the 2005 LANS in Schools Survey just under a half of primary school pupils had group or class email addresses and 28 per cent school-allocated addresses. In secondary schools school-allocated

Table 2.10: Website usage to provide remote access to learning

Type of school	% pupil lesson resources	% document access	% intranet access	% homework upload/download
Primary	15.71	33.97	3.85	7.05
PRU/Special	14.81	25.93	7.41	3.70
Secondary	41.47	52.07	16.13	28.57

Source: Survey of LAN Infrastructure and ICT Equipment in Schools (Becta, 2006a)

addresses were higher at 58 per cent, with 12 per cent having group addresses. In the case of curriculum and administration staff, over 70 per cent of schools provided school-allocated addresses.

ICT service provision

As we noted in the *Becta Review 2005*, little is known about the comparative effectiveness and efficiency of different forms of ICT support and maintenance, but we do know that the amount and quality of technical support can vary considerably between schools.

The reliability of resources and the confidence of staff in using ICT are dependent on good in-house support (Ofsted, 2004). Technical support is most effective when included as an integral part of strategic ICT planning. Unfortunately, schools rarely utilise a cost-benefit analysis of their technical support, and many primary schools fail to address the need to plan for technical support in the total cost of technology ownership.

Dedicated in-house technical support was provided in approximately 55 per cent of secondary schools and 10 per cent of primary schools (Becta, 2006a). In primary schools approximately 28 per cent relied on an LEA fully managed service. The same survey revealed that in many instances teachers continued to undertake many day-to-day administration, maintenance and support tasks such as log-in problems, server failure and adding new users. This appeared to be more of an issue for primary schools and special/PRU provision, however even at secondary level some full-time teachers spent around a third of their time addressing technical ICT matters, according to one report (PwC, 2004a).

There is evidence that staff not employed in technical support roles in both primary and secondary schools spend around 30 minutes per week installing IT, fixing problems and carrying out related admin tasks (for example, reloading paper in printers, backing up data or clearing disk space) (Becta, 2006c).

In 2005 over 93 per cent of schools had not implemented a Framework for ICT Technical Support (FITS) system and a significant proportion had no plans to do so in the near future. It was also found that less than 35 per cent of secondary schools and 17 per cent of primary had a documented disaster recovery plan in place. Of those that had one, less than 15 per cent had tested them (Becta, 2006a).



Technical support therefore represents an ongoing problem in schools, with many still facing the challenge of providing a responsive yet cost-effective service. Planned programmes to support schools in developing effective technical support are likely to offer real improvements to the productive time of some teaching staff in schools.

Sustainability

Schools' computer stocks have increased over time, producing a management issue of purchase, disposal and re-use of resources. Computers over three years old contribute significantly to the overall ratios of machines to pupils. In 2004, 47 per cent of primary school computers and 35 per cent of secondary school computers were over three years old (Prior and Hall, 2004) and this figure had remained consistent in secondary and special schools, with a slight growth in primary schools.

In 2005 registers to record all hardware and software were almost universal across schools (Becta, 2006a), with regular audits of equipment being conducted in 80–90 per cent of schools. In 38 per cent of primary schools and 67 per cent of secondary schools, there were spare workstations to replace stolen or broken equipment at short notice. However, 56 per cent of primary and 44 per cent of secondary schools did not have a policy in place for replacement of workstations in the school. Of those who did have a policy, 32 per cent of primary and 44 per cent of secondary intended to replace up to 25 per cent of their computer stock within the next five years. It appears highly unlikely that all stock will be replaced before it exceeds the commonly accepted target three-year life span.

Overall, the total cost of ownership of technology (TCO) remains an issue in schools. Becta research (Becta, 2006c) found that formal and informal support made up an average 55 per cent of the cost of ICT in primary schools and nearly 60 per cent of the cost in secondary schools. Hardware was the next highest ICT cost, followed by training, consumables, network and internet and software which made up much smaller proportions of the TCO. Hidden staffing costs for support (from teachers, heads, admin staff and classroom assistants) were a significant factor in this.

International comparisons

The OECD Programme for International Student Assessment (PISA) provides a range of data sets by which to monitor access to ICT in schools and informal settings across OECD countries. An ICT questionnaire survey was administered to 15-year-old students in 2000 and 2003 across 32 countries, covering their access to and familiarity with ICT. (OECD, 2005)

The PISA 2003 data was compared with general survey data for households. It substantiates the argument that families with young people are more likely to have computers and/or access to the internet. In the UK, 80 per cent of 15-year-olds had an internet connection at home and 55 per cent of homes have internet access. This compares favourably with the USA, while Australia, Denmark, Norway, Netherlands, Sweden, Canada and Korea have higher percentage figures of homes and 15-year-olds with internet access.

In terms of school provision, along with 10 other OECD countries, the UK has a student to computer ratio of five or fewer students per computer, comparing well with international counterparts and the OECD average of 7.7 students per computer. The survey reported 90 per cent of UK schools having computers connected to the internet, which compares with 19 of the participating countries where at least 80 per cent of computers in school were connected to the internet. Of these, 12 countries had figures comparable with or better than, the UK.

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Access to technology

As with schools, FE colleges and institutions have had to face the challenge of maintaining the currency of their technological infrastructure. However, at the same time they have had to meet demand created by the growing number of FTE students.

We noted in our previous review (Becta, 2005a) that there was sustained improvement to student:computer ratios in FE colleges, with most progress between 1999–2003 when the ratio dropped from 8.2:1 to 4.1:1. Since then, the improvement had declined slightly with a ratio of 4.7:1 in 2005, although still within the target of one internet-enabled computer for every 5 FTE students, as can be seen in Figure 2.11. (Becta, 2005b) This slight decline is largely attributable to the demands of meeting increased student numbers resulting from greater levels of recruitment and retention of learners across FE.

There is still considerable disparity, however, in levels of technology resourcing between differing types of college, and the evidence suggests a



widening gap here. In sixth-form colleges, the median ratio (the ratio of colleges at the middle value) of FTE students to computers showed a slight improvement to 3.5:1 in 2005 from 4.1:1 in 2003. However, for general FE colleges the ratio of students per computer declined in 2005 to 4.9:1 from 3.9:1 in 2003. In addition, the 1999 target for staff: internet-enabled computer ratios was set on a one to one permanent member of staff basis. In 2005, this target had been achieved or bettered by 47 per cent of colleges, an increase from 26 per cent in 2003 and 15 per cent in 2001. The median target figure of 1:1 was reached in 2005; in 2000 the comparable figure was 3:1.

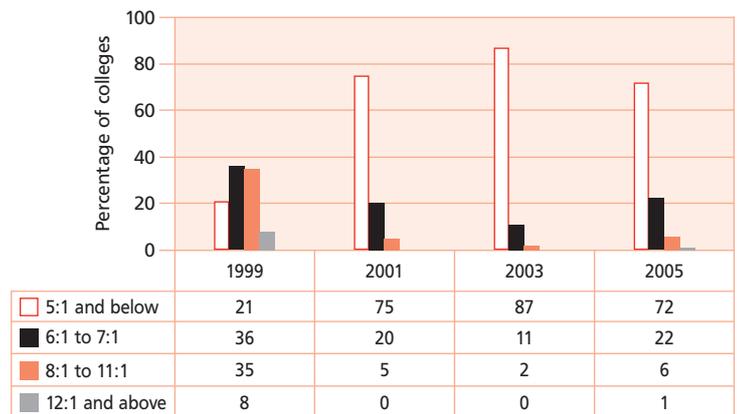
Looking beyond colleges to adult and community learning (ACL) and work-based learning, Luger (2006) reported that the ratio of ACL learners to accessible computers in local authorities was 34:1, a small improvement upon their 2003 figure of 36:1.

Published evidence relating to work-based e-learning is limited. However, recent research indicated that e-learning uptake was greater where there was a computer presence in the workplace and where access was easy (MacKinnon Partnership, 2005). Some 90 per cent of LSC-funded work-based learning providers had computers at their premises for learners' use. However, this did not necessarily mean that these computers were dedicated to work-based learners or that the learners were solely reliant on access to technology in work. There was an average of 21 work-based learners per on-site computer for learner use. It is difficult to tell whether this level of access is sufficient. This can only be established through a study of work-based learners.

Supporting technologies

As noted in the *Becta Review 2005*, display screen technologies continue to spread in teaching areas, with nearly all colleges reporting the availability of data projectors and only a small minority (4 per cent) stating that electronic whiteboards were not available. Data projectors and interactive whiteboards were cited as being available in at least some teaching rooms by 80 per cent of colleges. Whilst this demonstrates the spread of these technologies in teaching, this pattern of availability also gives an indication of how far colleges still have to go in providing access.

Figure 2.11: Ratio of FTE students to all computers



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)

In the adult and community learning sector, 92 per cent of local authorities were using digital projectors and 79 per cent used interactive whiteboards, though levels of provision are unclear. Gains in access to scanners, digital projectors and adaptive technology were reported, and overall a move towards a greater distribution of access to a range of supporting technology seemed evident (Luger, 2006).

In the work-based learning sector, around half of providers (49 per cent) provided laptops for use by learners in the workplace, with FE colleges (28 per cent) and employers (17 per cent) much less likely to provide laptops for work-based learners. One third of providers had electronic whiteboards for use by work-based learners, and 8 per cent had video-conferencing facilities (MacKinnon Partnership, 2005).

Connectivity and bandwidth

During 2004–5 a phased upgrade of college bandwidths by UKERNA, from the free 2Mbps internet connections provided via JANET to 4Mbps or 10Mbps (dependent on a college's aggregated overall traffic flow), began. At the time of the most recent FE survey, only 20 per cent of colleges still had 2Mbps bandwidth; many of these anticipated upgrading in the near future. Overall, the trend since 2003 can be seen as a decline in lower bandwidths, with many colleges now on a 4–6 Mbps connection, complemented by a rapid increase in connectivity at 10Mbps and higher.

However, demand for internet access continued to outpace college capability in around one third of colleges – those who reported in 2005 that they were unable to cope with current demand. Unfortunately this represents a growing trend; a quarter of respondents in 2001 and 2003 reported that they were unable to meet demand (see Figure 2.12). The number of access points remained the most important perceived constraint, with 6 per cent of colleges citing bandwidth as a constraint.



Not only are these colleges likely to be struggling as a result of increased FTE students, they are also likely to be dealing with the issue of raised expectations of young learners.

In ACL, 29 per cent of learning locations had internet access and some 21 per cent of local authorities had all of their learning locations connected to the internet. The majority (85 per cent) had between 1 and 50 locations connected. In terms of connectivity, 23 per cent of all learning locations had broadband access and 54 per cent of local authorities reported that all their learning locations with internet access were connected at broadband speeds (Luger, 2006).

Three quarters of work-based learning providers had computers on-site that had a fast internet connection, such as broadband (MacKinnon Partnership, 2005). A small number of providers (8 per cent) had computers with a slow internet connection, while there was a further 5 per cent with no computers connected to the internet.

Networking

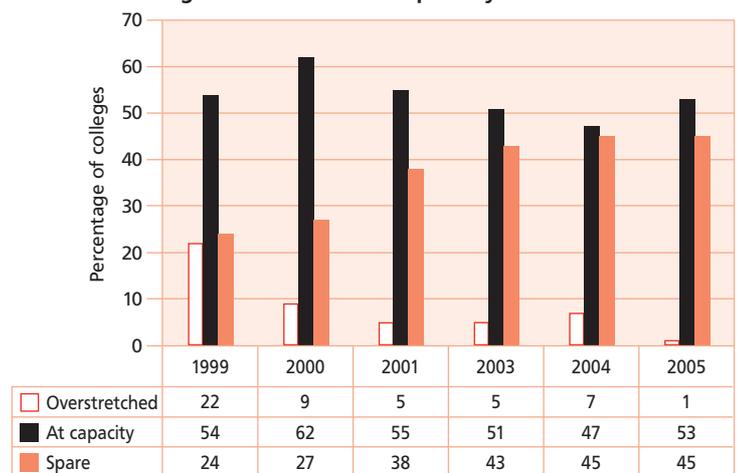
In 2005, 94 per cent of colleges were networked, with all major sites connected to the college network (Becta, 2005b). LAN specification continued the sustained improvements seen in the period 1999–2004, with many colleges upgrading their LANs in the period 2004–5, possibly to take advantage of the increased internet bandwidth available. The dominant LAN backbone of 2005 was the Gigabit Ethernet; the popular 10Mbps Ethernet of 1999 has now disappeared. The improvement of LAN specification is broadly in line with specification and volume of computers that they support (*ibid*).

Some 45 per cent of colleges in 2005 reported spare network capacity, the same as in the previous year, which is much greater than in 1999 when it was 24 per cent. The proportion of colleges reporting that their network was overstretched in 2005 fell to 1 per cent, the lowest recorded since 1999. Networks now appear to support greater numbers of machines with 97 per cent being networked rather than stand-alone in 2005 (Becta, 2005b) (see Figure 2.12).

Access to learning facilitated by technology

In 2005 most FE colleges were moving away from the use of computer labs to establish either multi-purpose

Figure 2.12: Network capability to meet demand



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)

teaching areas equipped with fixed computers, flexible open computer areas or small sets of laptops within each teaching room. A higher proportion of open access computers than classroom access computers remained available beyond daytime hours in colleges, with around one third of open access machines available for use at weekends (Becta, 2005b).

In one study of six colleges (Finlayson et al., 2006) subject areas which had established the use of computers in classes, such as media studies, teaching sessions were either routinely timetabled into rooms with fixed computer facilities or tutors were easily able to book computer rooms or open access areas that were allocated for their department's use. In areas where the use of computers for teaching sessions was less well established, tutors often found it very difficult to book a computer room for teaching. The same study found that in one college, part of the building serving the teaching of maths and science no longer had computer rooms, but there were not yet replacement laptops for use in the classroom.

In 2005, work-based learning providers reported that just over a quarter (27 per cent) had a computer network that work-based learners could access remotely. Providers with fewer than 10 employees were less likely to have a remotely accessible network (14 per cent) (MacKinnon Partnership, 2005).

Sustainability

We have little data on sustainability in FE, other than the information gathered from the annual FE survey (Becta, 2005b). However, though generally FE institutions replace hardware on a more frequent basis than schools, many face continuing problems keeping the infrastructure up to date, and the picture is worsening.



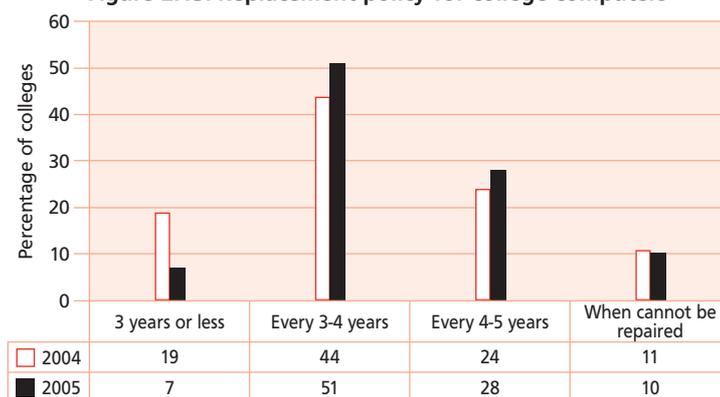
2005 saw a marked decline in colleges saying they would replace computers which were three years old or less – falling from 19 per cent in 2004 to 7 per cent (see Figure 2.13). Colleges in 2005 were much less likely to replace their computers on a three-yearly cycle than in 2004, with 10 per cent reporting that computers would be replaced only when they could not be economically repaired. Around 50 per cent of colleges with a three-year replacement policy still had older Pentium I and II machines in use.

ICT service provision

FE colleges employ technical staff to deliver a wide range of services. In 2005, the median ratio of directly employed technicians to computers in FE was one technician for every 100 computers (Becta, 2005b). Typically, technical support was focused on end-users, with around 90 per cent of service being provided in-house. Internet and network support was delivered in-house in about three quarters of colleges, with the remainder being partially out-sourced.

Technical support was available to nearly 97 per cent of local authority adult and community learning providers, with in-house staff providing most support (Luger, 2006).

Figure 2.13: Replacement policy for college computers



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)



3

PERSONALISED CONTENT AND THE USE OF DIGITAL RESOURCES

Key points

- In the schools sector the overall quantity of resources is good, as demonstrated by Curriculum Online product registration. E-Learning Credits have had a major impact on sales and a positive but limited impact on investment and innovation.
- Digital content continues to be overwhelmingly delivered and used offline, although the large-scale introduction of broadband may alter this trend in favour of online products. Concerns remain about gaps in a few subjects and key stages.
- In colleges the use of e-learning materials appears to have remained fairly static over the last three years, with internet and in-house resources considered by colleges as most important to content provision.
- While the market is providing increasing numbers of high-quality products in the schools sector, quality of provision is mixed. It is unlikely that demand will effectively drive improvements to quality, as purchases by schools continue to be concentrated on a relatively small number of suppliers. This is partly because practitioners are finding it difficult to develop effective strategies for identifying appropriate software.
- The way in which content and digital resources are used is crucial to personalised learning. Increased adoption has seen some improvements in practitioners' understanding of pedagogy and practice associated with the use of ICT in the classroom, in particular the way in which teachers select and organise ICT resources and how this use is integrated with other activities in the classroom and beyond.
- While some teachers are beginning to report that ICT can save time in lesson preparation through the re-use of learning objects, practitioners in both schools and colleges struggle to find the time to select and evaluate digital resources and then embed them effectively into their practice, including the required changes in planning for learning and teaching.
- While learning platforms exist in FE colleges and to a lesser extent in schools and the ACL community, the way in which they are being used to deliver content and courses is unclear. There is evidence that schools are using their local area network and websites as a repository or shared area for their own learning objects and teaching resources, as well as drawing them from external sources. In colleges different patterns of departmental use and related attitudes and values of practitioners play an important part in the nature and extent of use of digital resources.
- Currently only limited systematic research exists on the role of educational games in learning, but what there is has identified their motivational potential, their role in developing new cognitive abilities, 'learning by doing' and the promotion of shared learning and communications.

A number of government-funded programmes have been introduced to support the purchase and use of digital resources. In the schools sector teachers have access to a range of multimedia resources through Curriculum Online. In the autumn of 2005, an extra £125 million of e-Learning Credits was announced for schools to spend on digital learning resources. Over the next two years a total of £200m will be invested in digital learning resources.

BBC's new online curriculum programme 'BBC Jam' aims to deliver new learning experiences combining video, games, audio and animation for an intended audience of 5–16-year-olds. It will attempt to inspire children who are not achieving their potential by bringing online learning into the home as well as the classroom.

In the post-16 sector, the NLN materials programme provides centrally commissioned learning content in key areas. Ufi/learndirect provides a range of resources designed to support flexible learning opportunities for adults through a network of around 2000 Ufi/learndirect centres and 6000 UK Online centres.



In order to deliver personalisation, *Harnessing Technology* states:

We will stimulate innovation by encouraging the development of highly interactive software, drawing on the expertise of the games industries, among others. We want to shift the focus from presenting content to engaging learners in productive learning activities.

Harnessing Technology, page 28, paragraph 91 (DfES, 2005b)

Harnessing Technology promotes a focus on design flexibility for learning and teaching practitioners, including designs which allow the building of individual and collaborative learning activities around digital resources.

The aim is to do this by working through a partnership of the content industry, the public sector content providers, practitioners and learners. The intention is to provide more effective creation, adoption, adaptation and re-use of quality digital learning resources and thus provide resources which can be personalised to the needs of the learner.

DEVELOPMENTS IN SCHOOLS

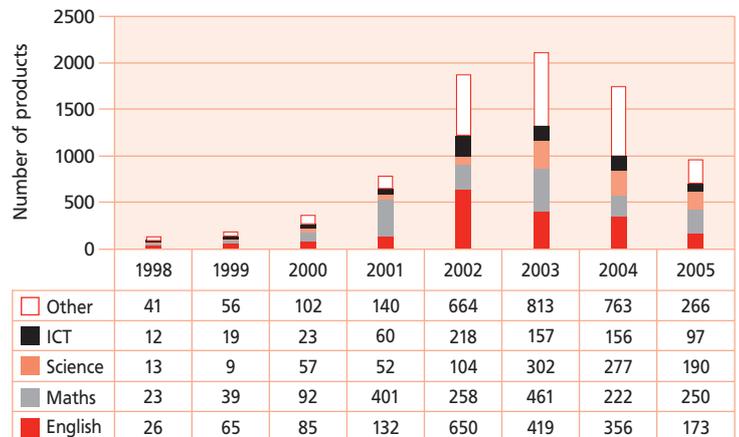
Supply and availability of digital resources

Number of titles and curriculum areas

Figure 3.1 shows the rate of increase in new products since 1998, as recorded on the Curriculum Online website. The rate of increase has slowed since 2003, but within the overall supply there have been large increases in the numbers of maths, English, science and ICT products registered. There have also been increases in products covering non-core subjects.

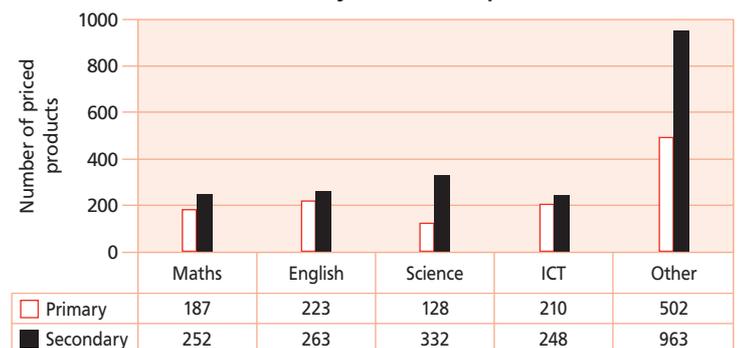
A study of the industry impact of Curriculum Online (McFarlane and Roche, 2005), found that 80 per cent of companies interviewed had produced new products since 2003, and 50 per cent believed that Curriculum Online, in the form of eLCs, had influenced this development. There was a slight increase in the development of online products since 2003, but digital content still appears to be overwhelmingly delivered and used offline.

Figure 3.1: Number of priced and free products by year of publication



Source: Content Advisory Board report to the Secretary of State (Becta/CAB, 2006)

Figure 3.2: Increases in the number of priced products by subject area and school type (between February 2004 and September 2005)



Source: Content Advisory Board report to the Secretary of State (Becta, 2006)

Overall the rate of increase between 2004 and 2005 has been larger for the secondary than the primary sector, particularly in science and non-core subjects (see Figure 3.2).

Companies considered that teachers still feel safer with offline materials, although the large-scale introduction of broadband into schools may influence this and increase the market for online products in future. Table 3.1 provides a breakdown of the resources registered on the COL website and shows the changes between 2004 and 2005. All categories with the exception of 'No category' and 'Assessment' showed an increase, arising from the development of new products and the re-tagging by developers of existing materials.



Content Advisory Board (CAB) surveys found that most schools/teachers considered there was a wide range of high-quality software in the marketplace (Becta/CAB, 2005). Commercial companies surveyed as part of the Curriculum Online Evaluation follow-up survey (McFarlane and Roche, 2005), stated that the content market was such that some schools were 'awash with software'. As a result, industry representatives suggested the market was more competitive, with products being selected by price rather than content.

Resource availability and discovery

The most recent Curriculum Online survey (Kitchen, Butt and Mackenzie, 2006) found that in both primary and secondary schools, the ease of finding relevant software was related to the subject taught. In both sectors mathematics teachers were most likely to rate finding software as 'easy'. An analysis of the supply of digital resources available on the Curriculum Online website across four subjects concluded that there were significant differences in the levels of provision across subjects at specific key stages. However, the work identified the limitations in such analysis, as it did not take account of product depth, quality of ICT amenability or commercial sector publishing plans.

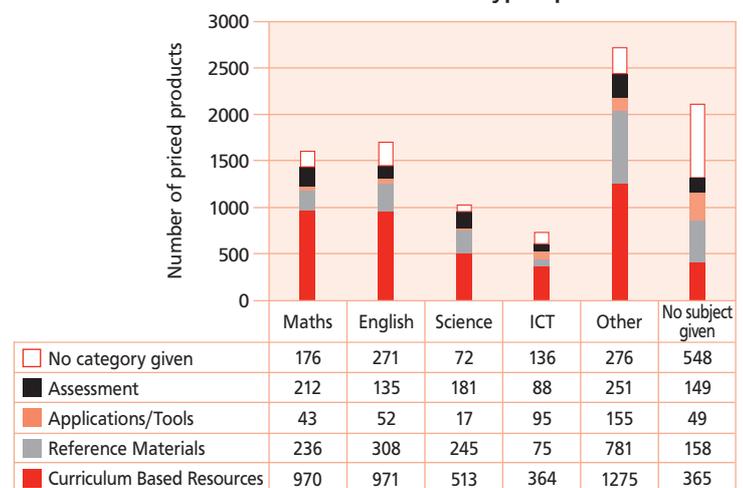
Over recent years teachers' reported ease in locating teaching materials on the internet has risen. Agreement with the statement 'It is easier to find relevant material for teaching in textbooks than on the internet' among primary subject respondents fell from 55 per cent at the first survey to 31 per cent at the third survey, for example (see Figure 3.4).

Respondents who had accessed the COL website reported on average a higher proportion of lessons planned using digital resources than those who had not accessed the website or had not heard of Curriculum Online. Exposure to Curriculum Online was also linked to more positive attitudes towards using ICT in lesson planning (Kitchen, Mackenzie and Butt, 2006).

Purchasing digital resources

Curriculum Online data in the 2004 CAB report found that purchases by schools tend to be concentrated on a relatively small number of suppliers and products which dominate the schools digital learning resources market. The most recent CAB report confirmed this

Figure 3.3: Numbers of priced products by major subject area and learning resource type April 2005



Source: COL database of registered products (Cambridge Economic Policy Associates)

Table 3.1: A comparison of the numbers of priced products by major subject area and learning resource type

2005 figures	Maths	English	Science	ICT	Other	No subject	Types totals
No Category	176	271	72	136	276	548	1479
Assessment	212	135	181	88	251	149	1016
Application	43	52	17	95	155	49	411
Reference	236	308	245	75	781	158	1803
Curriculum	970	971	513	364	1275	365	4458
Subject Totals	1637	1737	1028	758	2738	1269	9167

2004 figures	Maths	English	Science	ICT	Other	No subject	Types totals
No Category	676	592	350	233	691	309	2851
Assessment	381	253	202	57	393	87	1373
Application	13	6	0	28	16	6	69
Reference	226	330	148	61	465	115	1345
Curriculum	262	408	124	192	408	173	1567
Subject Totals	1558	1589	824	571	1973	690	7205

Source: Becta/CAB 2004 and COL database of registered products (Cambridge Economic Policy Associates)



situation, with no major reduction in the proportion of sales accounted for by the larger suppliers or the most popular products (Becta/CAB, 2006). The proportion of sales accounted for by the top five selling suppliers accounted for around 50 per cent of sales, the top 10 for around 60 per cent of sales over the eLC period as a whole. The dominance of a relatively small number of companies and products suggests that despite a relatively diverse supply, schools' choices and requirements appear to be narrow.

Purchasing criteria offered by practitioners fell into 'general' and 'specific' categories, although compatibility with hardware was a key concern for all purchases (Dixon et al., 2004). The more general criteria were linked to school or government policy. The specific criteria for selecting software appeared to be consistent over the last few years of the survey and included:

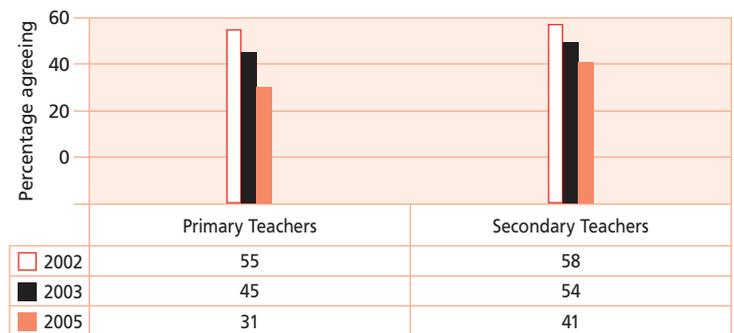
- fit with curriculum and schemes of work
- value for money
- being easy to use
- being suitable for all abilities
- being engaging for pupils, having a clear educational purpose, adding value to other teaching, and there being nothing similar available for free on the internet.

The process of spending of eLCs varies between primary and secondary schools (Dixon, Farrell and Barnard, 2005; Becta/CAB, 2005). In primary schools, software purchasing decisions tended to be made by the head or ICT co-ordinator, with software budgets generally spent on one key piece of cross-curricular software. This was because these were seen as providing a range of resources across the school with explicit links to QCA schemes of work, safe and secure web-style search facilities, compatibility between systems, interactive and engaging resources and access, on occasion to other schools' work and lesson plans.

In secondary schools, purchasing decisions tended to be made by departments independently. There were four key types of digital resources purchased:

- Well known commercial applications
- Internet resources and email
- Subject-specific software
- Home-made/adaptable software.

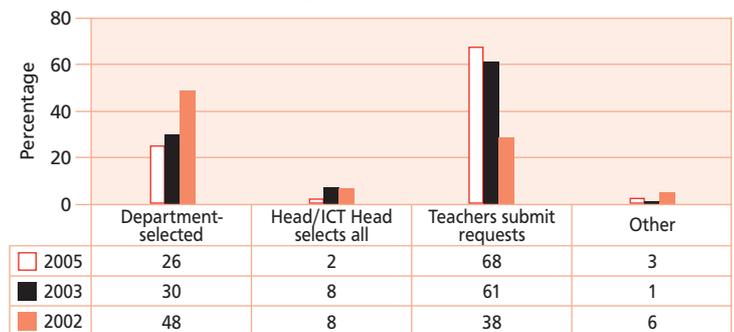
Figure 3.4: Agreement with the statement 'It is easier to find relevant teaching material in textbooks than on the internet.'



Base: all subject respondents answering (Primary: 641, Secondary: 948)

Source: *Evaluation of Curriculum Online: Report of the Emerging findings of the Third Survey of Schools* (Kitchen, Mackenzie and Butt, 2006)

Figure 3.5: Procedures for purchasing software in secondary schools



Source: *Evaluation of Curriculum Online: Emerging findings from the Third Survey of Schools* (Kitchen, Mackenzie and Butt, 2006) (All secondary schools N=195)

The majority of secondary schools in the CAB survey considered that eLCs had made them view software expenditure from a central strategic viewpoint rather than dispersing responsibility to subject teachers. In secondary schools this had resulted in a move away from departments selecting software independently towards submitting requests centrally, often through the ICT co-ordinator. This shift was not seen in primary schools, as the majority (62 per cent) said at the first survey that teachers submitted requests for software and this increased only slightly to 71 per cent by the third survey, and nine per cent that departments selected software independently.

Though resource discovery is reported as a challenge for practitioners, it is getting easier. The proportions of school and subject respondents stating that it was 'very easy' to find relevant software for curriculum use were



substantially higher in 2005 than in the first Curriculum Online evaluation survey (see Table 3.2). This was also the case for respondents stating that it was 'very easy' or 'quite easy'. Furthermore, there was a substantial improvement between second and third surveys. Table 3.2 shows that the majority of these increases were statistically significant.

Quality

While gaps in the range and nature of digital resources across subject and sector are important, in terms of learning and teaching, the quality of products and their use are a major focus. Defining what a quality product is from a pedagogic perspective is difficult. The Content Advisory Board's view (Becta/CAB, 2005) was that, while the market had provided an increasing number of high-quality products, the quality of provision was mixed and many products had yet to meet the full potential of digital learning resources in supporting effective learning.

Quality frameworks

As yet, there is no universal agreed framework for content or digital resource quality, although Becta has developed a set of quality principles for digital learning resources. A copy of the pedagogical principles taken from this document may be found in the Annex.

As the quality principles have only been launched recently, they have not yet been applied in an assessment of products across the curriculum. The best indications of quality, both technical and pedagogical, come from the BETT Awards. This scheme seeks to reward excellence in product design. Overall entry figures increased from 147 for 2005 to 364 for 2006. This increase did not, however, lead to an increase in the number of products defined as 'exemplar' – that is, demonstrating a particular level of quality. Some 45 per cent of the products in 2005 were defined in this way by judges, a figure which fell to 15 per cent in 2006. Though they should be taken as purely indicative, the outcomes from the BETT Awards do not suggest a sharp upturn in the number of high-quality products on the market.

Table 3.2: Ease of finding relevant software

2005 figures	Primary school	Teacher KS1	Teacher KS2	Secondary school	Teacher KS3	Teacher KS4
% very easy	12	18	20	15	26	24
% change from baseline	+8*	+8*	+9*	+11*	+5*	+5*
% change from second survey	+5	+6*	+9*	+8*	+8*	+6*
% very/quite easy	84	76	83	72	85	81
% change from baseline	+19*	+9*	+13*	+10*	+9*	+10*
% change from second survey	+12*	+6*	+9*	+1	+8*	+9*
Base: All answering	235	513	564	194	938	914

* statistically significant change

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

Table 3.3: School respondent ratings of software fitness for purpose

2005 figures	2002 (%)	Primary 2003 (%)	2005 (%)	Secondary 2002 (%)	2003 (%)	2005 (%)
Good	86	91	95	79	89	86
Very good	8	14	16	9	13	15
Quite good	78	77	79	70	77	72
Not very good	14	9	5	20	11	14
Not at all good	*	–	*	–	–	–
Base: All answering	234	234	233	192	191	193

* less than 0.5% gave this answer – no-one gave this answer

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

Teachers' perceptions

Teachers' perceptions of software offer a further indication of levels of quality. The *Becta Review 2005* found that:

- teachers' perceptions were generally positive about the relevance of content (Kitchen and Finch, 2003)
- practitioners found difficulty evaluating the bewildering array of available software (Comber et al., 2002).

More recent evidence from the *Guardian* 'Headspace' survey of headteachers found that the majority of heads whose schools subscribed to online/browser-based resources considered these to be of good quality (67 per cent of primary and 55 per cent of secondary respondents reported this).



According to the 2005 Curriculum Online survey, the view that software is not very good and fit for purpose has declined over the last three years. Within this trend there are patterns that relate to key stage, as can be seen from Table 3.4.

Science respondents were less likely to rate relevant content and technical quality as 'very/quite good' at Key Stage 1. Maths respondents at Key Stage 2 were more likely than English and science respondents to rate software as 'very good' or 'quite good' for relevant content, with more than nine in ten (94 per cent) giving this response. At Key Stage 3, 74 per cent of music teachers were least likely to rate relevant content as 'good.' At Key Stage 4 the pattern was 68 per cent of English teachers. It is interesting to note that while these are the subjective judgements of practitioners, they are almost all statistically significant in favour of improved relevance and technical quality.

Supporting personalised learning

Factors affecting use to support personalised learning

Availability of high-quality digital learning resources is just one challenge in ensuring high-quality, engaging learning experiences. Teachers interviewed as part of the Curriculum Online qualitative study considered that the standard of hardware and the time required to evaluate materials thoroughly and embed them into practice were constraining their use of educational content and affecting related spending of their e-Learning Credits (Dixon et al., 2004). However, by contrast, the COL follow-up survey found that there was no evidence that teachers in schools with a more developed ICT infrastructure were any more knowledgeable or engaged than teachers in less developed schools. Factors influencing teacher knowledge and engagement with digital material included:

- their personal level of comfort with ICT
- sharing of best practice
- perception of benefits of ICT
- levels of technical support
- ease of access.

The Curriculum Online surveys offer trend data about the use of ICT resources in lessons.

There has been a substantial increase in the proportion of teachers in both primary and secondary schools using digital resources and tools of all kinds.

Table 3.4: Changes in teachers' ratings of relevant content and technical quality by key stage

	Teacher KS1 (%)	Teacher KS2 (%)	Teacher KS3 (%)	Teacher KS4 (%)
Relevant content: Very good	17	17	20	19
<i>Change since baseline</i>	+9*	+10*	+6*	+3*
<i>Change since second survey</i>	+5*	+8*	+5*	+4*
Relevant content: Very good/good	86	87	86	82
<i>Change since baseline</i>	+12*	+12*	+9*	+8*
<i>Change since second survey</i>	+9*	+5*	+5*	+7*
Technical quality: Very good	16	19	18	18
<i>Change since baseline</i>	+7*	+12*	+6*	+5*
<i>Change since second survey</i>	+6*	+12*	+6*	+6*
Technical quality: Very good/good	90	91	88	88
<i>Change since baseline</i>	+11*	+11*	+6*	+9*
<i>Change since second survey</i>	+7*	+6*	+73*	+6*
Base: All answering (relevant content/technical quality)	509/500	564/554	933/920	905/897

* statistically significant change

Source: Curriculum Online Evaluation: Report of the third survey of schools (Kitchen, Butt, Mackenzie and Finch, 2006)

Table 3.5: Frequency of using ICT resources in lessons by Primary teacher (% half or more lessons)

Resources	2002	2003	2005
Computer packages	20	25	36
Internet-based resources	10	14	38
Interactive whiteboards	6	13	69
Subject-specific software	20	20	38
Base: All teachers	1038	733	650

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

For example, the use of subject-specific software applications increased from 20 per cent to 38 per cent between 2002 and 2005 (see Table 3.5).

In secondary schools, the use of subject-specific software also rose. The use of 'computer packages' – generic packages such as spreadsheets and word processors – in lessons rose from 8 to 19 per cent use in half or more lessons, although this type of use remained less common than in primary schools. Internet-based resources were used in at least half of lessons by 21 per cent of secondary respondents in secondary schools (Table 3.6).

Evaluators of the ICT Test Bed project found that the need to develop expertise and resource in the use of digital learning resources encouraged teachers to share tasks in order to make the work manageable. This has been particularly evident in Key Stage 1. In secondary schools the impact of full sets of



commercially-produced resources enabled more holistic planning and a better awareness of the structure and capabilities of the resource (Somekh, Underwood et al., 2006). This suggests that changes in planning for learning and teaching are required to gain full value from the digital learning resources purchased by schools.

Learning platforms and interoperable resources

There is little direct evidence on learning platforms and the extent of interoperability of learning resources. However, there is some evidence on the challenges in getting learning platforms to support access to resources.

VLEs have been introduced in two of the three ICT Test Bed clusters. The evaluation of the project has found that considerable time and effort were required to populate the VLEs effectively with resources. Some schools, primary in particular, developed alternative ways of storing and retrieving resources as a result. In secondary schools the need for senior management commitment and high-quality training was essential if the use of digital resources hosted on the VLE was to become embedded (Somekh, Underwood et al., 2006).

Becta's LANs in School Survey (Becta, 2006a) found that 81 per cent of all the schools surveyed provided a repository or shared area for learning objects and teaching resources on the local area network. A further 8 per cent made them publicly available on the school website. Only 11 per cent had no repository. In the same survey schools were asked what they used their websites for, and findings were that 18 per cent used them for teacher resources and 25 per cent for pupil resources. More common uses for the website were school news (74 per cent), parent communication (58 per cent), assessment and Ofsted data (40 per cent) and document access (41 per cent).

As schools expand their collections of digital learning resources, the need for improved learning platforms to support and deliver interoperable content will become increasingly critical to successful content deployment and use. Such developments are at an early stage in the school sector. Thomas and Horne (2004) reported benefits from this approach to support the delivery of key skills to a specific network of schools in the south-east of England. This pilot project identified a number of models of how teachers used a Learning Objects Repository. This is an important area for future development and research.

Table 3.6: Frequency of using ICT resources in lessons by Secondary teacher (% half or more lessons)

Resources	2002	2003	2005
Computer packages	8	14	19
Internet-based resources	5	10	21
Interactive whiteboards	5	11	42
Subject-specific software	10	14	30
Base: All teachers	1741	1212	954

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

Games software and personalised learning

Recent studies into the use of technology in the home provide evidence of the extent to which young people play online games. Livingstone and Bober (2005) found that 70 per cent of the 9–19-year-olds surveyed played online games and of these, 45 per cent did so either every day or once a week. Pratchett (2005) found that nearly all 6–15-year-olds and over 80 per cent of 16–24-year-olds play computer-based games.

The last five years have seen a series of studies investigating how games might be used or adapted for use in schools (for example, Becta Computer Games in Education Project, 2001 and Sandford and Williamson, 2005). In terms of specific impact on learning, Facer (2005) points out the motivational potential for educational games through role-based, goal-directed challenging play which is fun.

For educational purposes, these outcomes would need to be turned, through reflection, into transferable knowledge and skill. Games may have potential to support the development of new cognitive abilities, faster processing of information and the enhanced selection of relevant material/key elements of concepts from a range of sources. Kirriemuir and McFarlane (2004), found that games promote communication, working with others and problem solving and have potential to support maths learning and thinking skills. They note that:

Significantly the experience of game play seems to be affecting learners' expectations of learning activities. Preferred tasks are fast, active and exploratory, with information supplied in multiple forms in parallel. Traditional school-based learning may not meet these demands. (Kirriemuir and McFarlane, 2004)

Though there is much potential for games to contribute to learning, they can be expensive to develop. Thus research is required to understand the value they bring to learning and better understand the potential educational market for such technologies. At the moment there is little systematic evaluation of the learning outcomes arising from embedded use of games to support learning, and we lack a comprehensive understanding of the contexts and learning and teaching practices to support this new approach to learning.



Pedagogy and practice with digital learning resources

Teachers' attitudes towards using ICT resources for lesson planning and delivery have over the last three years become more positive (Kitchen, Butt and Mackenzie, 2006). The proportion of primary teachers' lesson preparation using digital sources increased across the three COL surveys from 15 to 32 per cent, although paper sources were still used more often. There were no subject differences in the proportion of lesson planning using digital sources. Unsurprisingly, primary teachers who used interactive whiteboards in at least half of lessons for their subject, made proportionately greater use of digital resources in lesson planning than those who said they used them in less than half of lessons (36 per cent compared with 22 per cent). Similar patterns were seen for frequency of use of other ICT resources. Thus interactive whiteboards and other computer-based display technologies appear to be providing a context where use of a range of digital resources in lesson preparation is encouraged.

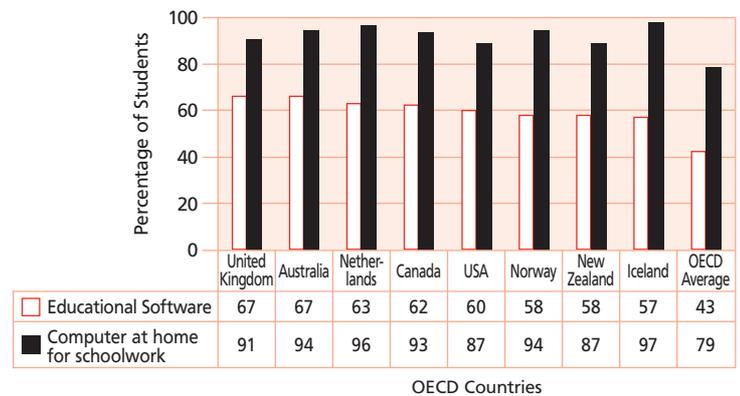
Facer and Owen (2005) report that the internet allows teachers to share resources and models of good practice, create databanks and offer lists of resources. However, relatively little development has been reported in the literature in terms of teachers sharing ideas as a result, although teachers are starting to share interactive resources on in-school and intra-school networks, with LEAs establishing central portals to support them (Ofsted, 2005b).

The effectiveness of digital learning resources in supporting improved learning depends to some extent on the decisions of practitioners. Teachers interviewed as part of the Curriculum Online evaluation qualitative survey pointed to the need for a reflective approach when using digital materials in teaching. In school settings it was viewed as important to combine the use of digital learning materials with traditional teaching methods when developing reading, writing and other skills and to balance independent learning with the appropriate support, facilitation and engagement from teachers (Dixon, Farrell and Barnard, 2005).

International comparisons

Findings from a survey of student access to ICT and educational resources in the home (OECD, 2005) indicated that not many students in OECD countries reported having access to educational software at home. However, Australia, Canada, the Netherlands,

Figure 3.6: Student access to a computer and educational software at home



Source: *Are Students Ready For a Technology-Rich World?* (OECD, 2005)

the UK and the USA all reported figures of 60 per cent or higher, which was well above the OECD average of 43 per cent. These were also countries where figures for computer availability in the home were very high, many over 90 per cent (see Figure 3.6).

Student use of the internet in the UK for entertainment was highest for communication activity such as email or chat rooms (69 per cent) and using the internet to look up information about people, things or ideas (65 per cent). Games were the third most popular (58 per cent), along with downloading music (58 per cent) and downloading software including games (49 per cent). All were above the OECD averages. As would be predicted, use of games was more common among boys, but was still not the main use.

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Supply and availability of digital learning resources

Number of titles and curriculum areas

Materials are available for post-16 institutions via the NLN materials programme which has provided learning content in a range of priority curriculum areas. Initial choices for provision have been based on subjects prioritised by *Success for All*. Ufi/learndirect materials are extensive, covering many thousands of hours. The supply emphasises skills for life – literacy, numeracy and ICT – and vocational or professional skills where there is employer demand. Ufi also provides a tool (Accelerator), designed to enable users to assemble their own content. The MacKinnon Partnership (2005) identified Ufi/learndirect as the largest commercial provider of



content alongside resources produced by industry or trade bodies.

In the case of work-based learning there is noticeable commercial provision. Large companies such as BP, Rolls-Royce and government departments and agencies such as the Ministry of Defence, commission customised resources. Other companies are more likely to purchase off-the-shelf resources (MacKinnon Partnership, 2005).

The Becta ICT and e-learning survey estimated that in total, FE institutions spent £7.5m (excluding staff time) in 2004 on digital materials, demonstrating that the commercial sector is supplying in some areas, as NLN materials do not account for this spend. Earmarked funding for software and learning materials in FE colleges for 2004–2005 was £54.9 million, a significant rise from £43.1 for the previous year. Of the £27 million of NLN funding allocated to colleges to be spent in the two years to July 2005, more than half was targeted on the development of locally produced materials, development tools for producing materials, and the procurement of and subscription to externally produced materials (Becta, 2005b).

In-house resource development

Surveys have found that there is a significant amount of in-house supply of practitioner-led development of electronic learning materials for use with students in FE institutions (see Figure 3.4) and by tutors involved in ACL and work-related learning (Luger, 2006; MacKinnon Partnership, 2005).

As is the case with schools, the ICT Test Bed Evaluation observed in the three Test Bed FE colleges that there did not appear to be an effective way for tutors to search across resource banks to find materials to suit the individual purposes of the lecturers:

The range and amount of available material makes reviewing a very difficult task and a common solution is to rely on a restricted range of sources and often to develop one's own materials. (Somekh, Underwood et al., 2006)

In adult and community learning the NIACE survey noted that the reported use of tutor-designed materials had increased from 50 per cent in 2003 to 80 per cent in 2005, suggesting that these are currently the dominant modes of delivering e-learning within community learning provision. It is likely that

this high percentage of tutor-designed materials does not represent the wide-scale authoring of electronic/online content by tutors, rather it is more likely to relate to the use of technology in the design of worksheets and other supporting materials, or the use of tutor-adapted professionally designed learning objects.

In addition, over half of work-related learning providers develop their own resources and 19 per cent produce resources in partnership with another organisation (MacKinnon Partnership, 2005). In this context, colleges and learning providers considered that intellectual property and copyright issues needed to be addressed.

Quality

There is currently no routine mechanism for monitoring the quality of content provision in the post-16 sector and comparatively little understanding of what constitutes high quality. There is some evidence, however, relating to quality arising from studies of use of NLN materials in six colleges (Becta/NLN, 2004). The research offers an assessment of users' views on quality. Learners value materials with multimedia elements, manageable chunks of information, and self-assessment and feedback. Tutors value support for differentiation in learning, diversity in learning design and the 'learning object' approach. They recognised that NLN materials set the standard for quality and represent exemplars to the content industry.

A proportion of the BETT Awards include post-16 software entries. In 2005 and 2006 there were 29 and 26 entries respectively. There was an increase in the number of products defined as 'exemplar' – that is, demonstrating a high quality in the view of the judges – from 10 per cent to 23 per cent.

Supporting personalised learning

Factors affecting use to support personalised learning

Becta's 2005 survey of ICT and e-learning found that e-learning materials continue to be most often used at the discretion of the individual teacher rather than college or departmental planning – in 58 per cent of the colleges, a rise of 2 per cent from the previous year. The use of such materials was directed by a college-wide plan in 17 per cent of institutions and by a plan at department or course level in 23 per cent. These figures remained broadly unchanged from 2004.

Overall in FE, the reported use of e-learning materials by colleges has remained fairly static since 2003. The internet was the most frequently reported source of learning materials, being used in 95 per cent of colleges (94 per cent in 2003) and in common use in 45 per cent (43 per cent in 2003). The NLN materials programme is now over five years old. Of the 87 per cent of colleges who reported using NLN materials, 13 per cent described their use as common practice, an increase from 4 per cent in 2003. However, overall the reported use of e-learning materials by colleges has not risen greatly since 2003 (Becta, 2005b).



Colleges were asked to rank sources of learning materials in order of importance. The ranking corresponded to the level of use, with internet resources ranked as most important and NLN materials ranked fourth (see Figure 3.7).

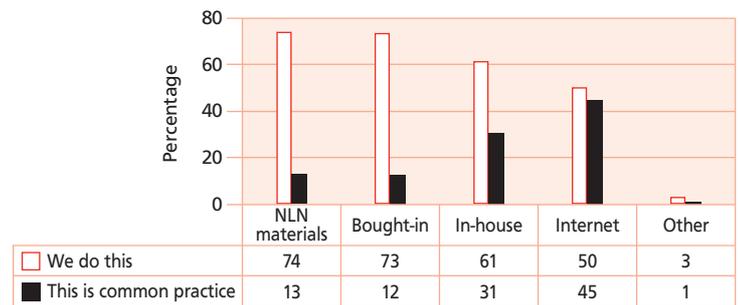
One possible indicator of the extent to which practitioners gain better value from their resources may be seen from material re-use. Unmodified re-use of materials where they are taken 'back off the shelf' for use with learners is widespread, with 82 per cent of colleges in the Becta survey stating that this took place. It was more likely that resources would be updated (88 per cent) before re-use, or repurposed for different learning contexts (70 per cent) The impetus for re-use appears to be from the bottom up rather than being developed strategically, as 93 per cent of respondents claimed their college had no policy on the re-use of e-learning materials (Becta, 2005b).

In 2005 NIACE surveyed local authorities, FE colleges and voluntary and community organisations to identify within which 'Areas of Learning', as defined by the Adult Learning Inspectorate, organisations from ACL were making use of e-learning. ICT was the curriculum area within which most organisations were already delivering e-learning content (54 per cent) followed by languages, literature and culture (34 per cent), art, media and publishing (30 per cent) and education and training (25 per cent).

Although direct comparisons between the 2004 and 2005 survey data are difficult because of the change in categories used in the questionnaire, the pattern is broadly similar to the previous survey (Luger, 2006; Rawicka et al., 2004).

Robust evidence of impact of the use of digital content in FE is limited and is mainly based on perceptions or case study research. The Becta/NLN study which examined the embedding of NLN materials in the curriculum, for example, offers accounts from learners of their experience of learning more effectively while supported by NLN materials. The LSDA/NLN evaluation study found that a significant percentage of both learners and tutors believed that the use of online resources improved learning and attainment (Becta/NLN, 2004; LSDA/NLN, 2004).

Figure 3.7: Electronic learning materials used with students



Source: *ICT and E-learning in Further Education (Becta, 2005b)*

Learndirect programmes are delivered in just over half of colleges (53 per cent) compared to nearly three quarters in 2003 (Becta, 2005b). This has contributed to a reduction in the number of colleges delivering remote-learning programmes from 79 per cent in 2003 to 68 per cent in 2005, with the delivery of remote learning not via learndirect remaining relatively static at just over 50 per cent, over the same period. It is difficult to account for this shift, but it may be that demand for skills for life provision, including ICT skills, has fallen back, owing in part to success to date in addressing previous demand.

Learning platforms and interoperable resources

In terms of the uses that colleges make of their learning platforms, Figure 3.8 shows that all platforms were used heavily as repositories for course documents and more than 70 per cent of colleges with a virtual learning environment (VLE) used it across a wide range of learning activity.

VLEs are being used with increasing effectiveness in the ICT Test Bed curriculum areas in the three FE colleges. This success in colleges compared to schools possibly results from expectations across the FE sector as a whole, that students should be able to access online materials off-site. The ICT Test Bed evaluation found that VLEs were being used with increasing effectiveness. As a result, students used materials outside the classroom when they chose to do so.

All three ICT Test Bed colleges reported increasing use of a VLE for making learning materials available to students. However, student use of the VLE was patchy; some students used it effectively but others made little use of it. The researchers noted that staff members were generally very positive about their use of the VLE and stated that as the use of the systems matures, the proportion of interactive materials and materials for formative assessment was likely to continue to increase. Interestingly, staff uploaded their materials to the VLE after the lesson, because they fear that attendance would be adversely affected if students were able to get the materials before attending the class (Somekh, Underwood et al., 2006),



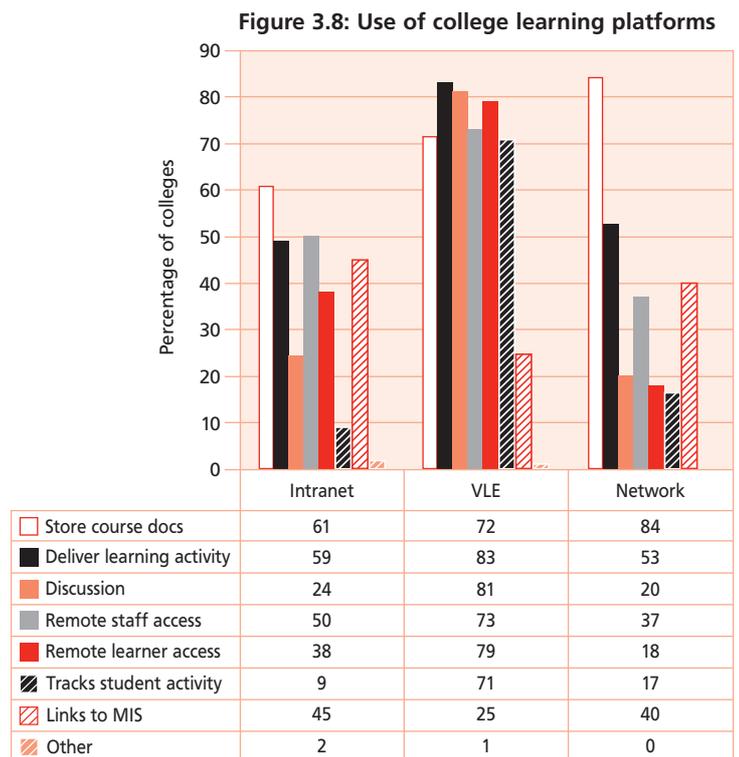
In the ACL community, there is evidence that an increasing number of organisations have started to use learning platforms, up from 4.5 per cent in 2003 to around a quarter in 2005, and of these, some are using them to host online learning materials. The survey notes that this increased use occurred primarily amongst local authority respondents rather than the community as a whole. While specific commercial and open-source products are mentioned, no indication is given of the way in which they are being used in terms of content and resource development and use (Luger, 2006).

Pedagogy and practice with digital learning resources

While there is evidence about the broad types of e-learning materials used with learners as reported earlier, there is only limited evidence about how digital resources are being used in learning and teaching in the FE sector. The NFER study of FE and sixth-form colleges, (Golden et al., 2006), found that while lecturers reported they had sufficient access to e-learning resources they were less satisfied with access to e-learning resources to use in the classroom. This was a particular issue for health and social care lecturers and was identified by the researchers as a factor in explaining why e-learning was used less frequently to assist in giving one-to-one attention to learners in the classroom. However, a similar study commissioned at the same time by the DfES (Finlayson et al., 2006), suggests that need not always limit the effective use of e-learning. They noted that:

Even when there is limited equipment available, specific e-learning uses aligned with specific pedagogic purposes can lead to positive outcomes, such as increases in concentration, student confidence and cognition (Finlayson et al., 2005, executive summary).

Lecturers are also concerned that there is not enough time to incorporate e-learning into teaching and learning practice. This factor was significantly more apparent amongst science lecturers compared to business and health and social care staff (Golden et al., 2006). The same general issue was identified in case studies of six general FE colleges by Finlayson et al., (2006). They found that while there were a variety of mechanisms for sharing good ILT practice within colleges, they had limited impact outside individual subject teams. Even within teaching teams,



Source: *ICT and E-learning in Further Education (Becta, 2005b)*

lack of staff time, often particularly acute for part-time staff, inhibited the sharing of good practice.

The survey data from the NFER study found that the majority of lecturers used e-learning extensively in their teaching preparation. Activities associated with preparing for teaching and learning that staff did all the time, or frequently, included using ICT to:

- research and access teaching materials (79 per cent)
- create teaching materials (76 per cent)
- prepare lessons plans and schemes of work (68 per cent)
- share course materials (56 per cent).

The latter point was also noted by Finlayson et al., (2006). They found that most tutors shared and re-used resources, particularly within teams, and considered this an important reason for using ILT. Evidence suggests that there may be departmental differences. In the three subject departments covered in the NFER study, health and social care lecturers were less likely to share course materials compared to other colleagues and were not using e-learning as much to present information to the class and making course materials available to learners, as lecturers in science or business.



4

LEARNER SUPPORT AND INFORMATION

Key points

- There is a low level of familiarity among headteachers with the concept of a personalised online learning space. However, those who are aware view them favourably.
- Although there has been a significant increase in the uptake of learning platforms in schools and colleges, their adoption in schools remains relatively low, especially in the primary school sector.
- There is an increase in the popularity of open source learning platform products in schools which may be related to the perceived cost barriers involved in investing in learning platform technology.
- In schools and colleges there remains a challenge to link learner information management to curriculum delivery.
- Teaching staff in schools are less likely to routinely use ICT for administration and management than schools leaders and there are still low levels of access to school management information systems from standard workstations in the school.
- Although there is an upward trend in teachers setting homework that involves use of computers and the internet, overall this is not common practice.
- Primary and secondary heads were unanimous in their view that if standardised ICT-based assessment were introduced, it would be most appropriate at age 16 rather than 14 or 11.
- While most FE colleges are familiar with records of achievement provided by schools, there is little evidence that this information is transferred across institutions to provide continuity of guidance or that this information is used to personalise learning.

The Government's vision for education is one where every child and learner is offered personal support and advice as they progress through education sectors and on to employment and lifelong learning. Parents and learners will need access to information and data that will help them understand and support their needs. Collaboration between children's services in education, health, social care and youth justice is required to support the ambitions of *Every Child Matters* (HMSO, 2003).

To enable this, common approaches are developing to the storage and transfer of personal records across education and children's services. Technology has a role to play by providing integrated online information and support. This entails an information architecture, including information flows and standards, to support system-wide technology-enabled services that work effectively and efficiently with each other. Technology also has potential to support better learner tracking, to improve the management and use of learner data and to provide tools to support learning, including e-portfolios and online learning spaces.

This is an emerging and dynamic area and it is therefore difficult to provide a definitive picture of the current situation. Needless to say, key developments are at early stages and the baseline of current activity that extends beyond institutional boundaries is relatively low. However, this review provides a picture of the national situation, where known, and examples of and insights into developments in this area.

DEVELOPMENTS IN SCHOOLS

Personalised learning

The General Teaching Council (GTC) found positive attitudes to the broad concept of personalised learning amongst teachers, with 80 per cent agreeing that their school encourages them to develop a number of personalised learning strategies (GTC, 2005). Some 44 per cent of teachers identified e-learning as a strategy for delivering personalised learning in their school (*ibid*). Teachers in secondary schools were more likely than those in primary schools to regard flexible use of ICT and other design factors as important for the successful introduction of personalised learning (*ibid*). A recent survey of headteachers found that ICT was reported to support personalised learning in 72 per cent of secondaries and 58 per cent of primaries (Edcoms, 2005).



In 2004, a survey (PwC, 2004a) found that only 5 per cent of primary schools and 7 per cent of secondary schools saw ICT as likely to have a significant impact on personalised learning. However, the latest Curriculum Online evaluation (Kitchen, Mackenzie and Butt, 2006), indicated that the majority of subject respondents surveyed felt that ICT resources could respond to differing pupil abilities. There is, however, fairly low familiarity with the concept of personalised learning spaces among headteachers, with only 29 per cent in secondary and 43 per cent of primary heads stating that they were aware of them as a concept (Edcoms, 2005). However, headteachers who were aware of personalised learning spaces viewed their introduction favourably (*ibid*).

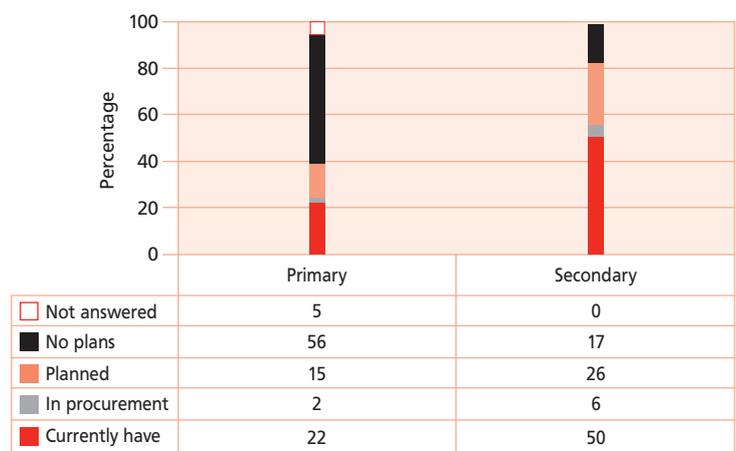
Learning platforms, VLEs and MLEs

The adoption of a range of learning platforms in schools provides an important indicator of progress towards adoption of the online personalised learning space. Learning platforms differ in complexity and functionality and range from shared file stores and intranets to a sophisticated MLE/VLE that combines various institutional systems and processes to administer and support learning and teaching.

Powell and Minshull (2004) state that 'learning platforms offer solutions to some of the immediate problems that beset large scale delivery of computer-based/e-learning in all its guises', offering one or more of the following:

- A place to store, find, access and use prepared materials
- A platform on which to build and deliver learning activity
- A common and consistent interface and way of working
- Secure and controlled (log-in) access for teachers and learners to materials
- A set of communications possibilities, ranging from transmission of static information (timetables, policies etc.) and narrative (notes, videos), through to discussions, collaboration and exchange
- Tracking and monitoring of student activity, performance and progress and, if linked to other business and information systems within the organisation, the potential to become the heart of a full managed learning environment

Figure 4.1: Prevalence of online learning environments in schools



Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

Table 4.1: Type of online learning environment

Resources	Primary (%)	Secondary (%)
Learning platform	29	24
Virtual learning environment	14	38
Learning portal	49	25
Combination of the above	4	12
Other	5	2

Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

- An offline facility, whereby content can be downloaded onto a laptop for use in sites without access to the network, then automatically updated when reconnected to the system.

There has been an increase in the adoption of learning platforms in schools since 2004. However, overall levels of adoption remain relatively low, with their presence still more prevalent in secondary schools than primary schools. One study indicated that there was some form of learning platform in use in 30 per cent of primary schools and 57 per cent of secondary schools (Becta, 2006a). The third survey of Curriculum Online (Kitchen, Mackenzie and Butt, 2006) indicated that, in the schools surveyed, 22 per cent of primary and 50 per cent of secondaries had an online learning environment (see Figure 4.1 and Table 4.1). This was an increase on 2004 where one study indicated that virtual/managed learning environments were relatively uncommon in secondary schools (23 per cent) and almost non-existent in primary schools (6 per cent) (PwC, 2004a).



Learning environments were still a relatively new introduction within schools, with 58 per cent of primary and 53 per cent of secondary schools stating that they had introduced them within the last two years (Kitchen, Mackenzie and Butt, 2006). In primary schools the most popular type of learning environment was a learning portal, while in secondary schools the most common type was a virtual learning environment (VLE) (*ibid*). The majority (60 per cent) of learning environments in primary schools were provided by a local authority. Provision in secondary schools was more diverse, with 32 per cent provided by a local authority, 27 per cent provided by a commercial supplier and 26 per cent self-created (Kitchen, Mackenzie and Butt, 2006). Recently, open-source learning platforms have been rising in popularity among schools, and this could account for some of the growth (Twining et al., 2006).

Case study research (PwC, 2004a) indicated that barriers to uptake could be related to the high cost of a licence, the time and costs associated with developing materials and the concern, particularly in primary schools, that the need for pupils to work independently might result in low use amongst younger pupils. The presence of a learning platform was related to school size, with larger schools in both primary and secondary more likely to have a learning platform (Kitchen, Mackenzie and Butt, 2006)

In 2004 future investment in a VLE was still a low priority for schools, with only 5 per cent of primary schools and 24 per cent of secondary schools viewing provision of a VLE as a high priority in the next two to three years (PwC, 2004a). In 2005, investment in a learning platform had gained in priority in secondary schools, with 30 per cent of the schools surveyed stating that they intended to set one up in the next two years. However, in the primary schools surveyed, 56 per cent still had no plans to set one up (Kitchen, Mackenzie and Butt, 2006).

There has been a recent marked increase in the uptake of open-source learning platform products in schools and colleges. It appears that the decision to adopt an open-source VLE solution was mainly related to the perceived cost advantages of this approach. This implies an issue relating to schools' possible lack of overall consideration of the total cost of ownership of learning platform products (Twining et al., 2006).

There is case study evidence of a growing sophistication in the use of VLEs in the schools sector, particularly at Key Stages 3 and 4 (Jackson, 2005). Examples include a live mentoring service, access to web-based resources matched to learning style, and VLEs that extend to other schools and, in one, case community outlets. However, these examples currently represent pockets of leading-edge practice.

Data standards and interoperability to support personalised learning

Data exchange and MIS

Harnessing Technology sets out the intention to develop 'an integrated teaching, research and administrative network for education [with] common systems for electronic learning, administration and business [and] common open standards to communicate with each other easily and safely' (DfES, 2005b).

Effective connectivity facilitates the transfer of data and information (Underwood et al., 2003). One regional study found that at least 50 per cent of teachers agreed that connectivity enabled the secure sharing of confidential information and improved communication with colleagues and the local authority (Lewis et al., 2005).

Kirkup et al., (2005), found that the effective use of data within institutions supported allocation of staff and resources, management of performance, monitoring initiatives and strategies, target setting and identification of pupils' achievements. Schools reported the value of access to pupil data in helping pupils make the transition from one school to another. Data also supported challenge to staff, pupils, parents and others and provided information for evidence-based discussions with Ofsted, local authorities and governors. An important theme arising from this study, and others, is that it is not the provision of data as such but the embedding of appropriate practices which will enhance learning and personalisation.

The *Becta Review 2005* reported that relatively few schools had integrated their management and learning networks, or had effective links between curriculum delivery and the institution's management information system (MIS). Though this is still a challenge, 28 per cent of primary and 31 per cent of secondary schools stated that they planned to combine networks (Becta, 2006a), which would allow teachers to access management information from any available machine. The ICT Test Bed evaluation (Somekh, Underwood et al., 2006) found that where individual staff were able to input information into the system, time spent administering information was saved (for example, in registering students and writing reports). There was also increased administrative effectiveness, for example in analysing information and making decisions on the basis of evidence.

But there are challenges based on existing practice and systems. Becta's (2005c) review of school MIS and value for money found that the move to electronic returns through such initiatives as the DfES Common Transfer File (CTF) and Pupil Level Annual School Census (PLASC), whilst benefiting interoperability, have grown in range, frequency and complexity such that



there is currently significant strain on schools, local authorities and MIS solution providers. As schools engage in greater data transfer within and between institutions, they will need more robust infrastructures in order to do this. However, it is reported that only 10 per cent of primary and 13 per cent of secondary schools had access to the MIS from any workstation in the school (Becta, 2006a).

Use of integrated data systems

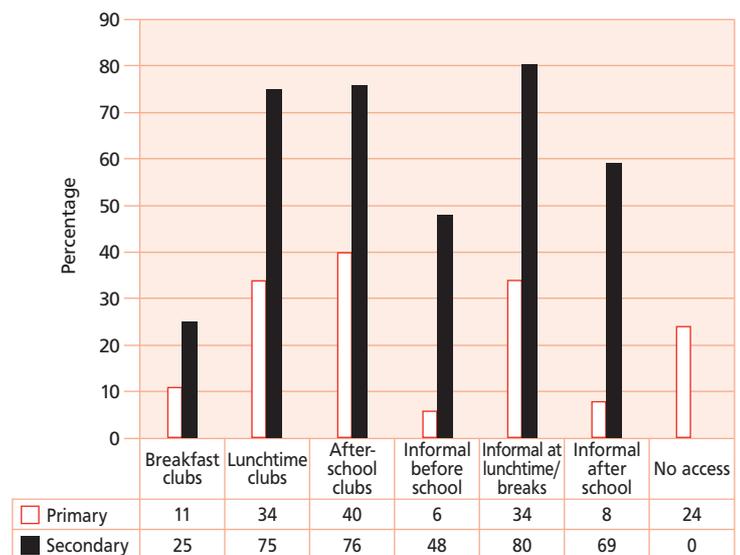
Selwood and Pilkington (2005) report a growing use of ICT for management and administration by teachers, with around 80 per cent of teachers surveyed in primary, special and secondary schools reporting that they used ICT appropriately to support administration and management. However, despite this growth, teaching staff were still less likely to routinely use ICT for administration and management than school leaders, with only 58 per cent in secondary schools and 52 per cent in primary schools reporting that they routinely used an MIS (*ibid*).

The ICT Test Beds evaluation (Somekh, Underwood et al., 2006) found that purchasing an MIS constituted a considerable financial and resource investment for schools and colleges, and secondary schools and colleges found the MIS increasingly valuable. In primary schools, however, not all MIS functions were being utilised.

Attempts within ICT Test Bed schools to link MIS and virtual learning environments to the home in two-way interaction were difficult (Somekh, Underwood et al., 2006). Integration of learning platforms with MIS remains a problem, making effective transfer of data, tracking and monitoring difficult. This problem has been more widely identified in the research: 73 per cent of schools and colleges felt their learning platform and MIS had no or limited integration (Twining et al., 2006). Other research (Becta, 2006a) and Becta's own work on developing frameworks for learning platforms, have highlighted the ongoing issue related to the need to enable interoperability between the MIS and learning platforms.

While the evidence (Prior and Hall, 2004; Becta, 2005a) indicates that only a minority of schools do not use ICT for administrative purposes, its use seems to be restricted mainly to basic information handling and data entry, with little evidence of the expanded use that a personalised learning space and a national

Figure 4.3: Forms of access to ICT resources provided outside lessons



Source: Curriculum Online Evaluation: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

framework for assessment will require. A case-study evaluation by Underwood et al., (2004) showed that increased use of intranets contributed to sharing administrative information and resources.

There is growing evidence that electronic registration records have a role in improving school attendance. In one study, over 60 per cent of primary and 80 per cent of secondary heads reported that they had been effective in tackling truancy and improving attendance (National Audit Office, 2005). Principal education welfare officers also welcomed them as a way of giving local authorities access to up-to-date records. A survey of schools where systems have been introduced to deal with high levels of unauthorised absence presents a more detailed picture (Band et al., 2005). It suggests a mixed picture in terms of support for dealing with high levels of unauthorised absence, though the system had helped support parental contact and involvement. Schools also faced challenges in linking attendance data to other information, such as attainment.

Learning through ICT beyond the school

The development of a technology infrastructure to support personalised learning beyond the institution, though at relatively early stages, is developing rapidly in certain areas. For example, there is increasing use of intranets, home-school email links, managed and virtual learning environments, handheld devices and podcasting. These represent indicators of progress towards access and availability of learning opportunities beyond the institution.



Evidence relating to the specific use of ICT to undertake homework shows an upward trend. However, Valentine (2005) found that teachers were deterred from explicitly setting homework using ICT because of concerns about a digital divide in children's access to technology out of school. In terms of practice, the COL survey collected data about homework and ICT, and found that setting homework that required use of a computer or internet access became more common in secondary schools between the first and third surveys (Kitchen, Mackenzie and Butt, 2006). Some 30 per cent of subject respondents at the third survey said that homework was set for their subject requiring use of a computer 'very often' or 'quite often', compared with 18 per cent at the first survey. The incorporation of ICT into homework varied considerably between subjects. Respondents for English and geography were more likely than other subjects to say that homework requiring use of a computer was often set (54 per cent and 51 per cent respectively). Maths respondents were least likely to set homework requiring use of a computer, with just six per cent saying they often did so and more than a third (36 per cent) saying that they never did. The variations between subjects were very similar for setting homework requiring internet access.

The e-portfolio and e-assessment

Definitions of the e-portfolio range from a simple electronic record to a personal record of the learning processes, outcomes and outputs. Lorenzo and Ittleson (2005) describe the e-portfolio as 'a digitized collection of artifacts including demonstrations, resources, and accomplishments [...] archived on a website or other electronic media'. It can also 'serve as an administrative tool to manage and organize work created with different applications and to control who can see the work'. Thus e-portfolios represent a new way of carrying out existing tasks and functions, including assessing, monitoring, recording and reflecting upon learning.

In the literature, the e-portfolio is viewed variously as a tool for assessment, reflection, evidence of achievement and personal satisfaction. At the moment little is known definitively about how, and how well, it can support a 'personal learning journey', and add value to educational processes. Further pilot studies are likely to provide evidence of this.

Becta (2005d) defines e-assessment as the use of ICT to provide flexibility for learners to strengthen their understanding of key concepts and to formally demonstrate their understanding at a time which is right for them. ICT-enabled assessment can be delivered at the level of granularity (course, module, single issue) required by the practitioner.

The *Becta Review 2005* cites several studies including NFER (2004) and Ridgeway et al. (2004) demonstrating the potential of ICT to support more individualised approaches to assessment. Studies on the use of VLEs (for example, North, 2004) also address the potential for formative assessment in colleges. However, there appears to be little or no comprehensive data to provide a national picture of the use of ICT to aid assessment in schools, particularly assessment in which learners demonstrate their achievements through e-portfolios.

Research commissioned by Becta (Twining et al., 2006) found that 64 per cent of schools have implemented electronic assessment recording and analysis, which includes e-portfolio systems. However, shared concepts and vocabularies are still an issue.

Opinions of primary and secondary heads in the Headspace survey (Edcoms, 2005) found that if standardised ICT testing were introduced, heads were unanimous in their view that it would be most appropriate at age 16 rather than 14 or 11. Some 33 per cent of primary and 38 per cent of secondary heads were in favour of them at age 14, while 22 per cent of primaries, and 30 per cent of secondary heads were in favour of them at age 11.

In terms of e-assessment, schools were making use of 'online' tests mostly at Key Stages 3 and 4, in ICT (at Key Stage 3, 39 per cent and at Key Stage 4, 17 per cent), thereafter in maths (16 per cent and 13 per cent at respective key stages). Use in science and English was around 11 per cent or less. Of the secondary schools sampled, 33 per cent stated that they partly used online assessment for ICT and 8 per cent used it wholly for ICT assessment. In all other subjects in both primary and secondary school use, figures were under 10 per cent (Becta, 2006a).

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Personalised learning

Becta's FE survey findings (Becta, 2005b) suggest that there is an increasing recognition within colleges of the value of e-learning to personalisation. Measures of e-learning implementation (Becta, 2005b), in particular the measure of the extent to which colleges have deployed ICT for teaching and learning including induction, assessment, teaching and supporting learners, made a steady rise in 2005. However, the survey also found that a significant proportion of colleges (25 per cent) do not have a central strategy or policy for ICT in learning and teaching.



Beetham (undated) states that ‘the capacity to record evidence about individual learners is no guarantee that the evidence can or will be used to personalise their learning experience...Research into how learning should be adapted to accommodate specific learners’ differences, and into the actual costs and benefits of doing so, is in its infancy, while the capacity to record complex learner data races ahead’. Beetham states that more research is needed into the ability for e-portfolios to support the learning process in relation to adaptive/personalised learning in the post-16 sector.

Learning platforms, VLEs and MLEs

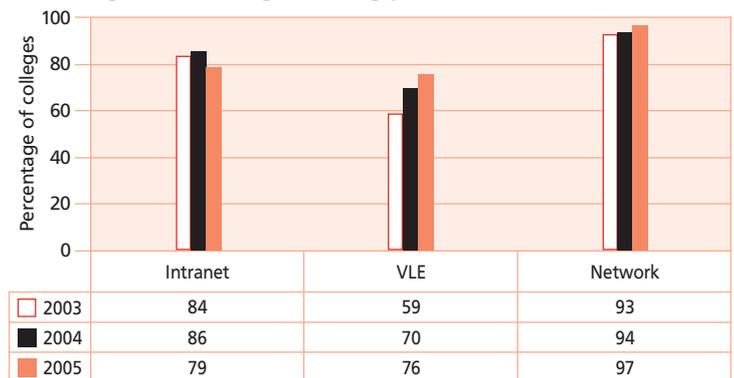
The *Becta Review 2005* noted that since 1999, when the National Learning Network (NLN) provided every college in the UK with funding towards the development of VLEs, learning platforms have grown in popularity. Since then there has been steady growth with the majority of colleges having adopted a MLE/VLE (72 per cent) and 70 per cent reporting using the VLE across a wide range of activities (see Figure 4.5). VLEs were cited as the main learning platform in 23 per cent of colleges and frequently used in 20 per cent – a continued rise in use (see Figure 4.4) (Becta, 2005b). Colleges made use of all three types of learning platform (networks, intranets and VLEs) as repositories for course materials.

There is an upward trend in the use of VLEs in adult and community learning, with 43 per cent of local authority providers reporting using or planning to use a learning platform in 2005, compared to 18 per cent in 2003 (Luger, 2006). In work-based learning, there was a move away from the dependence on learning management systems (LMS) to improving linkages between internal and external systems, staff and clients within which the LMS was one component (Somekh, Underwood et al., 2005).

Data standards and interoperability to support personalised learning

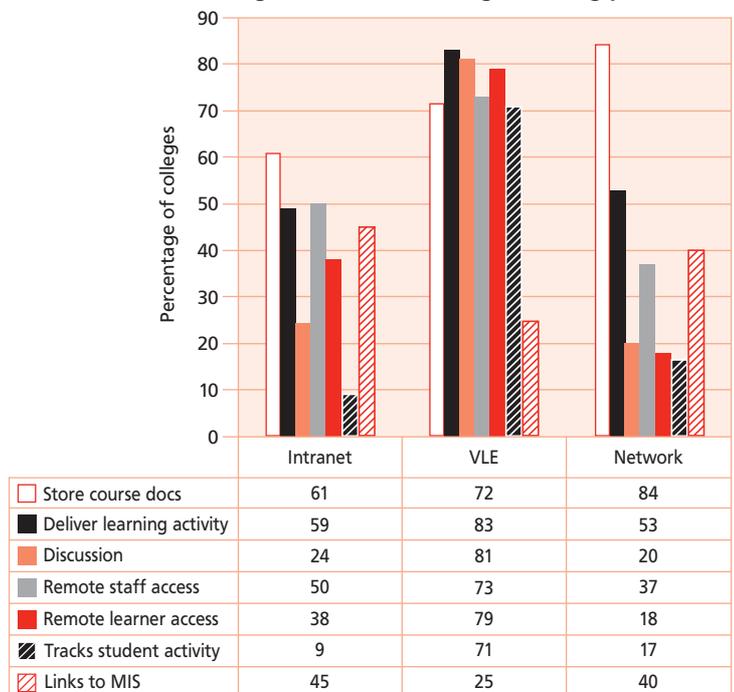
As with schools, there remains a challenge to link learner management to curriculum delivery, with colleges reporting that only 25 per cent of VLEs, 45 per cent of intranets and 40 per cent of networks link to the MIS (Becta, 2005b). While 71 per cent of VLEs are used to track student activity, very few intranets (9 per cent) and networks (17 per cent) track student activity (see Figure 4.5). As in schools, this lack of

Figure 4.4: College learning platforms



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)

Figure 4.5: Use of college learning platforms



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)

integration has created barriers to the efficient flow of learner data around the system. Often the situation is made more complex in the FE sector by the need to network multiple sites (PwC, 2004a).



Learners' access to learning through ICT beyond the institution

In the *Becta Review 2005*, we noted a stronger tradition of distance learning in the learning and skills sector than in schools. Links to other locations such as the workplace play an increasingly important role in developing ICT and e-learning which is focused on delivering the objectives of the DfES Skills Strategy.

The Becta ICT and e-learning survey (Becta, 2005b) demonstrates that widespread use of ICT for remote access to learning increased slightly from 10 per cent in 2003 to 12 per cent in 2005, although there was a decline in the use of ICT to enable learners to access some or all of the programmes at a convenient place or time. As can be seen from Figure 4.7, the proportion of FE colleges offering remote access to learning has decreased since 2003, with 32 per cent of colleges stating that they did not offer either remote learning via learndirect or other provision (Becta, 2005b).

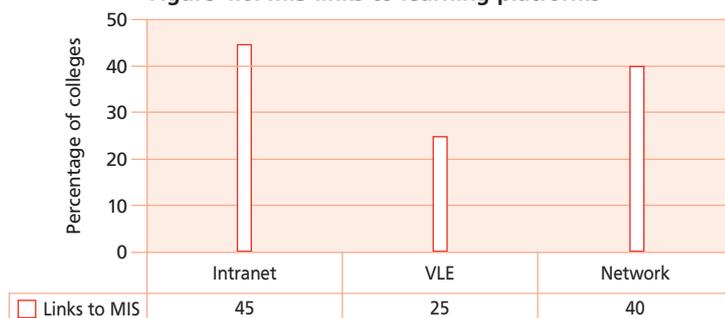
Home access to internet-enabled computers is high among FE students – at around 75–80 per cent (PwC, 2004a; LSDA/NLN, 2004). In 2004, half of these had broadband, while a third accessed VLEs and college intranets remotely. However, daily use of email comments from teachers was fairly low at that point and similar to the picture in schools, and video conferencing was rarely used in teaching.

The e-portfolio and e-assessment

According to Beetham (undated), the use of portfolios for the collection and management of assessment evidence in the UK has been a feature of vocational and professional programmes for a number of years, although many of these schemes are currently paper based. Examples of such schemes in the UK include DfES Progress Files (14–19), Records of Achievement (HE) and Individual Learning Plans (FE and Adult/Lifelong learning).

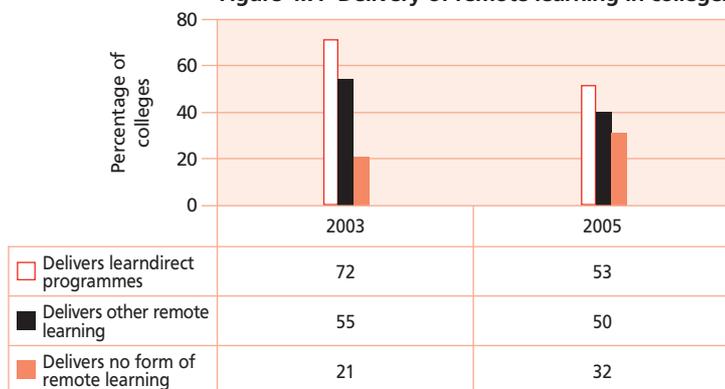
Beetham notes that e-portfolios can support summative assessment, learning and learning to learn, presentation and personal and professional development planning. The evidence indicates that the level of adoption and success of e-portfolios differs depending on which process it is supporting in this sector.

Figure 4.6: MIS links to learning platforms



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)

Figure 4.7: Delivery of remote learning in colleges



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)

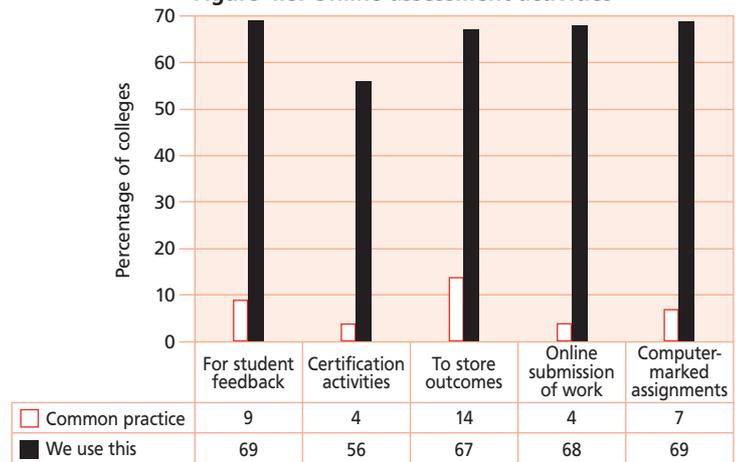
Most FE institutions are familiar with records of achievement provided by schools. However, even where information is routinely collected, there is little evidence that this information is transferred across institutions to provide continuity of guidance, or that this information is used to personalise learning. According to the Becta FE survey, 48 per cent used electronic information to support personal tutorials, an increase from 35 per cent in 2004. Information from tutorials was recorded electronically in 29 per cent of college, an increase from 19 per cent in 2004. Only 27 per cent maintained electronic student portfolios or records of achievement, which was little changed from 24 per cent the previous year (Becta, 2005b). This appears an area of relatively slow progress and challenges in supporting and freeing practitioners to use this information to support learners (Beetham, undated).



The number of colleges that used ICT in initial student assessment increased slightly between 2004 and 2005, from 86 per cent to 88 per cent (Becta, 2005b). Online assessment was reported as insignificant, or limited to individual enthusiasts, in 35 per cent of colleges surveyed, an improvement on 2004 figures. It was widespread in only 6 per cent of colleges, an improvement from 2 per cent in 2004.

As can be seen from Figure 4.8, the most common use of ICT in assessment in FE is storing and recording the outcomes of assessment, with 14 per cent of colleges stating this is common practice. Only 9 per cent commonly used ICT for student feedback and 4 per cent for online submission of work. There remains little evidence that e-assessment practices, though growing, are widespread in the sector.

Figure 4.8: Online assessment activities



Source: *ICT and e-learning in Further Education – the Challenge of Change* (Becta, 2005b)



5

E-MATURITY: INSTITUTIONAL, WORKFORCE AND LEARNER CAPABILITY

Key Points

- Leadership of ICT and e-learning in schools has improved, but variations between schools remain. Schools making progress in using technology to support learning in sustained ways are those where there is strong vision and leadership for ICT from senior management, needs-related centralised resources allocation and whole-school strategies which focus on how ICT can enhance teaching and learning.
- In FE colleges, management time to plan and set targets, along with the need to appoint staff at a senior level to facilitate change, are essential for the successful implementation of e-learning. Development is still often left to individual enthusiastic staff and departments.
- Significant numbers of headteachers and school managers have now completed the NCSL SLICT programme and there is evidence that completion has had a positive impact on the way heads are integrating ICT in their schools as a result.
- Management Information Systems (MIS) have a critical role in developing institutional effectiveness and in reducing the administrative burden, yet evidence of widespread effective use and productivity gains is only to be found in a small number of schools.
- Many leaders present their vision for learning as focused primarily on supporting learning within the institution. Learning beyond the institution is currently viewed as a low priority. As a result, independent learning afforded by the technology is not fully supported.
- ICT is viewed by teachers as the most common need for future training and CPD. However, headteachers consider that the ICT skills of their staff meet or exceed current needs. ICT and e-learning training for staff in colleges is not as extensive as in schools, although the role and effectiveness of informal training and peer support networks are similar in both sectors.
- In FE, classroom practice does not appear to have developed significantly as a result of the use of technology over the last two years. However, learners are better supported in independent learning as a result of access to technology and digital learning resources.
- There is a growing body of evidence that the use of ICT in education has a positive, if small, impact on learner attainment as measured in national tests. The ICT Test Bed evaluation, for example, found that technology deployment and use predicted an improvement in test performance relative to 'benchmark' comparators.
- A recent survey of FE practitioners found that e-learning was reported to have a positive impact on student motivation, retention, attendance and attainment.

The *Becta Review 2005* reported variations across the system in the adoption and use of technology. Institutions, practitioners and learners were at different stages of maturity in this respect. Only a minority of institutions had successfully embedded ICT across activities and leaders were often uncertain about the benefits of ICT.

Given evidence that ICT can help raise educational standards, it is important to provide opportunities to share effective practice and to support institutional leaders across the system in developing their use of technology to serve their educational ambitions.

Similarly, learners and practitioners need to develop the skills and capabilities to maximise the opportunities presented by technology – to develop effective practices for learning in a digital world.

Technological innovations are 'rarely a direct cause of change, but rather they act as a facilitator or amplifier of existing educational practice' (Underwood and Dillon, 2004). This effect is mediated by system-level, local, institutional, practitioner and learner processes and decisions.

For the purposes of this review, evidence about maturity will be considered at three levels for which there is reasonably reliable data: those of the institution, the workforce and the learner. A range of indicators of 'e-maturity' are discussed in order to help develop a picture of current levels of effectiveness with technology.



DEVELOPMENTS IN SCHOOLS

Institutional e-maturity

Overall e-maturity

Ofsted's 2004 report on the impact of ICT in schools noted that ICT resources were at record levels, comparing well with other countries. A more recent study concluded that most schools were resourced at least satisfactorily. There has been good progress in the provision of equipment, systems and support in the last few years, with the progress most marked in secondary schools (Ofsted, 2005c). In schools which made best progress with ICT, senior managers have been involved in developing a whole-school strategy, with a focus on how ICT enhances teaching and learning (Ofsted, 2004). Such vision and understanding is considered crucial in providing a context in which ICT can flourish:

The vision for education has to be clear and realistic and needs to precede the vision for ICT: in a sense the 'learning' needs to precede the 'e'... It is essential for issues relating to funding, as well as those relating to the ICT infrastructure, to be shaped and driven by the overall vision for teaching and learning. (PwC, 2004a)

There is clear evidence from the ICT Test Bed evaluation of the success of focusing on whole organisation development in the primary sector. In ICT Test Bed secondary schools the impact of this focus has been noticeable in improved management of information and better access to pupil data to inform decision-making. This has led to a change in culture whereby use of that data to support learning has become more accepted practice. Where this has happened, it is driven by the vision and leadership of senior management teams, and included planning for workforce collaboration (teachers, teaching assistants and technical support staff) development and deployment of ICT resources (Somekh, Underwood et al., 2006).

In 2004 PwC found that key indicators of overall school e-maturity included ICT infrastructure, training and technical support, and institutions' stated willingness to embed ICT. In 2004 the picture of e-maturity, or e-enablement, stood at 10 per cent of primary schools and 14 per cent of secondary schools (see Table 5.1). Becta will conduct further research in 2006 to update these figures.

Table 5.1: Spectrum of e-enablement by school type

	Late adopters (%)	Ambivalent (%)	Enthusiastic (%)	e-enabled (%)	Sample size (N)
Primary schools	7	44	39	10	118
Secondary schools	11	41	34	14	85
Special schools	16	35	33	16	43
All schools and colleges	13	36	40	11	345

Source: *Moving Towards E-learning in Schools and FE Colleges (PwC, 2004a)*

However, a recent report by Ofsted into the embedding of ICT in schools concluded that while most schools made at least satisfactory curriculum provision for ICT, in none of the 39 schools involved in the pilot of the common evaluation framework, could 'ICT be said to be embedded to the extent that it was an everyday aspect of pupils' learning' (Ofsted, 2005a). This does not necessarily reflect the national picture, but nonetheless illustrates the challenges in developing the use of ICT in schools.

Resource allocation and management

There is evidence that schools are moving towards more needs-related and centralised resource allocation, which may support more strategic approaches to the deployment of technology. However, this may have an adverse impact on the engagement of subject departments and practitioners in the development of technology in institutions.

PwC (2004a) found that in 'e-enabled' institutions, funding tended to follow the identification of need rather than leading the process. Internal bidding processes among these institutions were widely used. The use of this mechanism was related to institutional size, with primary schools generally using it least and larger institutions, mainly secondary schools, using it the most.

The most recent Curriculum Online evaluation report found that the introduction of e-learning credits has brought about greater centralisation of the software purchasing process within schools, with most schools electing to hold their eLCs centrally rather than allocating among departments. Such a move to a more centralised approach to purchasing has the potential to avoid the problem of unwanted duplication of spending and make it more cost effective for schools to purchase products and subscription services which cover a number of curriculum areas (Kitchen, Mackenzie and Butt, 2006).

The Curriculum Online Evaluation qualitative study found that centralised approaches were used to 'sustain subscriptions to cross-curricular resources, to upgrade specific materials, to purchase materials for new ICT facilities such as interactive whiteboards, and to ensure equal access to ICT by different groups of pupils.' (Dixon, Farrell and Barnard, 2005)



The rationale for allocating subject or departmental budgets was to find ways of involving and engaging practitioners in an equitable way. The study found that request systems were not always successful, particularly when requests had to be made at a particular time of year. (*Ibid*)

Leadership of ICT and e-learning

The *Becta Review 2005* noted Ofsted's (2002) report on ICT in schools, which indicated that there was variability in quality of leadership:

ICT leadership within secondary subject departments... is good or better in four in ten, but unsatisfactory in nearly a third... The monitoring and evaluation of ICT use in departments are particular weaknesses in over four in ten departments. (Ofsted, 2002)

Ofsted's 2004 report indicates that leadership and management of ICT has improved. ICT leadership was judged to be good or better in over two thirds of primary and secondary schools and in just over half of special schools. However, variation between schools in the quality of ICT leadership remains an issue.

Over 10,000 school leaders have participated or are participating in, the National College of School Leadership (NCSL) 'SLICT' programme since it started, including 2,390 headteachers in 2005–2006. The interim report of the evaluation of the programme (Comber et al., 2005), aimed to assess the extent to which participation in the SLICT programme had influenced developments in each of the eight key areas of ICT integration: Vision for ICT development, Management of Resources, ICT provision, Staff Development, Teaching, Learning, Policy Development and Curriculum Planning. Based on survey data from 206 heads who had been part of the 2003/04 cohort, the report concluded that there had been a steady improvement in these areas for most of the schools in the sample. This represented a shift in many cases from a relatively low pre-emergent or emergent base (as rated by respondents), towards becoming established in all eight key areas of ICT integration.

Ofsted presents data on the effectiveness of ICT co-ordination in schools and found this varied considerably. It was good or better in 60 per cent of secondary and special schools and 50 per cent of primary schools, but unsatisfactory in 10 per cent and 20 per cent respectively. Good co-ordinators understood how ICT could enhance learning and had the skills to promote its development across the curriculum (Ofsted, 2005d).

Administration, management and planning

As with other aspects of institutional development, we are reliant on indirect indicators of progress in effective linking of curriculum delivery, learner management and business planning. A recent report by Becta states that effective use of school MIS has a critical role to play in developing institutional effectiveness, especially in the reduction of administrative burden on school staff. They can also facilitate more effective learning by matching curriculum resources to particular teaching and learning activities or by making a range of assessment and analysis tools available to teachers so they can better understand the attainment of pupils (Becta, 2005c).

There is evidence from the ICT Test Bed evaluation that quality information on target setting and the analysis of assessment data which was made available through effective management information systems (MIS) could provide managers with incentives and tools to develop visionary leadership and improve insight and decision making. The researchers noted that sharing information with central government and the local authority was clearly facilitated by ICT, and schools were becoming increasingly sophisticated in their analysis of such information for the benefit of pupils and the school (Somekh, Underwood et al., 2006).

Electronic registration, including lesson-by-lesson registration in secondary schools, improved attendance in some ICT Test Bed schools. The speed of registration made lesson starts smoother and absence or lateness more public. Enhanced analysis of such data revealed 'selective attendance' which facilitated prompt action and improved communication with parents. In primary schools the immediate availability of data to the school secretary prompted an early morning contact with parents or guardians that has had a positive impact on attendance, raising it in some instances by 3–4 per cent and improving security.

Overall, the evidence indicates that technology is beginning to support a range of institutional management and administration activities but evidence of the effectiveness and efficiency savings from such operations is only available from a small number of schools. The potential of technology to support these processes, and deliver related efficiencies and effectiveness, is still not being fully realised.

ICT and productive time

Ofsted notes that the potential of ICT to reduce teacher workloads has not been fully realised (Ofsted, 2005c). The *Becta Review 2005* cited work (PwC, 2004b) which concluded that ICT had helped address workloads for teachers, but this was only achieved when a range of factors were in place, including an institutional strategy oriented towards delivering productive time benefits, and practitioners who were confident in using ICT.

Other evidence supports the role of ICT in achieving efficiencies or benefits to practitioners' productive time. Prior and Hall (2004), found that 65–70 per cent of teachers in primary, secondary and special schools considered that the introduction of ICT had reduced their workload, with only about 10 per cent reporting an increase. Similarly, the same survey found a comparable picture when teachers were asked if introducing ICT had affected their need to undertake routine administrative and clerical tasks.



Recent Becta research (Becta, 2005e) identified productivity gains for practitioners in planning lessons with digital resources compared to planning without. It also identified time saved through the use of integrated electronic registration systems and time saved in lessons due to the use of whole-class display technologies. In ICT Test Bed schools practitioners reported considerable time savings in medium- and long-term lesson planning, leading to reduced workloads. Researchers describe ICT as being used to formalise co-operative planning by teachers and making curriculum plans easily available to colleagues and managers.

Using technology to extend the boundaries of learning

Evidence from the earlier section on Technology Infrastructure and Learner Information and Support described the range of ways in which schools use technology to improve access to learning, including providing:

- external, remote access to the school network, learning platforms and VLEs
- mobile devices such as laptops and PDAs, to use within and beyond the boundaries of the school, including in the home
- access to learning via the school website
- equipment loan schemes for pupils and staff
- access to lunchtime, after-school and breakfast clubs where ICT is available
- the provision of email accounts.

However, many schools have struggled to address policy and process issues associated with providing these types of access. For example, Becta's e-Safety study found that many schools permitted personally owned mobile devices such as mobile phones (24 per cent), laptops (16 per cent) and PDAs (13 per cent) to be brought into schools. However, few allowed these devices onto their networks, and of those that did, few had a documented policy for allowing access to the school network (Becta, 2006d).

It may be that schools struggle with policy and process in this area as a result of competing or relative priorities. A recent survey of schools and colleges found that 90 per cent of respondents identified the home as being of 'some' or 'a lot' of importance within their organisations' visions of learning. Only 24 per cent of respondents' organisations viewed parents as being of primary importance, though this did vary across respondent groups (Twining et al., 2006). The proportions of organisations that provided parents,

Table 5.2: Amount and quality of ICT training available

	Primary (% very/quite good)	Secondary (% very/quite good)
Amount of training	63	52
Quality of internal training	73	64
Quality of external training	47	31
Base: All teachers	1,038	1,741

Source: *Evaluation of Curriculum Online: Report of the Baseline Survey of Schools* (Kitchen and Finch, 2003)

carers and/or other community members with access to learning platforms, digital resources and/or MIS data suggests that the majority of organisations were not attempting to engage actively with these groups through ICT (*Ibid*). Rather they saw their organisation's vision for learning as focused primarily on supporting learning within the institution, and learning from home came lower down their priorities.

Workforce e-maturity

ICT training for teachers

The *ICT in Schools Survey 2004* showed that the vast majority of teachers at that time had received training in the use of ICT. Yet despite high levels of training, a General Teaching Council survey (Sturman et al., 2005), found that 56 per cent of teachers considered that ICT was the most common area in which they needed continuing professional development (CPD) over the coming year. This was followed closely by developing their skills and knowledge in the area of personalised learning (53 per cent), an area where the government believe ICT can provide significant support.

Teachers' satisfaction with training was higher when provided internally – possibly linked to greater tailoring and differentiation, as Table 5.2 indicates.

In primary schools, there is evidence from the Curriculum Online evaluation that there is an increasing focus in schools on planning internal staff training. The study also found greater focus than last year on sharing good practice and skills between schools staff, and concluded that this may suggest that a core number of staff have moved past acquiring basic skills (Dixon et al., 2005). The ICT Test Bed evaluation identified the value of internal training and sharing of knowledge and skills:

... the immersion in ICT experienced by many teachers in ICT Test Bed secondary schools has led those who had not been early adopters of technology to develop (rapidly) a wide range of (often advanced) computer skills. Although the project made some formal training available, many such staff referred to learning most from informal support given by more technically able members of the department. (Somekh, Underwood et al., 2006)

Secondary schools in the Curriculum Online Evaluation study varied considerably in the availability of training, with some practitioners familiarising



themselves with digital resources at home, while others were doing so as part of formal training.

ICT training for support staff and paraprofessionals

The *Becta Review 2005* reported that teaching assistants and other support staff had not had the same amount of ICT training as teachers. Although there have been some improvements, the level of ICT skills for support staff continues to be a concern in primary schools (Dixon et al., 2005). A recent GTC survey found that 62 per cent of primary and 57 per cent of secondary headteachers claimed to need assistants with the same, or higher, levels of ICT literacy as teachers (Sturman et al., 2005). Ofsted also notes that most primary schools now correctly identify the need to provide training in ICT for teaching assistants and for all new staff (Ofsted, 2005c).

Research by the University of Exeter into the ICT for Success training programme for teaching assistants, in three pilot regions of England (Tearle and Ogdan, 2005) concluded that the programme had been well received and met the range of needs of teaching assistants. It was targeted at the needs of assistants with some, relatively limited, existing ICT skills. In such circumstances the face-to-face nature of training, and the length (two days) of the initial training was shown to have been particularly important.

ICT training for school leaders

Feedback on the effectiveness of NCSL's 'SLICT' programme indicates that benefits include:

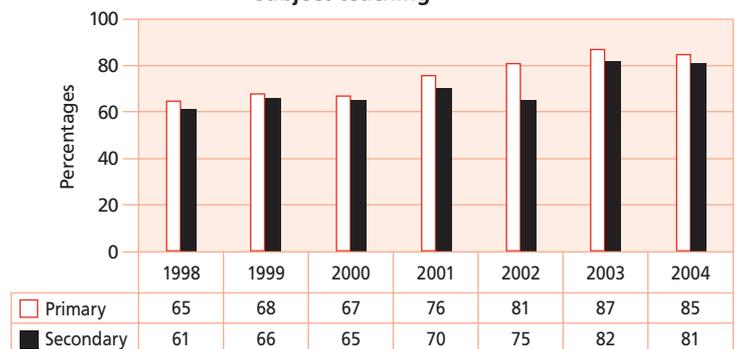
- the opportunity to share practice and network with others
- strategies to improve the clarity of vision for ICT in school
- an understanding of the links between ICT and learning.

Ofsted recommended that the programme be extended to include middle managers (including ICT co-ordinators), LEA personnel and national strategy consultants (Ofsted, 2004). The interim report on the Phase 3 evaluation of SLICT (Comber et al., 2005) concluded that the programme was the key factor in bringing about changes in vision, ICT provision and policy development.

Workforce skills

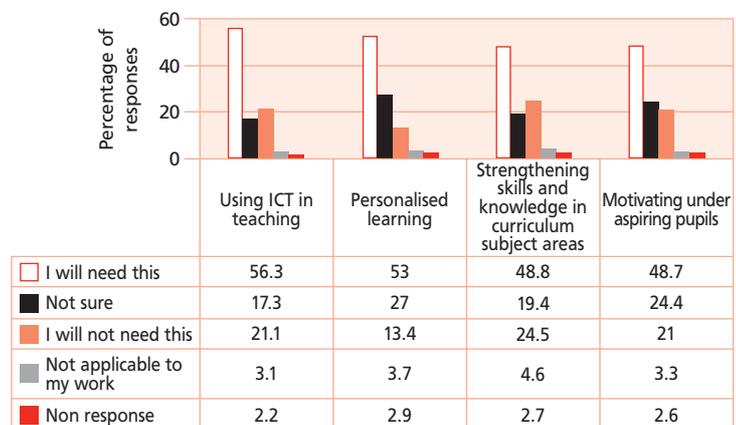
The *Becta Review 2005* reported that skills and confidence of staff in using ICT in teaching had shown a marked improvement over the five years to 2003.

Figure 5.1: Staff who feel confident to use ICT in their subject teaching



Source: *ICT in Schools Survey 2004* (Prior and Hall, 2004)

Figure 5.2: Key areas where teachers feel they need CPD over the next 12 months



Source: *GTC Survey of Teachers* (Sturman et al., 2005)

However, 2004 saw the first drop in levels of staff confidence to use ICT in subject teaching, as reported by schools (Prior and Hall, 2004). The drop was not statistically significant, but could be indicative of a levelling off (see Figure 5.1).

In the absence of any more up-to-date national data on staff confidence, it is unclear whether confidence levels have changed. However, the fact that over half of the staff interviewed in the GTC survey (Sturman et al., 2005), considered that ICT was the most common area in which they needed continuing professional development (CPD) over the coming year, suggests that teachers are increasingly aware of continually changing skill demands. Figure 5.2 shows the four most important areas where teachers felt that they needed CPD. A particular need was identified in relation to the use of technology to support management and administration. A total of 49 per cent



wanted further training in this area. The survey also found that teachers in more challenging schools were more likely to report the need for further training.

However, the view teachers have of their ICT training needs contrasts with that of headteachers. A recent survey of heads found that 86 per cent believed that teachers' ICT expertise meets most, or exceeds, current needs (EdComs, 2005). While this difference may be down to local context and perceptions of professional abilities, it indicates the need for a more shared view of needs and standards relating to ICT competence in the teaching profession.

In terms of addressing perceived gaps, the aspects of CPD which are most effective in improving teaching and learning appear to be those emphasising peer support rather than leadership by supervisors, the use of outside 'experts' to support the school-based activities, and observation and shared interpretations to support the teacher implementing a new strategy (Cordingley et al., 2005).

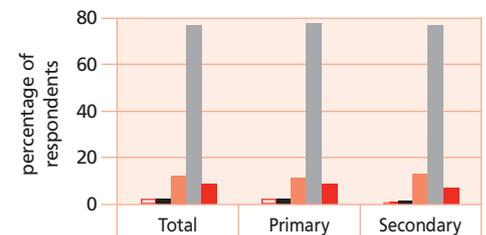
In addition, the latest GTC survey found that 32 per cent of teachers considered that access to online materials was 'very important' in making CPD an integral part of the teaching profession, with a further 48 per cent rating it as important. However, this lagged behind factors such as 'support from senior managers', 'supply cover' and 'an understanding of teachers' individual development needs' (Sturman et al., 2005).

Attitudes towards and use of ICT in schools

Teachers' attitudes towards using ICT resources, including material on the internet, for lesson planning have become more positive over the last three years. The role of ICT in differentiating on the basis of pupils' abilities was recognised by over 80 per cent of the primary and secondary subject respondents in the 2005 COL survey. However, attitudes towards the relationship between ICT use and pupil attainment have remained largely the same over the course of the evaluation (Kitchen, Mackenzie and Butt, 2006).

The Curriculum Online evaluation (Kitchen, Mackenzie and Butt, 2006) found an increase in the numbers of teachers making regular use of ICT in lessons (use in half or more lessons). When comparing 2003 figures with those from 2005, in all cases, there was an increase. Trend data comparing the first and third COL surveys shows increases in the use of subject-specific software, computer packages, internet-based resources and interactive whiteboards.

Figure 5.3: Whether teachers possess the necessary expertise to use ICT effectively in the curriculum



	Total	Primary	Secondary
Don't know	0	0	1
Expertise does not meet needs at all	2	2	1
Expertise meets few needs	12	11	13
Expertise meets most needs	77	78	77
Expertise generally over and above needs	9	9	7

Headteacher judgements of staff ICT skills

Source: EdComs, Headspace national survey of Headteachers (Guardian Newspapers Ltd and EdComs Ltd, 2005)

Table 5.3: Frequency of using ICT resources in lessons 2002–2005

Resources	Primary teacher (% half or more lessons)	Secondary teacher (% half or more lessons)
Computer packages	36	19
<i>Change since baseline</i>	+16	+10
Internet-based resources	38	21
<i>Change since baseline</i>	+28	+16
Interactive whiteboards	69	42
<i>Change since baseline</i>	+63	+37
Subject-specific software	38	30
<i>Change since baseline</i>	+18	+20
Base: All teachers 2005	625	925

All changes statistically significant

Source: Evaluation of Curriculum Online: Emerging findings from the third survey of schools (Kitchen, Mackenzie and Butt, 2006)

Interactive whiteboards were used most frequently in lessons in secondary schools by maths teachers, three fifths (60 per cent) of whom said that interactive whiteboards were used in at least half of maths lessons. Interactive whiteboards were least likely to be used frequently by music teachers, with 27 per cent saying they were used in at least half of lessons. However, subject-specific software applications were most likely to be used in at least half of lessons for music (45 per cent) and maths (39 per cent) in secondary schools.



These findings of general increased use of ICT are broadly reflected in recent inspection evidence. In 39 observed schools, ICT was used mainly to support English and maths. The Primary National Strategy has helped raise the profile of ICT as a teaching tool and the proportion of lessons in which teachers and pupils use ICT has increased significantly. Almost all schools have installed interactive whiteboards and more teachers are using them effectively to teach new skills, to provide good models and to introduce a broader range of source material directly from the internet (Ofsted, 2005b).

Ofsted noted the role subject departments play in levels of ICT use in secondary schools. While there was clear progress in the incorporation of ICT into teaching and learning in secondary school departments since 1997, the rate of growth was slow, with on average two to six departments making some effective use of ICT, with little ICT use in the rest. (Ofsted, 2005e)

Quality of use in the classroom

Ofsted inspections offer evidence of continued improvements to the quality of use of ICT in learning and teaching (Ofsted, 2004 and 2005c). The Ofsted Annual Report 2004/05 states that ICT teaching in primary schools has improved considerably. In 1998–9, ICT teaching was good or better in only one third of schools compared to three fifths in 2005. Schools where teaching was unsatisfactory fell from one in five to less than one in twenty. The report concluded that while the use of ICT across subjects is growing steadily, the extent and frequency of use vary widely.

In secondary schools, teaching in ICT was good in over two thirds of schools, but expectations and challenges continue to differ widely and are unsatisfactory in one tenth of schools. Ofsted notes that teachers need to give consideration to the circumstances in which independent learning using ICT can flourish:

Tasks incorporating the use of ICT are often overstructured – both in ICT lessons and more widely. This is somewhat ironic because ICT can be very effective at motivating pupils to learn and to take this learning forward on their own. (Ofsted, 2005c)

Ofsted maintains that there is a clear link between relevant training and support in the use of ICT and a favourable impact on the quality of teaching and learning in all types of schools. However, even where there was good CPD provision, there still remained

insufficient opportunities for staff to observe good practice. Where ICT practice was good, schools recognised the need to develop a structured and coherent programme of CPD that was closely allied to the overall school vision for ICT and linked to whole-school objectives (Ofsted, 2005b).

Learner e-maturity

Access to and use of ICT for learning

Access to and use of ICT at home varies with socio-economic group. Lower socio-economic groups are currently relatively disadvantaged. Livingstone and Bober (2005), found in a national UK survey of 1,511 people aged 9–19 that 88 per cent of middle-class children had access to the internet at home compared to 61 per cent of working-class children. Valentine et al., (2005) found that libraries and internet cafés were not necessarily an effective substitute for a lack of home access to ICT, as those who did not use ICT at home were also the same group who used it least in other locations.

Livingstone and Bober (2005) found that of the 90 per cent of the 9–19-year-olds who used the internet to do work for school or college, 72 per cent went online daily or weekly. The research also noted gender difference in home use of a computer for schoolwork: girls were more likely to do so than boys, reflecting their more conscientious attitude to study rather than a preference for ICT.

Learner-related factors in the impact of ICT on learning

The *Becta Review 2005* reported on research demonstrating the motivational effect of technology use in learning (Passey et al., 2004). At higher levels, pupils' ability to search a range of resources appeared to be particularly motivating if underpinned by clear task orientation. Related to this, ICT contributed to pupils' perceived efficacy in learning by providing tools which enabled pupils with different needs to achieve success.

Evidence from UK Children Go Online, however, found 30 per cent of children aged 9–19 surveyed reported having received no training at all in using the internet, although most acknowledged that they had been taught something. Despite 87 per cent reporting that they 'were good at' finding information online, children were reported to lack key skills in evaluating online content. As many as 38 per cent said they trusted most of the information on the internet, and only 33 per cent of daily or weekly users had been taught how to judge the reliability of online information.

Of relevance to pupils' efficacy in learning using ICT, assessment of ICT capability was a weakness in one fifth of schools at Key Stage 3 and one in eight at Key Stage 4. Pupils generally received insufficient feedback on how they could improve their work. In many schools teachers did not evaluate specifically how well pupils applied and used their skills across the curriculum (Ofsted, 2005c).

Impact on learning

There is a growing body of evidence indicating that ICT use has a positive, if small, impact on learner attainment and other outcomes. The *Becta Review*



2005 reported large-scale studies, such as ImpaCT2 and Becta's statistical analysis of national data (SAND) (Becta 2003a and 2003b), which found that ICT had a positive impact on standards on a national scale, in certain schools and certain subjects.

Since the 2005 *Becta Review* further large-scale studies have reported, including the ICT Test Bed evaluation, which presents attainment data from the second year of the study, based on benchmarking against comparable local authorities.

Between 2002 and 2004, in the ICT Test Bed local authorities the rate of improvement in key stage test scores was higher than the national average in key areas. For example, attainment for primary schools within the Test Bed Local Authorities (LAs) significantly improved over the course of the project for the KS2 English tests. The decrease in scores seen in KS2 Science was replicated by the comparator LAs. The decrease in scores for the Test Bed LAs was not found to be significant in science, whereas the decline in the Comparator LA scores for this test was found to be significant.

Attainment for secondary schools within the Test Bed Local Authorities significantly improved over the course of the project for the KS3 English tests, KS3 maths tests and the number of students achieving GCSE A* to C grades. A significant change was also detected for the KS3 science test although performance on this test within the Test Bed LAs was found to have decreased rather than increased between 2003 and 2004. This was also true for the Comparator LAs, whose KS3 science achievements had also decreased. The researchers note that this may reflect a general issue with the tests rather than any differential outcome for the target and comparator schools.

Performance on the KS3 maths test in 2004 improved significantly for the Test Bed schools by comparison with their performance between 2002 and 2003. No other tests score variations for ICT Test Bed schools between 2003 and 2004 were statistically significant.

These are early findings from the ICT Test Bed evaluation, which is continuing during 2005-6. Further analysis will provide a better picture of the role and contribution of technology to raising standards.

The impact of specific technologies

The Broadband Evaluation (Underwood et al., 2005) found that at GCSE level there were significantly improved

Table 5.4: Improvements in ICT Test Beds Local Authority Key Stage 2 Scores

Year	% achieving Level 4 in English (SD)	% achieving Level 4 in Maths (SD)	% achieving Level 4 in Science (SD)	Average Point Score (SD)
2002	70.61 (15.57)	72.18 (16.37)	85.29 (14.03)	27.02 (1.89)
2003	72.30 (15.59)	72.00 (15.83)	85.56 (12.62)	27.08 (1.87)
2004	75.29 (15.51)	72.37 (16.18)	84.99 (12.86)	27.21 (1.91)

SD = standard deviation

Table 5.5: Improvements in ICT Test Beds Local Authority Key Stage 3 Scores

Year	% achieving Level 5 in English (SD)	% achieving Level 5 in Science (SD)	% achieving Level 5 in Maths (SD)	Mean Point Score KS3 (SD)
2003	62.02 (14.58)	61.83 (14.6)	63.97 (14.09)	32.94 (2.02)
2004	65.95 (15.83)	59.40 (14.13)	66.35 (13.44)	32.96 (2.11)

SD = standard deviation

Table 5.6: Improvements in ICT Test Beds Local Authority GCSE results

Year	5 or more A*-C GCSE (SD)	5 or more A*-G GCSE (SD)
2002	41.28 (14.99)	87.71 (6.86)
2003	44.32 (16.57)	87.42 (7.07)
2004	46.35 (16.20)	87.89 (6.46)

SD = standard deviation

performances in the year immediately following the installation of broadband. This finding should be treated with caution owing to small sample size. However, the report notes that the findings from the GCSE data are encouraging and:

...whilst the improvement in performance at this level cannot wholly be attributed to the introduction of broadband connectivity, it would not be overly presumptuous to assume that broadband is certainly a contributory factor to schools' general improvement, especially given the findings documented throughout the rest of this report. (Underwood et al., 2005)

With the significant expansion of presentation technologies, evidence of the effects on attainment and learning are beginning to be reported. A number of studies provide evidence about the impact of interactive whiteboard use on learners, as reported by teachers and learners, through lesson observations, and analysis of learner assessment results. They relate both to motivational effects and the quality of learners' understanding and attainment. A study of ICT and pupil motivation (Passey et al., 2004) found that where used effectively, both teachers and pupils regarded whiteboards as motivating.



This was attributed to:

- presentational features (items can be flashed up or completed on screen, for example)
- the ability to annotate what is shown
- direct interaction through touch.

Learners respond positively to the range of media that can be used with the interactive whiteboard (Somekh, Underwood et al., 2005; Higgins et al., 2005). The motivational effect of the technology has been attributed to the 'stepped learning' that characterises much interactive teaching with whiteboards. New concepts can be presented in a logical way, minimising leaps of understanding; learners are provided with new challenges and offered frequent assessment of achievement as a stimulant to further involvement (Miller et al., 2004).

Studies involving pupil responses maintain that interactive whiteboards:

- make lessons more enjoyable and helped them pay better attention in lessons
- made it easier to understand lesson content and learn better as there was a visual display as well as an explanation (Higgins et al., 2005).

However, the pupils experienced frustration when technical difficulties arose, and also if the teacher was not skilled in using the interactive whiteboard (*ibid*).

Observations and teacher interview evidence suggest that learners' responses to interactive whiteboard tasks vary by phase of education. Younger learners are keen to 'have a turn' whereas some older learners are more reluctant to use the whiteboard in front of the whole class. It can open them up to public viewing which some pupils do not enjoy, although this is not the universal experience (Somekh, Underwood et al., 2005). Other evidence suggests that the flexibility and visual power of the whiteboard can often engage lower-attaining pupils and encourage better concentration (Ofsted, 2004; Somekh, Underwood et al., 2006). They can also be particularly effective at encouraging pupils with special educational needs, who perhaps prefer a more multi-sensory approach (Becta, 2004b; Somekh, Underwood et al., 2005).

Impacts on attainment using interactive whiteboards are not universal. While some teachers believed that

interactive whiteboard use led to improvements in pupil attainment, in other cases teachers stress that this resulted from good teaching rather than the technology alone.

Higgins et al. (2005) looked at pupils' performance in national literacy and numeracy tests, in classes which had received whiteboards as part of a pilot scheme. They found that in the year after the whiteboards had been introduced, pupils in the pilot schools performed better than pupils in other equivalent schools in national tests in mathematics, but that this gain was not sustained into the second year. Comparison of the results for low- and high-achieving groups in the pilot schools found that interactive whiteboard usage was linked to a reduction in the proportion of low-achieving pupils in English. The research suggests that the use of whiteboards does not serve in itself to improve pupils' learning, but as the study does not factor the precise nature or amount of whiteboard usage into its analysis, it is difficult to draw more general conclusions about the value of the technology.

Impact of home use of ICT

There is also impact evidence relating to home use of ICT in a study by Valentine et al., (2005). They found that home use of ICT for educational purposes was linked statistically with small improvements in children's attainment compared with expected targets in maths at Years 6 and 9. There was a modest but more extensive effect in English and maths at Year 11. However, substantial use of ICT for leisure purposes was statistically linked to a sizable decrease in attainment against expected targets. The researchers concluded that it is not access to, or general use of ICT *per se* that will affect attainment, but rather how the technology is used.

Context factors

As reported in the previous *Becta Review*, positive impact on learning is not guaranteed where technology is deployed in learning. Several factors influence the achievement of learning gains.

Sutherland, Robertson and John (2004) found that the motivational effect of ICT enabled students to learn for extended periods of time. However, it is where ICT was integrated effectively in meaningful activities that lessons were perceived by pupils as more enjoyable and provided memorable learning experiences (Sime and Priestley, 2005).

Practitioner e-maturity – in terms of understanding the differing capabilities of technology and how they relate to learning and teaching – is important in providing an experience for learners which maximises their learning. The impact can be diverse. ICT use has helped pupils manipulate shapes in mathematics, bridging the gap between concrete and abstract, while in English the digital review of film led to detailed analysis and discussion which would not have been possible through any other medium. When writing in a foreign language ICT use led to better fluency, length and quality in writing (Taylor, Lazarus and Cole, 2005). In geography, the use of ICT gave students more freedom in their research into, and presentation of, geographical issues. ICT was seen as having potential for increasing the efficiency and effectiveness of the teaching process (Morgan and Tidmarsh, 2004).



The ICT Test Bed evaluation found several aspects of institutional e-maturity predicted improvement in the attainment scores of learners, notably:

- the curriculum maturity model (including institutional issues such as curriculum IT policy) and external linkage model (such as networking with other schools) were predictors of improvements in Key Stage 2 test results
- the curriculum maturity model was a predictor of A-level results.

Other 'sub' factors across six areas of maturity were found to be predictors of A-level and other key stage improvements. Further details of the maturity models and the elements that make up the models may be found in the Annex.

International comparisons

International evidence suggests that the UK compares well with other OECD countries in terms of basic indicators of learner maturity (OECD, 2005).

Data in the OECD Programme for International Student Assessment (PISA) for the UK states that the length of time 15-year-old students had been using computers ranged from 48 per cent using them for more than five years, 33 per cent for three to five years and 19 per cent between less than a year and one to three years. The figures are based on students' self reports and the UK figures were well above the OECD average. This places the UK about 8th (allowing for the fact that the UK response rate was too low to ensure comparability), behind Australia, Canada the USA, and close to the responses for Korea, Iceland and Finland. A majority (around 50 per cent or higher) of 15-year-olds have at least five years' experience in eight OECD countries: Australia, Canada, Denmark, Finland, Iceland, Sweden and the USA. The UK sits just below this group in terms of ICT experience.

Nearly three quarters of 15-year-olds questioned across all the OECD countries surveyed were using computers at home several times each week. In the UK, 81 per cent of those surveyed said that they were frequent home users, and 18 per cent said that they used a computer frequently in places other than that school or the home. The main uses of the computer at home on average for all OECD countries were for email or chat rooms, internet research, playing games and word processing, (50 per cent said their use was almost every day or a

Table 5.7: Length of time that students had been using a computer

Country	Length of time using a computer (% responses)			
	Less than one year	One to three years	Three to five years	More than five years
Australia	2	8	21	69
Canada	2	10	22	66
Sweden	1	12	30	57
New Zealand	4	16	24	55
Denmark	2	18	28	52
Finland	2	17	30	51
Iceland	2	19	30	50
United Kingdom	2	18	33	48
Korea	2	18	35	45
Liechtenstein	1	21	38	40
OECD average	10	26	27	37

Source: *Are Students Ready for a Technology-Rich World?* (OECD, 2005)

Table 5.8: Percentage of males and females frequently using ICT for the Internet and entertainment

Country	Type of ICT activity											
	Games on a computer		Using the internet to download software (including games)		Using the internet to download music		Using the internet to look up information about people, things or ideas		Using the internet to collaborate with a group or team		Using a computer for electronic communication (e.g. e-mail or chat rooms)	
	M	F	M	F	M	F	M	F	M	F	M	F
Australia	67	33	58	35	62	53	76	72	46	40	68	69
Canada	75	44	70	46	80	75	77	73	55	44	81	85
Sweden	81	32	62	27	71	52	71	54	38	19	75	75
New Zealand	69	42	58	36	62	54	67	63	43	35	68	70
Denmark	84	33	60	18	59	28	76	59	43	26	64	61
Finland	75	30	51	9	56	21	49	31	20	7	55	63
Iceland	77	28	60	24	73	43	79	66	33	18	72	69
United Kingdom	76	40	61	37	66	50	69	61	46	36	69	69
Korea	74	33	60	29	80	78	58	61	48	51	71	77
Liechtenstein	67	27	65	39	71	52	72	61	40	24	72	80
OECD average	70	35	51	25	56	40	59	50	36	27	56	55

Source: *Are Students Ready for a Technology-Rich World?* (OECD, 2005)

few times a week), thereafter, learning school material (30 per cent), programming (22 per cent) and using educational software (15 per cent).

The UK figures suggest a degree of sophistication of internet use and contrast with the finding that some students maintain that they have had little or no



internet training at school. It would suggest that for many teenagers skills are self taught, or peer taught, a factor which the OECD report identifies as a key factor influencing students' attitudes towards computers, especially in the UK.

Subjective assessments by students, of their performance in three broad categories of computer task provide a measure of their confidence in using ICT. The tasks were:

- routine tasks such as opening a file, playing a computer game or copying a file from a floppy disk
- internet tasks such as getting onto the internet, writing and sending emails or downloading music
- high-level tasks including using a database to produce a list of addresses, creating a multimedia presentation or constructing a web page.

Generally all students reported high confidence in using ICT, with the majority saying that they could perform 17 out of the 23 tasks very well by themselves. The report notes that this shows an encouraging situation with respect to ICT confidence and suggest that: '...there is not today a general problem with young people's ability and willingness to use a computer as a basic learning tool to find information or to write up a project, for example.' (OECD, 2005).

The UK index of confidence figures was consistent across the three areas, in line with other developed countries. Whereas in some participating countries students reported being less confident on the high-level tasks, the UK index figures were similar to those for the USA, Australia, Canada, New Zealand, Austria and Liechtenstein.

DEVELOPMENTS IN THE LEARNING AND SKILLS SECTOR

Institutional e-maturity

Overall e-maturity

Becta's ICT and e-learning survey of FE institutions assessed FE college levels of e-maturity, or 'e-enablement', drawing on indicators developed by PwC (2004a).

Figure 5.4: Spectrum of e-enablement



Source: *ICT and E-learning in Further Education (Becta, 2005b)*

These reflect five broad categories: student ICT access, workforce ICT skills, e-learning resources and management and use in learning. The results were based on the 80 colleges that had completed the annual survey for three years.

The picture is one of steady movement towards e-maturity. By 2005, 62 per cent were e-enabled or enthusiastic, an increase from half of all colleges in 2003. However, at the level of the individual college the picture is less clear, as only one college had maintained its position in the 'e-enabled' category over that time, demonstrating that sustaining progress across all five dimensions is a challenge for institutional leaders.

Finlayson et al., (2006) found of FE colleges that, while all colleges were moving towards better integration of ICT and e-learning within all areas of study, this was a complex development process involving a major leadership commitment, technology provision and support and professional development of the teaching staff. They also noted a change in emphasis in the vision as colleges mature. The least mature focus on the management of learning, where as those further along the continuum begin to focus more strongly on the use of ILT within the classroom.

Initially this takes the form of promoting ILT for creating variety and interest in teaching to motivate learners. In the most mature colleges the strongest emphasis is on embedding ILT within teaching and learning to improve students understanding and involvement in learning and in learning how to learn. (Finlayson et al., 2006)

Leadership of ICT and e-learning

The Becta *ICT and e-Learning Survey 2005* notes that often the way colleges translate strategies into action is through setting targets. Therefore the presence or absence of targets relating to ICT and e-learning is an indicator of levels of strategic institutional approach. In 2005, 29 per cent of colleges set



formal targets for the use of ICT and e-learning across all programmes. A further 43 per cent set them where they considered it appropriate and 25 per cent set no targets for ICT. The report found that this situation had worsened since 2003 and suggested that this indicated a dislocation between strategy and action in many colleges.

The role of the senior management team is stressed in the ICT Test Bed evaluation, with researchers noting:

Clearly-defined management structures and stable senior management teams are important conditions for effective leadership of change in major ICT innovations. The active support of a senior manager, and supportive interest of the whole senior management team, is essential. (Somekh, Underwood et al., 2006)

College case studies have indicated that there is considerable inequity between departments in most colleges in terms of the priority given to embedding ICT and e-learning. Middle managers can play a pivotal role in facilitating or blocking developments (Finlayson et al., 2006), suggesting the need to ensure that middle managers are closely involved with organisational strategy.

PwC (2004a) note that the most effective e-learning strategies were developed when all staff fully 'bought in' to the overall vision for learning and associated strategies for the use of ICT. In addition, phased approaches to the implementation of e-learning and ICT were recommended in order to take account of the pace at which staff could accommodate change.

Administration, management and planning

In 2005 electronic student portfolios or records of achievement were maintained in nearly 27 per cent of colleges. In the FE sector levels of use of electronic information to support learning increased from 35 per cent to 48 per cent between 2004 and 2005.

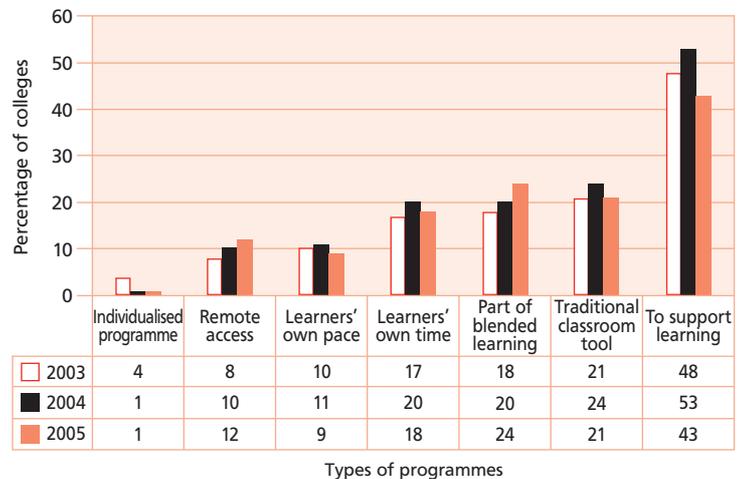
However, there are clearly challenges in realising the effective use of technology to support administration, management and planning in colleges. Golden et al. (2006), in a study of over 2,200 lecturers in general FE colleges and sixth-form colleges, found that a notable minority of respondents (40 per cent) were not convinced that the use of online resources had the potential to save lecturers' time. The majority of lecturers indicated that e-learning had assisted them with preparation for teaching and learning, and had helped them in ways in which would be considered to

Figure 5.5: Extent to which formal targets are set for e-learning



Source: ICT and E-learning in Further Education (Becta, 2005b)

Figure 5.6: Use of ICT in all or most mainstream college programmes



Source: ICT and E-learning in Further Education (Becta, 2005c)

contribute to strengthening the interface between lecturers and learners. Noticeably fewer indicated that e-learning helped them to undertake administration and management tasks more effectively.

Continuity of learning/home-institution links

Widespread use of ICT for remote access to learning increased slightly between 2004 and 2005, from 8 to 12 per cent. At the same time there has been a decline in the use of ICT to enable learners to access some or all of their programmes at a convenient pace or time. Some 53 per cent of colleges delivered learndirect courses in 2005, a significant drop from 2003, when remote learning not delivered via learndirect was offered by 50 per cent of colleges in 2005, a fall of 5 per cent over the same period. Some 32 per cent of colleges offered neither form of remote learning, a proportion that has grown from 21 per cent in 2003.



Workforce e-maturity

ICT training for staff

The 2005 ICT and e-learning in FE survey found that over 90 per cent of colleges offered some development programmes in using technology in the classroom, use of learning platforms, and development of learning materials. By contrast development relating to online learning and teaching was not so widely available, with 32 per cent of colleges not offering skills development in this area.

Finlayson et al. (2005) noted a variety of mechanisms for sharing effective practice in colleges but generally these had limited impact within the six colleges studied outside subject teams. Lack of time was reported as a key inhibitor to sharing good practice. This was especially acute for part-time staff.

Ofsted provides evidence relating to initial training of further education teachers. Based on inspection data from 30 colleges and 13 HE institutions, Ofsted reported that few providers offered certification opportunities in ICT, and, while ICT as an initial teacher's key skill was acknowledged as important, it was not always successfully embedded in the training (Ofsted, 2006). This is in sharp contrast to the school sector where student teachers must achieve minimum standards in literacy, numeracy and ICT before gaining Newly Qualified Teacher (NQT) status.

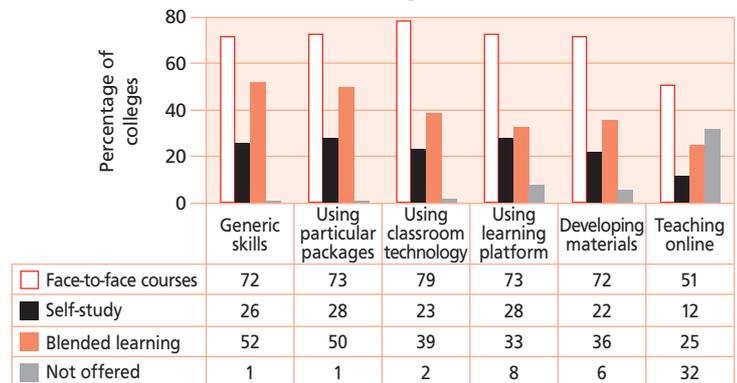
Ofsted, commenting on FE initial training, reported that the most proficient trainees extended student learning through the use of ICT when they had access to appropriate resources. A lack of resources was noted as the reason training providers felt constrained in their ability to develop trainee ICT competences (Ofsted, 2006).

Workforce skills

The 2005 Becta ICT and e-learning survey shows a continuing, upward trend in reported levels of teaching staff ICT and e-learning competence. Colleges overall considered that 59 per cent of staff had reached the level of 'competent' and 'advanced' in e-learning skills. Though there has been rapid progress, however, there is clearly a continuing challenge here.

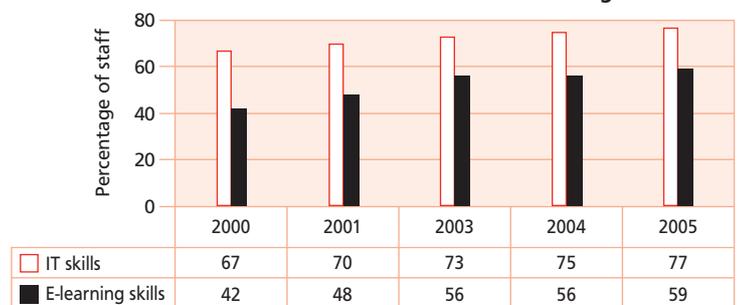
The survey asked colleges to distinguish between IT skills and e-learning skills. IT skills involved the personal use of IT for administration, word processing, lesson preparation or record-keeping; e-learning skills refer to

Figure 5.7: ICT skills development offered to teaching staff



Source: ICT and E-learning in Further Education (Becta, 2005b)

Figure 5.8: College estimates of staff competent and advanced in IT/e-learning



Source: ICT and E-learning in Further Education (Becta, 2005b)

the application of ICT knowledge and skills to use in the classroom and with students to support and encourage learning. Definitions within these categories were left to the judgement of respondents on the grounds of practicality.

On average, 77 per cent of staff were regarded as competent or advanced in their personal use of IT, compared with 67 per cent in 2000. The figures also indicate that the trend between both sets of figures has been upwards, the gap between the two sets of skills appears to have remained constant since 2003. The report notes that:

...the lack of a commonly agreed and well-understood set of definitions of e-learning competences, combined with the uncertainty about what constitutes good practice and effective pedagogy for e-learning, may have led many respondents to overstate the e-learning skill level of staff. (Becta, 2005c)



Finlayson et al. (2006) found that tutors had a wide range of technical skills, but lacked skills required to use ICT effectively in teaching, especially when it came to understanding and awareness of how ICT could contribute specifically towards learning and teaching in their subject area.

Where training is provided only in general uses of ILT (e.g. how to upload materials to the VLE) the tutors may see little purpose in using it, and think it is inappropriate in their subject area.’ (Finlayson et al., 2006)

The Becta survey concluded that when ICT was used in a teaching context, it most commonly supported traditional teaching approaches. Aspects of ICT use which offered the chance for new pedagogical approaches were less prevalent (see Figure 5.9).

The scoping study for the DfES into the impact of e-learning in FE, (Harris et al., 2004) concluded that while there was a generally acceptable technological infrastructure in place within FE colleges:

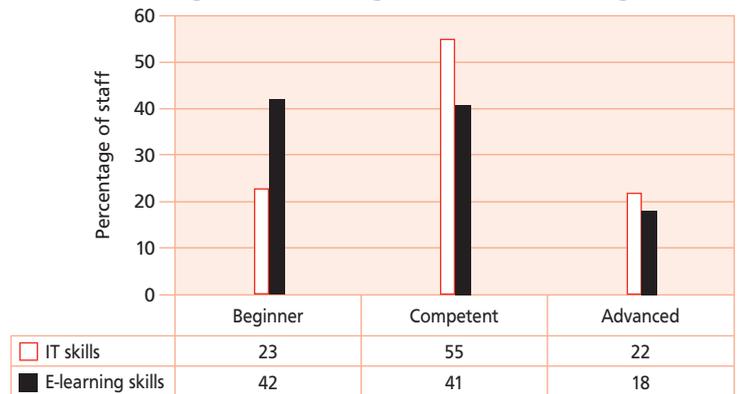
There was still a need to develop teachers’ skills and confidence in using e-learning across the curriculum, with implementation varying greatly between subjects and departments. (Harris et al., 2004)

The LSDA Transformation study (LSDA, 2006) indicates that a year on from their 2005 study, staff ICT confidence and competence continues to be a key barrier to e-learning. Specific concerns include the time and effort needed to absorb these skills, along with a lack of access or frequency of use of e-learning resources for staff and students.

Lecturer attitudes towards and levels of use of ICT

Lecturers tended to agree (to some extent) that there was an expectation that they should be using e-learning in their teaching and learning, particularly from college management (87 per cent), but also from learners (56 per cent). Nearly two thirds (61 per cent) were determined to use e-learning to its full potential, although 7 per cent of respondents admitted that they didn’t know where to start with e-learning and only 15 per cent felt that e-learning had had little impact on them. The report concluded that the majority of respondents were positive and proactive in their use of e-learning and intention to use it.

Figure 5.9: Teaching staff IT and e-learning



Source: *ICT and E-learning in Further Education (Becta, 2005c)*

Becta’s *ICT and e-Learning in FE survey 2005* noted that while display technologies have made significant inroads into teaching practice, colleges still have a way to go in embedding technology in the classroom.

However, in 2005, FE staff were making good use of technology to support their preparation and other activities. The majority of lecturers in the NFER study were using e-learning extensively for this. Over half were using e-learning to present and communicate to learners, but use was more variable with regard to administration and management and in the interaction between lecturer and learner. Lecturers’ perceptions were that e-learning was being used less frequently by learners for some types of activity, for example for presentations, for reinforcing and developing knowledge, for managing learning independently or for collaborating with peers (Golden et al., 2006).

Findings from the NFER survey (*ibid*) indicate that subject-related variability of ICT use was similar to that found in schools. Lecturers in health and social care were generally more negative in their attitudes and business lecturers appeared to be the most committed to, and determined to, use e-learning in their teaching and learning practice.

This was indicated by their responses to:

- I don’t know where to start when it comes to e-learning
- I can readily identify opportunities in my subject for the use of e-learning
- e-learning has had little impact on me

In contrast, business and science lecturers displayed a more positive attitude towards their current experience and practice with using e-learning. In particular a significantly greater proportion of business lecturers expressed an upbeat stance with regard to statements such as: ‘*I don’t know what I would do without e-learning*’ and ‘*I am determined to use e-learning to its full potential.*’ This finding suggests that, for these business lecturers, e-learning



had become embedded in their overall teaching practice and they had seen its value, and this was reflected in their determination to use it in the future.

Learner e-maturity

Learners' access to and use of ICT

In this sector there is limited data on learners' access to and use of ICT. However, the National Statistics Omnibus Survey 2005, found that internet use was highest in the 16–24 age group (83 per cent) and lowest in the 65 and older age group (15 per cent).

Lecturers' reports of the frequency and nature of use of ICT by learners (Golden, 2006) identified the most commonly perceived uses of e-learning were:

- researching activities (67 per cent)
- presenting written work/data (63 per cent)
- working independently (52 per cent)
- reinforcing knowledge (49 per cent)
- creating visual presentations (42 per cent)
- engaging with subjects in the classroom (38 per cent).

Evidence from students at the ICT Test Bed colleges (Somekh, Underwood et al., 2006) provides a number of examples of student use of ICT in subjects across the curriculum. The majority said they were using the technology to create their own presentations to show the results of their research or assignment work to the rest of the class.

Digital literacy

Some indications of digital literacy among post-16 learners can be derived from pass rates in standard ICT qualifications. Ofsted (2005g) reported that pass rates in European Computer Driving Licence (ECDL) and Computer literacy and information technology (CLAIT) were a key strength in around one third of colleges inspected between 2001 and 2005, but that they were too low in many colleges. Retention rates were low in about one third of colleges and this figure had not improved since the beginning of the inspection cycle.

Case study evidence concerning the application of ICT skills to learning by college students is documented in the 2005 ICT Test Bed evaluation report. FE students reported increased confidence and competence in using the internet rather than books to locate information (67 per cent in 2005 compared to 51 per cent in 2003). The internet was their favoured research tool and in 2005 this

became the most daily used application in colleges. In interviews students rated word processing and the internet as the most useful technologies. In 2005, daily use of word processing dropped (14 per cent compared to 38 per cent in 2004) and there was a shift to word processing being used mostly at home.

Impact on learning

The LSDA Transformation project evaluation study (LSDA, 2006), found that one in three lecturers reported that they felt that retention had been enhanced through the use of ICT and e-learning. However, the majority could see no evidence to support the idea, or were less certain. Golden et al. (2006) found a similar picture in a survey of 1761 lecturers, with only 19 per cent saying e-learning had increased retention. Three quarters of those questioned in the LSDA transformation project said that e-learning had improved attainment. Golden et al. (2006) found a lower attainment figure – 31 per cent.

However, when the researchers looked only at the respondents who felt that retention or achievement in general had improved in the last three years in their college, the analysis found that 41 per cent felt that use of e-learning had led to improvements in retention (compared to 19 per cent of all lecturers) and 54 per cent felt that use of e-learning had led to improvements in attainment (compared to 31 per cent).

Further perception data from the scoping study into the impact of e-learning in FE (Harris et al., 2004) found that key informants were positive about the effect of e-learning on participation, retention and attainment. The potential impacts were thought to occur by:

- creating a sense of engagement
- excitement and involvement
- the personalisation of the learning interface to individual needs
- improving communication.

Finlayson et al. (2005) noted that where e-learning uses were aligned with specific pedagogic purposes, this led to positive outcomes such as increase in concentration, student confidence and cognition. Only in a few cases was there objective evidence in the six colleges studied that ILT enhanced retention and achievement rates. In these cases excellent teaching was observed as critical to adding value to learning from the use of ICT.

The NFER research team (Golden et al., 2006), investigated lecturers' perception of the impact of e-learning on their teaching and learning activities. They found that of the lecturers surveyed, 57 per cent felt that they had developed their learners' understanding of the subject more effectively as a result of using ICT/e-learning than they did initially, while 34 per cent felt there had been no change and 1 per cent felt that they were less effective. Also, 64 per cent felt that over the last three years, learners developed their understanding of the subject more effectively using e-learning; 25 per cent felt there was no change and 1 per cent felt learners developed their understanding less effectively. There was also some indication that lecturers felt that e-learning was most beneficial for learners with higher levels of attainment (51 per cent thought it was 'very helpful', 33 per cent quite helpful for these learners).



6

PROGRESS, ISSUES AND CHALLENGES

Key points

- Overall access to ICT continues to improve in the schools sector, with rapid growth in the adoption and use of whole-class display and other supporting technologies. There has been a related acceleration in the use of ICT by practitioners. It is becoming increasingly the norm for practitioners to prepare and deliver lessons using digital resources. However, in FE the picture of improved access and developing practice is more mixed.
- There is still considerable variation between institutions in the level and quality of ICT provision. There are no indications of progress in improving the sustainability and affordability of institutional infrastructure. Survey data suggests that this may in fact be worsening at the moment.
- Progress is also notable in the adoption of learning platforms, though adoption is low in the primary schools sector. Related use to support effective learning is limited, however. The effective use of technology to enhance learner information and support is also in its early stages.
- The strongest indications of improvements to learning and teaching through the use of ICT relate to learner motivation and inspection data.

However, though not unambiguous, there is an accumulating body of evidence which links the use of ICT in learning and teaching to improvements in standards.

- There is clearly evidenced potential for technology to support greater effectiveness and efficiency across a range of educational processes, particularly management and administration. Key system-level interventions are required in order to enable this potential to be realised.
- Engaging hard-to-reach learners effectively requires an understanding of their diverse needs and how, where appropriate, technology can help meet some of those needs. Learning from innovative projects and enabling the transfer of learning is essential.
- The use of technology to support an increasingly open and accessible system is in its early stages. There is a need to address both technical and professional practice issues to make significant progress against this objective.
- Key issues and challenges include: overcoming critical variation, supporting whole-institution change, achieving sustainability and affordability, embedding the learner space, promoting e-assessment, using data to support educational decisions, understanding the implications of difference between primary and secondary school sectors, supporting continuity of learning, understanding the implications of current learner access and capability and better supporting discovery and selection of digital resources.

OVERALL PROGRESS

ICT Provision

In last year's *Becta Review* we reported that:

...there has been recent significant progress, especially in the areas of learner access and institutional ICT provision. Practitioner ICT confidence and levels of use in learning and teaching have shown considerable growth over the last two years, and we have evidence of a positive impact on standards. International comparisons suggest that the UK is one of the leading nations when it comes to the development and use of ICT in education. (Becta Review 2005, preface)

Again, this year has seen some rapid change across the system. As with last year, improvements to infrastructure provision are particularly notable. Student:computer ratios continued to improve in the schools sector, and the adoption of interactive whiteboards and whole-class display technologies continued its high rate of growth. Increased student numbers in the FE sector, however, meant that ratios worsened between 2004 and 2005, though there are other signs that technology provision is improving and the number of colleges with poor student:computer ratios is decreasing.

In line with these trends, last year fewer school practitioners reported that the quantity of ICT resources was less than they needed (for example, for laptops, this dropped from 67 per cent in 2002 to 45 per cent of primary teachers in 2005). Similarly, though there was no real change in reported ratios in FE institutions, the number of colleges with over-stretched networks fell dramatically, from 7 per cent to 1 per cent, signalling some improvements to student and practitioner experience in the use of ICT.



However, though it appears that overall progress in provision and the related experience of practitioners and students is generally good, there are still issues to be dealt with. Notably, the sustainability and reliability of institutional infrastructure remain challenges, as does variation between institutions in terms of levels and quality of provision, particularly in the schools sector (see 'Issues and Challenges', page 58).

Digital learning resources and ICT practice

Provision and use of digital learning resources has also developed. Last year's *Review* reported that some school curriculum areas were relatively poorly served. This year, though the rate of increase in Curriculum Online-registered products has slowed, gaps are being filled, with large increases in non-core as well as core curriculum products. Levels of use of digital resources in lesson preparation and delivery are also rising quickly in schools. This trend is not reflected as strongly in FE at the moment. However, growth has been steady in this sector over the last few years.

It is important to note, however, that growth in provision does not necessarily mean improvements in the quality of provision. Indicative data from the BETT Awards suggests that a considerable proportion of products are not judged to be high quality.

There have been notable improvements since 2002 in teachers' reported ease of locating relevant subject software. Resource discovery and selection, however, is still an issue for many practitioners, as reported in the Curriculum Online evaluation study. Availability may be good, but practitioners report that, arguably as a consequence of high levels of provision, they are 'spoilt for choice' and do not have time to properly evaluate and select resources for specific purposes.

Rapid and noticeable progress especially in the schools sector, therefore, focuses around the use of digital resources in lesson preparation and delivery, facilitated by the growth in display technology provision and use. Patterns of adoption in fact reflect a classic bell curve, now at the steep point in the upward curve, indicating adoption which is clearly demand-led and set to continue.

A further indication of demand in the system is the high level of reported need for training in the use of ICT by teachers. This was reported as the highest area of need in 2005. Though this contrasts with the views of headteachers, there is arguably a realisation by

practitioners that, in order to fulfil the pedagogical potential of technology and reflect the growing expectations and experiences of learners, further professional development is required. There are indications of similar issues in FE, though expressed lack of capability appears to be confined to a smaller group of practitioners.

So we have a situation of high demand for the use of technology in learning and teaching and a strongly perceived skills gap, or training need, among practitioners. Clearly the compelling progress in adoption is not at the moment being matched by related progress in the confidence and capability of practitioners.

Learner information and support

Patterns of adoption of technologies such as integrated management information systems linked to learning platforms are fairly low at the moment, especially amongst schools, though demand appears to be present. The challenge of embedding the 'learner online space' is discussed in the final part of this section. In terms of general progress in this area there are some encouraging indications, with some firm signs of rising adoption by schools and clear intentions for a high proportion of secondary schools to purchase these platforms in the future. FE colleges are more advanced – a far greater proportion of FE providers use VLEs and related platforms than schools, though only a minority do so as their main platform.

The main barriers to progress in this area relate to the development of effective practice in the use of information to better support learners and learning and to the continued challenges of linking curriculum and management information systems – an issue reported in the *Becta Review 2005* and the subject of recommendations to Government by Becta in its 2005 MIS review. These challenges are discussed further in the final part of this section.

The use of technology to improve the provision and use of learner information – in support of a range of educational processes, including learners' transitions between institutions and sectors, helping parents better understand children's learning, and enabling practitioners to make decisions about programmes of work for individual learners – though advancing in pockets of good practice, is still very much in its early stages. Given the evidenced benefits arising from the effective use of technology for these purposes, as identified, for example, in the ICT Test Bed evaluation, there is a clear argument for strategies to accelerate progress in this area.

The rapid adoption and rise in use of technology by practitioners over recent years represents an encouraging sign of readiness to engage with the increased use of online information. Arguably, as practitioners' and leaders' online experiences in the workplace and elsewhere increase, there will be a commensurate increase in demand for the use of online information as opposed to information from practitioners. Arguably, too, as parents' experience of technology in their own lives increases, there is likely to be increased demand from this group for online information about learners. This does not, however, ensure that the challenges of implementation are met. These are discussed in the final section.



PROGRESS IN MEETING EDUCATIONAL OBJECTIVES

While not always the case within both the school and learning and skills sectors, the evidence suggests there has been progress against all objectives of the strategy:

- Transforming teaching and learning and helping to improve outcomes for children and young people, through shared ideas, more exciting lessons and online help from professionals
- Achieving greater efficiency and effectiveness, with online research, access to shared ideas and lesson plans, improved systems and processes in children's services, shared procurement and easier administration
- Engaging 'hard to reach' learners, with special needs support, more motivating ways of learning, and more choice about how and where to learn
- Building an open accessible system, with more information and services online for parents and carers, children, young people, adult learners and employers and more cross-organisation collaboration to improve personalised support and choice.

These objectives are of course not independent of each other. For example, improving the quality of learning and teaching, wherever it happens, is likely to serve the objective of engaging hard to reach learners, as will improved online information and services.

Transforming teaching and learning and helping to improve outcomes

The evidence demonstrates that the range of ICT-supported activities in schools continues to grow, driven to a large degree by the rapid adoption of interactive whiteboards and related technologies. There is a clear trend for increasing numbers of school teachers to make regular use of ICT in lessons (use in half or more lessons), but while the use of ICT across subjects is growing steadily, the extent and frequency of use vary widely. A similar situation is found in the post-16 sector, where the extent to which colleges have deployed ICT for teaching and learning, including induction, assessment, teaching and supporting learners, is steadily rising.

Practitioners' attitudes and competence

Teachers' attitudes towards using ICT resources, including material on the internet, for lesson planning

have also become more positive over the past three years. The skills and confidence of staff to use ICT in subject teaching had shown a marked improvement over the five years to 2003. However, 2004 saw a drop in levels of staff confidence to use ICT in subject teaching, which could be indicative of a levelling off, or a reappraisal of need. Teachers also reported that 'ICT' was a priority training need despite headteachers reporting that they believed that teachers' ICT expertise met or exceeds most current needs.

In the FE sector, colleges reported a continuing, upward trend in levels of ICT and e-learning expertise in lecturing staff. Overall, colleges considered that a majority had reached the level of 'competent' and 'advanced' in e-learning skills. Given evidence from the schools sector that heads and teachers have widely differing views on training need in this area, this does not necessarily suggest that competence has been developed to the levels reported. It is likely that, though there has been progress, there is a continuing challenge in this area.

Pedagogy and improved outcomes

Ofsted inspections offer evidence of continued improvements to the quality of use of ICT in learning and teaching in schools. The issue is the extent to which this supports better learning. There is a growing but not unambiguous body of school evidence indicating that ICT has a positive impact on learner attainment and other outcomes. Though this impact has been picked up in recent studies, it is fairly small and is variable. The strongest school sector evidence to date relates to the motivational effects of learning and teaching using ICT. There is clearly a challenge to translate engagement and motivation into solid added value in terms of learning outcomes. In the post-16 sector we are reliant on practitioner reports of impact on outcomes. In one survey of college lecturers three quarters reported that attainment had improved through the use of e-learning. However, in another study the figure for attainment was around one third.

Overall, the picture appears to be one of growing enhancement of learning and teaching using technology. Case study evidence from other sources, such as Becta's ICT in Practice awards, demonstrates that there are pockets of leading edge practice which can be viewed as transformational – representing genuine innovations to learning and teaching practice. These, however, are currently limited. The challenge continues to be that of learning from developing practice and engaging with professional forums and networks in developing and embedding effective practice more widely.

Achieving greater efficiency and effectiveness

Research cited in the *Becta Review 2005* demonstrated that ICT has potential to improve efficiency and effectiveness in various areas of educational administration and management, both at the institutional and class/practitioner levels. However, realising real value is dependent on a combination of effective leadership, training and technical support, as well as access to a suitable technical infrastructure. Currently the effective use of technology to support institutional management and administration is likely to be present in only a minority of schools. However, trends suggest that the potential for realising efficiencies is growing, as indicated, for example, by evidence that schools are increasingly using learning platforms and VLEs to



enable practitioners to share teaching materials and lesson plans.

Management and administration

Again, though progress is limited to date, an increasing number of institutions use ICT to support better use of data to allocate staff and resources, improve management of performance, and support monitoring, target setting and challenge to staff, pupils, parents and others. However, relatively few schools currently integrate their management and learning systems, although a considerable minority are planning to do this. Evidence from both the school and the college sectors tells us that setting up and using an integrated network of this kind is not straightforward, owing partly to currently poor standards of interoperability.

In colleges the use of electronic information to support teaching and learning has progressed. Information from tutorials appears to be recorded electronically in a growing minority of colleges, while a quarter maintain electronic student portfolios or records of achievement. A survey of workplace-based providers shows the same broad pattern. Colleges are also moving towards better integration of ICT and e-learning within all areas of study. However, this is clearly a challenging process and requires major leadership commitment and resource deployment. We know that the most effective e-learning strategies also develop when all staff have fully 'bought in' to the overall vision for learning, there are associated strategies for the use of ICT, and there is a phased approach to implementation.

We have an improving picture in the development of ICT leadership in the schools sector, due in large measure to the National College for School Leadership 'SLICT' programme, but also to more general awareness of the importance of strategic approaches to technology implementation. In the FE sector the picture is slightly different. A decreasing number of colleges set targets relating to ICT and e-learning, suggesting that there has not been an increase in the number of colleges leading e-learning development centrally. Department-led approaches appear to dominate. This is likely to serve as a barrier to further progress in relation to effectiveness and efficiency.

Workload

Given current limitations in institution-level strategic planning for ICT and e-learning, it is likely that there

is a mixed picture currently in relation to the impact of technology use on workloads. However, we do know that teachers consider that the introduction of ICT has reduced workloads and saved time in lesson preparation through the re-use of learning objects. However, we also know that, owing to hardware limitations and the time expended on evaluating digital materials and embedding them in practice, *significant* time savings from the use of educational content may be hard to achieve. We also know that practitioners do not necessarily save time gained from using digital resources, but tend to use time freed to produce more or better quality outputs – so a productivity gain, rather than a time saving, is the predominant pattern.

It is likely that similar productivity gains are accruing as a result of the increasing use of digital resources and tools in the post-16 sector, although there is currently no clear evidence of actual time savings. We know that a considerable proportion of college lecturers were not convinced that the use of online resources had the potential to save their time, although most indicated that e-learning had assisted with preparation for teaching and learning. Few indicated that e-learning helped them to undertake administration and management tasks more effectively.

Hidden costs

Hidden staffing costs for supporting technology in institutions must be factored into the analysis of productive time. A key aspect of this is the non-technician staff time taken up in maintenance and technical support tasks. This was also identified in the *Becta Review 2005*. There are likely to be many reasons for this, but the lack of reliability of equipment, systems and networks is a key factor. Becta's current plans – to better support educational institutions in purchasing and managing hardware, networks and systems to a high standard, in order to improve reliability and effectiveness – have potential to produce productive time benefits for practitioners.

Overall, there is clear potential for greater effectiveness and efficiency in educational processes, including administrative and management processes, to be achieved with the support of ICT. The challenge is that of effective leadership, resource deployment and change management to this end, primarily at the institutional level. However, key system-level interventions, such as Becta's national standards for digital infrastructure, are likely to enable positive change in this area. Further work in developing a coherent national-level technology-based architecture for learner data and information is also likely to improve effectiveness and efficiency across the system.

Engaging 'hard to reach' learners and learners with special educational needs

'Hard to reach' learners represent a diverse set of groups, each with distinct learning needs and circumstances. They include groups as such as children from the travelling community, prisoners, learners with special educational needs, including those with a range of cognitive, sensory and physical disabilities, excluded school pupils and 16-19-year-olds not in education, employment or training.

As a result of this diversity, it is very difficult to make general assessments about the contribution that ICT and e-learning can make to engaging and



supporting them. At the moment there are many examples of good practice in using technology-based interventions to engage and support these learners. Among many examples are the groundbreaking and successful 'notschool.net' project for engaging young people who have been outside traditional school education for a period and the 'E-LAMP' project for supporting the education of travelling children (Marks, 2004). At the same time the Communication Aids Project has provided technology-based support to learners with significant difficulty in communicating with others, enabling access to learning, development of life skills and greater autonomy in life choices.

These projects represent valuable examples of effective practice in meeting the needs of specific groups. The extent to which a national technology strategy is successful in addressing the needs of a significant number of hard-to-reach learners is to a large degree dependent on how effectively lessons are learnt from these kinds of projects and how well practice is embedded appropriately across the system. Robust evidence of the effectiveness of projects of this kind is important in enabling this.

Clearly, technology-based interventions are more likely to address the needs of some groups than others. For example, technology has enabled blind and visually-impaired learners to learn alongside their peers, with screen readers enabling them to 'read' books and websites. Switch and symbol-supported ICT is helping many physically disabled learners to express themselves. Any meaningful overall assessment of the impact of technology in supporting the engagement of hard-to-reach learners and learners with special educational needs must be informed by an awareness of the relative potential of technology-based interventions to support different groups. Becta is currently engaged in work to develop this understanding, and until this picture is clearer, meaningful impact assessment is not possible.

However, within formal learning settings most of the improvements already reported as relevant to learners in general also have an impact upon some hard-to-reach groups, arguably with more force at times. Issues such as continuity of learning, improved information management, provision of a wide range of resources and engaging forms of technology are as much help to these learners as to others.

In schools, for example, there is good evidence that ICT contributes to pupils' perceived efficacy in

learning by providing tools which enable pupils with different needs to achieve success, while nearly a third of college lecturers have reported that retention has been enhanced through the use of ICT and e-learning.

It is argued that it is important that education develops diverse approaches to learning and teaching to help pupils engage with learning. Work to fully understand the educational potential of games is ongoing and has a clear contribution to make in this area. Whilst, without good evidence of effectiveness, it is important to be cautious about this potential role, research has identified that games may have potential to support the development of new cognitive abilities, faster processing of information and the enhanced selection of relevant material/key elements of concepts from a range of sources. These developments may enable learners who may otherwise become disengaged to take part in learning. At the moment, however, there is a need for systematic evaluation of the learning outcomes arising from embedded use of games to support learning, plus further work to develop a comprehensive understanding of the contexts and learning and teaching practices to support this new approach to learning.

Building an open and accessible system

Progress in this area depends on a strong technical infrastructure within individual schools and colleges and the establishment of effective links and partnerships between a range of institutions within and beyond the formal education system. This review has confirmed that progress has been made on the first. However, apart from case study evidence in specific areas and regions, there is less evidence to suggest that technology is being used systematically to support effective partnerships between organisations, for example to avoid duplication of learner information, or to support learner transitions with the seamless transfer of student portfolios.

Sharing and transferring information

In terms of the development of an underpinning capability, there is strong evidence from the schools sector that it is difficult to link transfer data within institutional systems – the problem of linking management information systems to learning platforms. There are also challenges based on existing practice and systems. The move to electronic returns, such as the DfES Common Transfer File (CTF) and Pupil Level Annual School Census (PLASC) has placed a strain on schools, local authorities and MIS providers.

These issues are also reflected in problems supporting effective two-way interaction between home and institution. Though further work needs to be done to understand the implications of this, it may be a critical barrier to opening up provision and allowing effective extra-institutional partnerships to operate effectively.

The strongest message in this area, however, is that even when information can be effectively shared or made available, institutional practice in using it to support learners tends to be limited. Thus the development of professional practices in this area is as important as solving the technical problems in sharing and transferring information.



Linking schools and colleges to the wider world

There is evidence of growing collaboration between institutions which is supported by technology. This is strongest in the post-16 sector. For example, 80 per cent of colleges reported collaboration with other colleges and schools on some form of ICT-related activity. Whilst it is difficult to know what kind of activities are being supported, the fact of collaboration of this kind is encouraging for developments in this area.

Levels of provision and use of video conferencing, however, have remained relatively stable over the last period, suggesting that if 'live' links between institutions are to be encouraged, for example to enable specialist lesson delivery, or to enhance international twinning, this area may need targeted intervention and support.

ISSUES AND CHALLENGES

A review of this kind will inevitably identify issues and barriers in the effective development of technology to support educational processes. Technology-supported change in any sector is challenging, but is arguably more so in education than in other sectors, as its application extends beyond improving information and communication productivity to supporting complex social and cognitive processes. These are some of the current issues and challenges, for consideration and possible action at all levels in the education system.

Critical variation

The issue of variation between practitioners, departments and educational institutions was raised in the first part of this section. This was a key theme of the *Becta Review 2005*. While there is evidence that some of the more problematic differences, such as stark differences in students' access to ICT, are being overcome, there are still issues in this area. It is not reasonable to demand that all institutions across a given sector have the same levels of provision and use of ICT, since different circumstances and missions demand differing deployment solutions. Nonetheless, existing variation is problematic in terms of delivery of educational processes and outcomes. Critically, in those institutions which are not yet e-enabled, the use and effectiveness of learning and teaching with ICT is dependent on individual practitioners or department

leaders. In these cases, the experience of learners within the same institution is likely to be variable. Where a learner studies a range of subjects, for example, use of technology may be effective in one but not in another, even where use supports generic rather than subject-specific processes, such as information search and retrieval. Becta's work to support institutions in developing reliable and affordable infrastructure and effective strategic leadership and management of ICT is clearly necessary to help reduce these critical differences.

Whole-institution change

As reported in the analysis of the impact of ICT on attainment in last year's review, the strategic leadership of ICT at an institutional level, integrated effectively with other institutional processes such as curriculum planning, is a critical enabler in achieving value from ICT investment. The ICT Test Bed evaluation and other research have emphasised the importance of the integration of, for example, learning and teaching strategy and professional development planning to the successful implementation of technology to support learning. The continuing flow of participants in the National College of School Leadership's 'SLICT' programme is an important facilitator of this change, as is Becta's Self-Review Framework.

It is important, however, not to underestimate the skills, capabilities and pure determination required to implement technology effectively at an institutional level. It is critical that ongoing monitoring of progress and issues in this area plus research into the transferability of effective practice continue to inform debates, discussions and policy interventions relating to effective whole-institution change.

Sustainability and affordability

In line with our earlier discussion of overall progress, there are remaining issues relating to institutional sustainability of technology. We have seen a worsening picture in relation to this in FE – a marked increase in colleges waiting beyond three years to replace computers (Becta, 2005b). In schools there has been no drop in the proportion of computers for learning and teaching which are over three years old. Sustaining current ratios is a struggle for institutions across sectors.

This issue exists in the context of a changing technology landscape. It is important in the sustainability discussion not to forget the increasing capabilities of mobile and other devices. Arguably the effective use of technology to support learning can only be delivered fully if learners have ubiquitous access to technology. This is only really achievable on the basis of personal access to a device both at school and at home. At the moment this is far from the case, though pilot projects using mobile devices such as laptops and PDAs (personal digital assistants) are providing interesting outcomes.

Embedding the learner space

Though there is evidence of growing adoption of learning platforms in both the schools and FE sectors, the goal of providing all learners with an online space which supports learning in meaningful ways is likely to be a continuing challenge. We know from findings in the post-16 sector that the adoption of the technology does not necessarily mean that it is being used in any systematic way across an institution.



We have also seen differences in reported intentions to use learning platforms between primary and secondary sectors. This is likely to be due to differences in learning and teaching practice and in learner management between these sectors. Secondary school practice may in fact currently represent a better foundation for the meaningful development and implementation of the online learner space than primary school practice. In promoting an online space for every learner, it is essential to understand the ways in which future practice with online learner spaces links with existing practice and organisation in order to fully understand and address the challenges of implementation.

The e-assessment challenge

Though there is very little detailed evidence in this review on e-assessment, the little that there is offers a clear message of relative lack of progress in this area. QCA's implementation of the online Key Stage 3 ICT test is a notable development. However, greater personalisation for learners demands greater and more intelligent use of assessment to support learning – to enable practitioners, learners and parents to reflect on the progress and individual needs of learners.

We know from pockets of practice that good digital learning resources have the potential to enhance assessment for learning and to enable differentiation of learning in an efficient way. The challenge here, again, is one of developing practice. It is, however, also one of developing and promoting effective resources to support assessment for learning. The challenge, therefore, is one for the ICT industry as well as educators and educational managers.

Using data to support educational decisions

There is evidence that some institutions have deployed and used technology very effectively to deliver enhanced information about institutional performance and individual learners. There are clearly pockets of good practice, and evidence of the capability of technology to support positive developments in practice effectively across the system. But continuing challenges remain. As we know, the challenge here is two-fold: achieving effective interoperability and communication between technology systems to enable the right information to be made accessible in usable and efficient ways, and encouraging change in practice with information to support educational decision making.

It is difficult to make simple assessments of how this challenge can be met, as the context is a complex one, involving governmental data requirements, local authority data management and institutional collection and use. It may be necessary for policy intervention from the centre to encourage a prioritisation of this as an area of development. This would need to be facilitated by related technology development and advice on tools and approaches to support enhanced use of information.

The primary–secondary divide

A clear message emerges from this review: that there are differences between the primary and secondary school sectors in terms of the implementation and use of technology. A range of measures presented in this report pick up sometimes stark differences between the two. Overall it appears that the primary sector is finding it easier to integrate standard classroom teaching practice with technology than the secondary sector. However, the secondary sector, as evidenced by its adoption of and preparedness for learning platforms, is more ready to support the development of the online learner space and related online information for parents and learners.

In line with the earlier points relating to embedding the learner space, there are clearly differing learning, teaching and educational management processes operating between these two sectors, with implications for technologies and approaches which are considered suitable and effective.

This is a challenge inasmuch as there are strategic ambitions for the role of technology in supporting a range of educational processes. It is likely that some will be easier to implement in one sector than another. Arguably, the use of digital interactive learning experiences to support personalisation may grow faster in the primary sector, whereas the use of learning platforms to store outcomes and outputs from learning will grow faster in the secondary sector.

Supporting continuity of learning

One of the main benefits of many learning technologies is that they can enable access to information and to learning experiences anywhere and at any time. For many learners, especially those engaged in independent learning, or those working or living remotely from their host institution, these capabilities can be invaluable. This is an area, like many others, which is in its early stages of development across much of the education system. Recent studies have documented the specific challenges in using technology to support continuity of learning.

A continuing challenge is that of providing equitable access to the right technology beyond the institution. There are clear messages that access to the internet in the general population, though high overall and in terms of international comparisons, varies considerably on the basis of socio-economic group. There are initiatives under way to help redress this balance, and many institutions offer loan schemes to enable access to computers for learners. However, internet access, especially broadband access, remains limited for some groups. In addition, remote access to institutional platforms remains limited, especially in the schools sector.



Further work is essential to develop sustainable models of ICT resourcing and access to support continuity of learning.

Learner access and capability

Of relevance to these issues is the growing use of technology by young people who have good access at home. We know that there is increasing engagement by young people with the online world, as evidenced by the growing use of online capabilities and applications such as instant messaging, chat and blogging.

This presents a series of challenges. The first relates to an apparently growing digital divide among young people, whereby those with good access at home are demonstrating accelerated progress in the use of technology, whereas others still have limited skills. Recognising and acting on these differences is critical if technology is to become further integrated into learning and teaching.

The second is the growing divide between the experience young people have of technology in educational institutions compared to that at home. This is related to the issue of the differential between the ICT skills of learning and teaching practitioners and young people. This is likely to have an impact on practitioners' perceived competence and confidence in using technology with young learners. The development of practice in learning and teaching with ICT should take into account what young people bring to this experience and how this can be utilised.

Digital resources – discovery and selection

Though the number of digital resources for learning has increased, there remain issues for practitioners in the discovery and selection of resources. Many of these issues relate to the time it takes to identify potential resources, evaluate them and make informed judgements about what can be effectively integrated in the learning and teaching process. Given that the number of lessons delivered, for example, by a school teacher each year may exceed 900, the sourcing of digital learning resources in a technology-enabled context needs to happen on a routine basis.

The challenge here is to establish the systems and processes which enable discovery and selection of resources as a matter of routine, based on sound,

practitioner-relevant information. This is a complex challenge which is unlikely to be met at the institutional level. It requires a system-wide underpinning information structure which supports practitioner decision-making, and is likely to also be supported by networks and channels which enable the sharing and development of professional practice.

CONCLUSIONS

Though it is just one year since the *Becta Review 2005* discussed the progress of technology in education, there are clear differences to report since the last review. Though many findings relating to progress are the same as last year – for example, continued development of the infrastructure – there has been notable accelerated progress in the development of practice. It is now becoming the norm, for example, that teachers prepare lessons using online resources. Use of display technologies to support classroom learning is also becoming the norm. Thus we can see a noticeable embedding of technology into everyday learning and teaching practice.

Despite evident improvements in key areas, there is still fairly high variation in the adoption, deployment and use of technology. Last year's review reported this at both practitioner and institutional levels, noting that in 2004 around 15 per cent of institutions across the sectors were 'e-enabled'. In FE the number of e-enabled institutions has increased, but there is still a core of institutions whose progress is slow. Clearly, continued effort should be directed at smoothing out some of the critical variation where it occurs.

There are new developments which represent the next generation of accepted practice. We are seeing noticeable adoption in key areas. In supporting mobile access for example, the adoption trend for laptops and other devices is rising, and there are increasing reports of the use of these technologies to support learners' real-time and independent use of the internet for research. Similarly, though still representing pockets of leading-edge practice, there are clear signs of the development of effective use of learning platforms to support learning, teaching and management in a coherent, effective and efficient way. This is a key point at which 'best practice' to support educational processes in these areas can be established. Learning from early adopters is critical at this stage, and should be prioritised at all levels in the system.



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ANNEX: ICT TEST BED MATURITY MODELS

More details of the model and the ICT Test Beds Evaluation may be found on the website [http://www.evaluation.icctestbed.org.uk/methodology/maturity_model/].

Model	Elements in the model	
Technological Maturity	<ul style="list-style-type: none"> • Policy overall • Policy for resourcing of equipment • Connectivity • Interoperability • Accessibility/fitness for purpose • Security of network and users • Infrastructure management 	
Curriculum Maturity	• Institutional	<ul style="list-style-type: none"> • Curriculum ICT policy • Monitoring effective learning • Institutional awareness of exposure to ICT
	• Teacher	<ul style="list-style-type: none"> • Embedding ICT in teaching and learning • Critical thought • Teacher innovation • Fitness for Teacher creativity • Usage and planning • Reuse of materials • Inclusion • Assessment • Teacher encouragement of autonomy • Student autonomy
Leadership/Management Maturity	Pupil/learner	<ul style="list-style-type: none"> • Critical thought • Creativity • Enrichment • Student autonomy
	Leadership	<ul style="list-style-type: none"> • Vision • Planning • Policy • Implementation
	Management systems	<ul style="list-style-type: none"> • Management systems • Data collection • Analysis of attainment and progress
	Co-ordination of ICT	<ul style="list-style-type: none"> • Co-ordinator's role • Co-ordination of ICT
Workforce Maturity	Whole staff development	<ul style="list-style-type: none"> • Planned staff development • Training options • Learning online • Staff ICT skills
	New approaches to learning and teaching	<ul style="list-style-type: none"> • New approaches • Monitoring innovation
	Technical support	<ul style="list-style-type: none"> • Provision • Proactive or reactive technical support
	Developing workforce roles	<ul style="list-style-type: none"> • Use of support staff in learning and teaching • Using support staff to reduce administrative roles



Model	Elements in the model
Linkage: Inter/intra-institutional Maturity	<ul style="list-style-type: none"> • Communication throughout the institution • Communication through/with other institutions • Communicating with LEAs • Nested learning communities • Sharing of expertise • Sharing of best practice
Linkage: External communication	<ul style="list-style-type: none"> • Wider community access to resources • Websites • Communicating with homes • Communicating with parents • Students' electronic links to the institution • Use of external expertise • Parental access to ICT • Providing information for use by the wider community

QUALITY PRINCIPLES FOR DIGITAL LEARNING RESOURCES

A copy of the full set of Principles may be found on the Becta website [http://partners.becta.org.uk/index.php?section=sa&cat code=_sa_cs_cf_03].

The Quality Principles have been developed to be generally applicable to a range of ages and contexts, including the schools and post-16 sectors. Becta does not intend the quality principles to be used as a checklist, but as a basis for developing supporting materials for differing audiences and purposes. The principles are in two parts:

- Core pedagogical principles
- Core design principles.

Details of the elements which make up the pedagogical principles are now explained in more detail.

Core pedagogical principles

1) Match to the curriculum

'Curriculum' refers to any programme or learning activity planned by practitioners and/or learners. Digital learning resources should be aligned to an appropriate curriculum or programme of learning activities by having:

- clear objectives, specified at the appropriate level
- content that is relevant, accurate, trustworthy and authoritative

- learning activities that are appropriate to curriculum goals
- assessment (where it is present) that is appropriate to curriculum goals.

2) Inclusion and access

Under UK legislation, educational institutions are required to ensure that no learner is prevented from participating fully in education or disadvantaged because of factors such as:

- physical, sensory or cognitive impairment
- ethnic or social background
- gender.

The learning experience offered must be based on inclusive practices. This includes selecting appropriate pedagogies and resources. Digital learning resources should, in most circumstances, support inclusive practices in their design and in the supporting materials they offer practitioners and learners.

3) Learner engagement

Teaching and learning should engage, challenge and motivate learners. This entails an experience that:

- is motivating, in that it encourages a culture of learning, is enjoyable and is experienced positively by practitioners and learners alike
- has a worthwhile educational aim and is not simply about occupying or entertaining learners
- does not produce reactions to learning that are likely to reduce the general motivation to learn or that could discourage learners from using ICT to learn.

Engagement and motivation are achieved through a complex mix of aesthetic, technical and educational design and can be strengthened by the context.



4) Effective learning

The experience of effective learning promotes effective cognitive and behavioural development or change. This principle can be realised in a variety of ways, including:

- the use of a range of approaches that allows the learner to choose one that suits them, or that can be personalised for the learner, or that will extend the learner's repertoire of approaches to learning (such as 'learning how to learn')
- the provision of evidence that learning outcomes have been realised
- the satisfaction of a range of the characteristics of effective learning, including supporting appropriate learner agency and autonomy, encouraging metacognitive skills and higher order thinking, and enabling or encouraging reflection and collaboration
- the provision of authentic learning (authentic to situations outside the immediate learning environment and to the learners' existing perspectives and situations)
- the provision of multiple perspectives on a topic (another aspect of authenticity).

5) Assessment to support learning

In order to support learning, teaching and learning should incorporate a formative assessment of what has, or has not, been learnt or understood. This includes providing feedback to the learners on their acquisition of knowledge and skills. The feedback should be specifically aimed at improving learning and should provide or point to other activities that further support learning. This need not be limited to the provision of tests and may be achieved via:

- rapid feedback that helps learners see how they can improve and what they must do to improve
- opportunities for peer- and/or self-assessment, with appropriate understanding by the learners of the criteria or standards of performance required.

To be effective, feedback needs to be personalised; that is to say specific to the individual learner's problems and needs

6) Robust summative assessment

Summative assessment should be used to provide information on learner performance that can be used for guidance or selection in relation to future education or work opportunities. Not all technology-enhanced learning will encompass summative assessment, but where it does, it must be:

- valid and reliable in that it assesses what is meant to be assessed and gives consistent results for particular learners or other users
- informative in that it is usable and comprehensible by practitioners, learners, parents and employers (as appropriate)
- able to deal with a range of achievement levels
- able to be retained and accessed over time by users, if they wish to do so, as evidence to support their progress or claims about their own learning.

7) Innovative approaches

Digital learning resources may be innovative in their design and use of technology and/or innovative in the approach to teaching and learning that they offer.

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