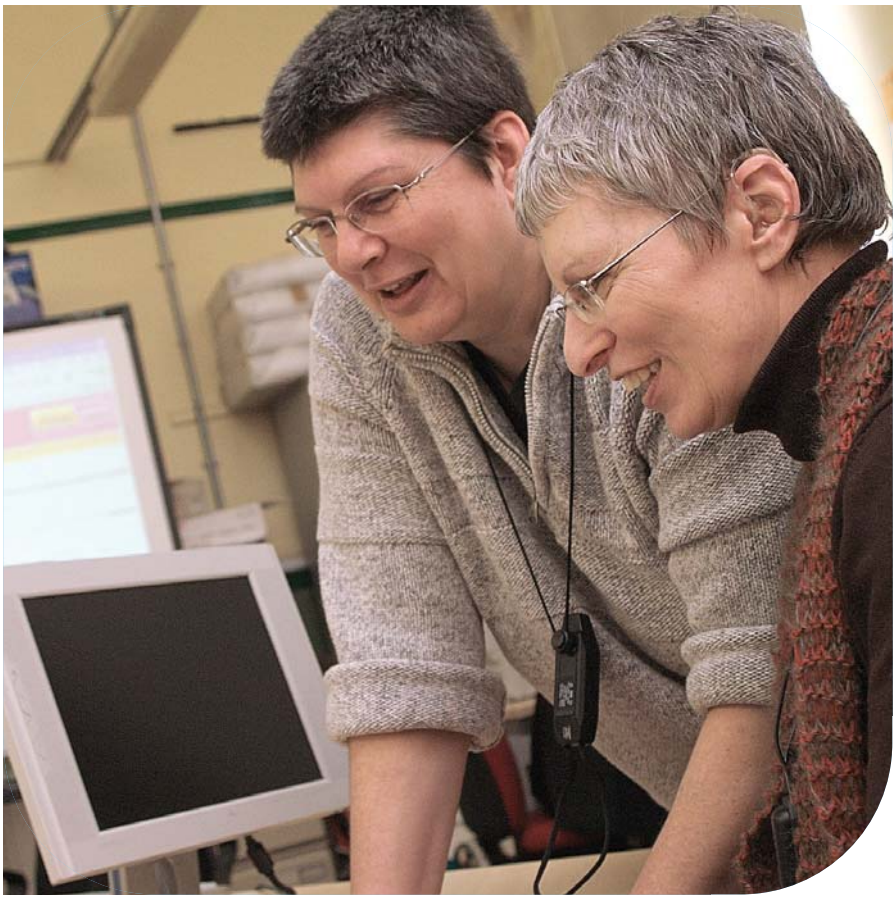
Learning in the 21st century

The case for harnessing technology



Becta

Executive summary

There has never been a more important time to consider the role of technology in promoting and supporting learning. Modernising schools and colleges and developing skills for tomorrow's workforce are important policy priorities. Technology has a critical role in delivering these agendas.

This report summarises Becta's case for technology. It presents the powerful, evidence-based arguments for investment in technology across education and training.

Current academic and public policy research shows that technology:

- **Raises standards**
  – improving learners' attainment in schools and further education colleges where technology is effectively embedded.
- **Develops the skills needed for today's workplace**
  – enhancing individuals' employability and the global competitiveness of the UK.
- **Improves motivation**
  – making learning more enjoyable and rewarding, especially for the 'hard to reach', and empowering learners to take greater control of their learning.
- **Frees up teachers and college tutors from routine tasks**
  – increasing productivity and efficiency, and allowing more time for personalised approaches.

"What makes our ambitions possible is to apply the transformative power of technological innovation to learning – enabling technology to be what it has the potential to be: the great liberating force in providing opportunity to all."

Prime Minister Gordon Brown, 2007

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Technology in schools and colleges assists teachers and tutors, improves attainment and motivates students in new ways.

Improving access to technology develops the key skills required in today's economy.

How technology boosts learners' attainment in schools and colleges

"The most effective schools provide clear evidence that technology is helping to improve achievement and open up choice through innovation. It's time to ensure every school steps up and follows their lead. I see technology as the central enabler for continued improvement. We need people to want to use it, and know how to maximise the benefits."

Schools Minister Jim Knight, 2007

Technology boosts attainment levels overall and makes education more responsive to the learning needs of individual students.

In this context, it is crucial for education providers to have a forward-thinking approach to computers and technology systems. Too often, education policy fails to recognise the benefits of taking a more strategic approach to technology implementation. In failing to do this, schools and colleges miss out on opportunities to enhance learning and improve educational outcomes.

1. Technology makes a positive difference to learning

Consistent evidence, dating back over a decade, shows that technology can and does improve attainment in almost all National Curriculum subjects and in the achievement of National Vocational Qualifications (Cox et al 2003). In schools the biggest improvements have been in the core subjects of English, mathematics and science at all key stages – the areas in which investment in new technologies has historically been highest.

Getting technology provision and staff skills right will bring about improvements in learners' achievement across all subjects.

2. Technology supports personalised learning

"Put simply, personalised learning and teaching means taking a highly structured and responsive approach to each child's and young person's learning, in order that all are able to progress, achieve and participate. It means strengthening the link between learning and teaching by engaging pupils – and their parents – as partners in learning."

Department for Education and Skills, 2020 Vision: Report of the Teaching and Learning in 2020 Review Group, January 2007

Technology allows a more tailored and flexible approach to teaching, supplementing whole-class teaching with the chance for pupils and students to work alone or in small groups, at their own pace, and to learn outside the classroom environment. In the critically important FE sector, students have praised improved personal support, learner-led pacing and new ways to access learning as positive benefits of technology (Gfk NOP 2007).

With the advent of broadband and cheaper access to computers, there is potential to expand the use of technology even further. Teachers who use interactive whiteboards can work more effectively, because they are freer to engage with their students and have more flexible access to tools and resources to respond to learners' needs. When used appropriately, technology allows the lesson to be more dynamic and allows the teacher to engage more effectively with learners.

Technology means that each learner can learn at the right pace, in the way that suits them best, in or out of the classroom.

3. Technology facilitates greater choice of subject

Improvements in technology infrastructure bring the benefits of increased choice to learners: learners in schools and colleges where choice is limited can now take subjects that were unavailable a few years ago. In South Yorkshire, for example, schools have worked together to develop a range of lessons that are suitable for online delivery, increasing the choice of courses for pupils throughout the area.

Shared communication technologies, such as video conferencing, help students to work with teachers at a distance. This can help learners in rural areas and those who want specialist subject teaching. Schools in Birmingham have developed imaginative video-conferencing techniques in teaching foreign languages. The Cambridge School Classics Project enables video conferencing and web-based tuition so that schools without specialist teachers can offer Latin at GCSE and A-level.

Technology brings a much wider range of learning to more learners in a cost-effective way.

4. Technology helps schools and colleges with priority groups

Technology has been shown to provide added value in teaching groups with diverse needs, such as students with special educational needs, disaffected learners and traveller children.

Learning platforms (virtual learning environments; VLEs) are now used by 96 per cent of FE colleges. Remote access to learning has doubled since 2005, allowing learners access to programmes at a time and place to suit them (Becta 2006). This is particularly helpful to students who are self-employed or otherwise short of time.

Using technology to personalise learning has increased the confidence and satisfaction of learners from under-represented groups.

5. Technology produces better test results

Evidence from more e-mature ICT Test Bed schools showed that between 2003 and 2006 Key Stage 1 and Key Stage 2 reading scores improved significantly in schools that used technology in teaching – an improvement that did not occur in schools not embedding technology effectively (Somekh et al 2007).

Research shows evidence of a positive impact on results in many subjects, including mathematics, foreign languages, science, history and geography.

Technology is an increasingly important development in today's classroom. It has already led to a significant improvement in learners' attainment.

For its full potential to be captured, technology needs a central place within government education policy.

Why technology is key to improving the UK's productivity and competitiveness

"We must ensure that every young person entering the workforce – regardless of their background or preferred learning style – is equipped with the skills that they need for successful employment, and that employers need to improve productivity and competitiveness."

Department for Innovation, Universities and Skills, World class skills: implementing the Leitch review of skills in England, July 2007

The commercial and industrial sectors today routinely use technology to enhance the quality of products and services and the efficiency of business processes. In 2002, 40 per cent of the UK's national income came from industries that place a premium on technology, including high-tech manufacturing, finance and telecommunications, as well as specialised services in education and health. By 2005, 48 per cent of all jobs in the UK were in these sectors. The Organization for Economic Cooperation and Development (OECD) estimates that eight out of every 10 new jobs created in advanced industrialised societies are knowledge-based, placing a high premium on human capital and related skills and competencies.

Technology has a key role to play in developing today's workforce. Through higher skill levels and qualifications, firms see higher employee productivity. The use of technology also reinforces soft skills, such as communication and team working, which employers also require.

1. Technology is essential for higher productivity in the knowledge economy

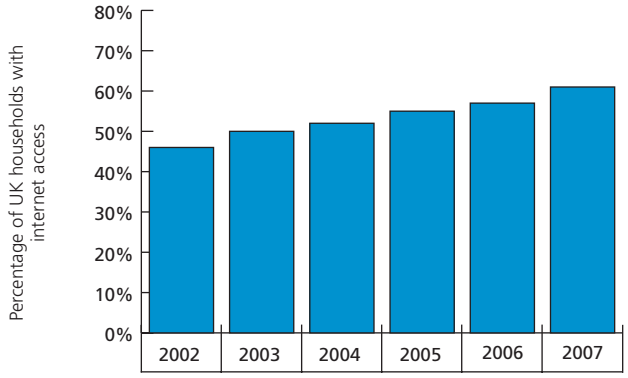
The Leitch report, *Prosperity for all in the global economy – world class skills (2006)*, sets out the challenge ahead if the UK is to be a world leader in skills by 2020. Although the UK has a strong economy and high employment levels, it has one of the lowest levels of productivity among the 15 EU countries. One of the key reasons for this is the relatively low level of workforce skills in the UK – around one quarter of UK companies currently experience skills shortages, and one in six see gaps in the skills levels of their existing workforces.

Workforce skills in the UK need a sharp boost to stimulate productivity and global competitiveness.

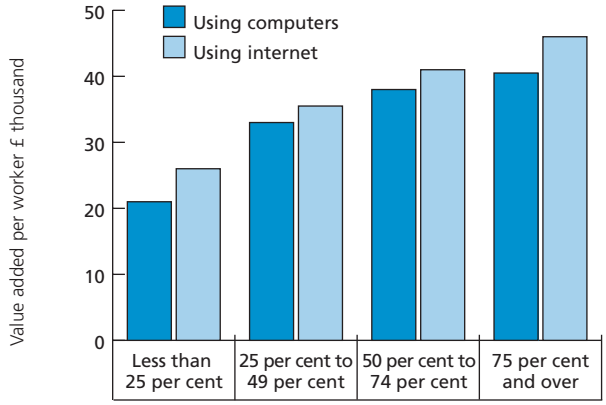
2. Technology is already embedded in the UK

The ability to process information and work with technology is fast becoming an essential competence for individuals, firms and public institutions. Although the economic impact of technology is mainly determined by its use at work, computer use in households has grown across the UK, particularly among younger age groups.

Percentage of UK households with internet access: Office of National Statistics, 2007



Labour productivity by employees using ICT in manufacturing and services: Office of National Statistics, 2005



"Extra productivity gains are identifiable, associated with more widespread use of computers by employees within firms."

Office of National Statistics 2005

Today's learners have a good head start: the number of computers per household in the UK has been steadily rising over the last decade and the UK's level of household computer ownership remains at the top of ownership levels in industrialised nations. However, there is increasing concern at the development of a digital divide based on social background or location.

Technology is already commonplace in most households in the UK.

3. Technology in schools and colleges is essential in combating the digital divide

The gulf that often exists between households in which technology is commonplace and those where computers or broadband access remain out of reach acts as a barrier to UK productivity. For those on the wrong side of the digital divide, the availability of up-to-date and reliable computer technology in the classroom, lecture theatre or library provides important opportunities to advance technology skills and learning.

Technology-rich schools and colleges can reduce the gap between technology 'haves' and 'have-nots' and consequently the barriers between high and low skills and high and low quality work.

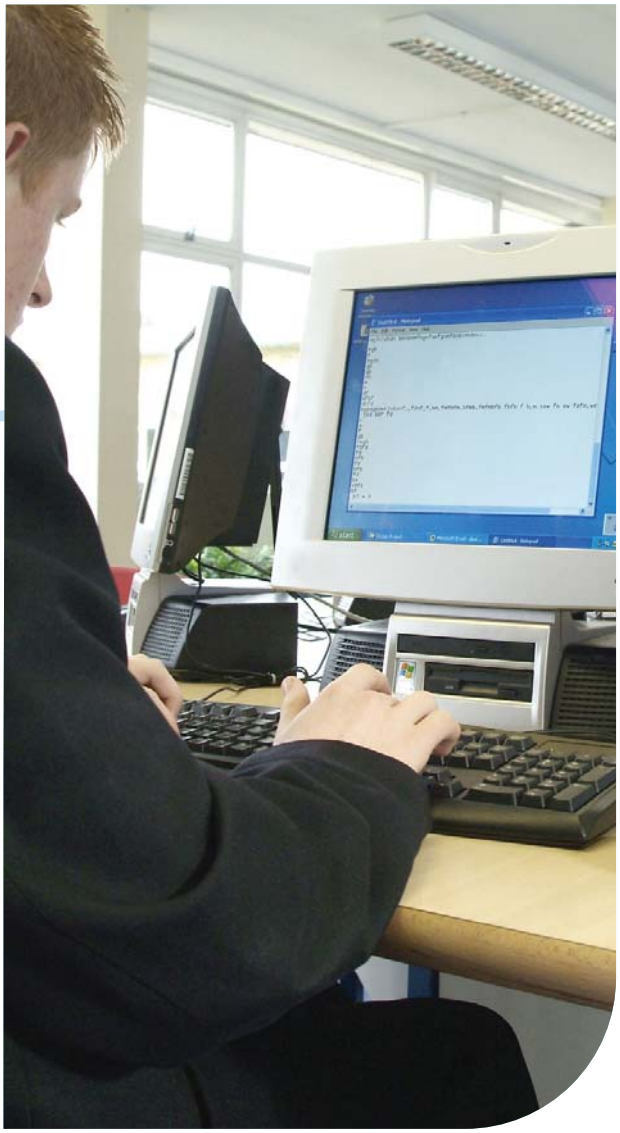
4. Technology skills are wanted by employers

Evidence clearly shows that higher skills are associated with higher productivity and improved outcomes for firms. A key factor in enhancing skills and productivity is the development and use of ICT in the workplace, which is associated with higher value added per worker (see chart).

According to the Office of National Statistics, there is a clear and demonstrable connection between ICT and higher productivity, through better internet communications, the use of e-commerce and the integration of computers in the workplace.

As employers more than ever look for economically valuable skills, skills that are transferable between firms and organisations come at a premium. Consequently, employees who come readily equipped with technology skills and the means to adapt to high productivity workplaces are sought after in today's job market.

Employers want higher skilled workers, but are often hampered by the lack of highly suitable candidates.



5. Technology is important for soft skills as well

The benefits of early exposure to technology do not just manifest themselves in terms of hard qualifications; they also help develop the soft skills that employers constantly look for.

Around four in ten employers consider the level of business, non-technical and interpersonal skills of new recruits to be below company requirements. Key desirables, such as high communication skills or the ability to work in a team can be enhanced by familiarity with technology and the use of computers from an early age (Condie et al 2007).

Familiarity with technology also helps develop the soft skills that add value to the workplace.

Technology has a very important role to play in developing the skills that employers want.

Schools and colleges can boost the future prospects of students by using technology.

The economy will benefit from a skilled workforce boosting productivity and competitiveness.

How technology helps teachers

> "It is vital that schools make the most effective use of teachers' time, ensuring that they spend their time only on activities that really need the professional skills and judgement of a teacher."
>
> **Schools Minister Jim Knight, 23 July 2007**

The ICT competence levels of British teachers are well above the European average. This means that teachers are well placed to take advantage of technology to deliver better lessons.

Across all sectors of government, there is a drive to improve efficiency and productivity, especially among frontline staff. In schools and colleges, technology has already helped increase productive time spent on lesson planning, delivery and record keeping. More developed use of technology could bring greater savings to other aspects, such as sharing resources and improving assessment.

1. Technology eases the burden on teachers and tutors

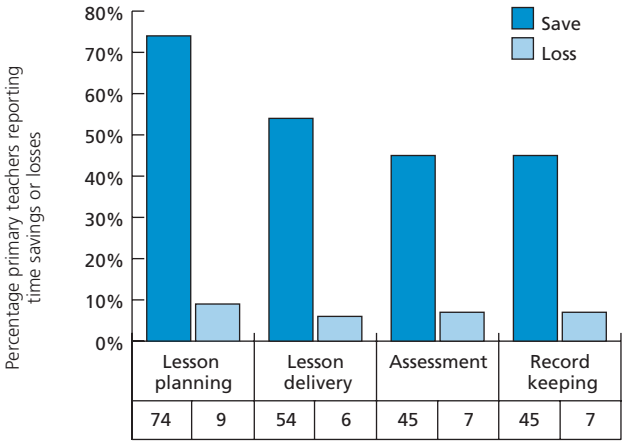
There is a growing body of evidence to show that technology can free teachers and tutors from routine tasks, increasing their productivity and efficiency.

Teachers work, on average, 50–60 hours per week during term time (PwC 2001). Primary teachers spend more than 14 hours a week on lesson planning and marking, and another 5 hours on general administration. The picture for secondary school teachers and FE lecturers is much the same.

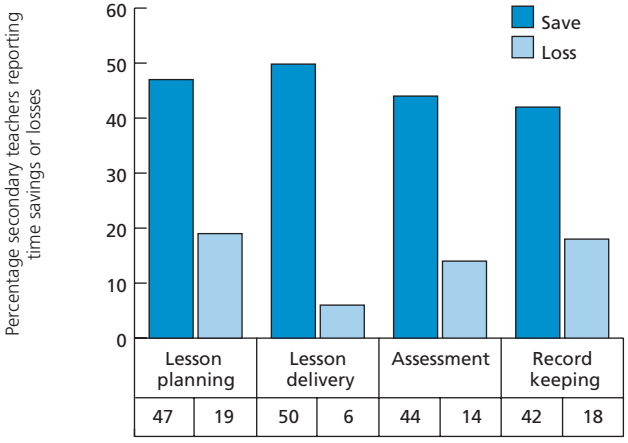
Teachers and head teachers report that using technology can make it quicker and easier to manage and complete this work. Nearly half (47 per cent) said that this time saving allowed them to take on new tasks or do existing tasks to a higher standard (PwC 2004). This efficiency not only boosts staff morale, but also means better quality lessons and better support for learners. Consistent and effective use of technology to improve efficiency could bring gains across the board.

Technology-related time savings/losses for teachers: Kitchen et al, 2007

Primary teachers



Secondary teachers



> Investment in technology – and in training for teachers and tutors – results in better quality, more efficient teaching methods and more personalised learning.

2. Technology allows better record keeping

Evidence shows that using technology to record attendance reduces the number of unauthorised absences, particularly from individual lessons, and provides quicker notification to parents if their children do not arrive at school or if they skip a class. Schools estimate that it would take them two and a half times as long to register pupil attendance manually than by using new technology.

Many schools now use technology to provide an online admissions service. This means parents can easily retrieve and amend applications and enjoy the peace of mind of immediate email confirmation of receipt of the application.

> Using technology to simplify core tasks in schools frees time at busy periods of the day and reduces truancy.

3. Technology enables teachers and tutors to teach more effectively

Using technology improves lesson planning, leading to higher quality lessons. The internet has significantly increased the range of resources available to teachers and tutors when planning teaching. Research suggests that creating a lesson from scratch using digital resources is equivalent to gaining half an hour of extra preparation time compared with creating a lesson without digital resources.

Sometimes, an initial investment of time is needed when developing modules – for example, when preparing a lesson that uses an interactive whiteboard. However, once it has been created, this lesson can be saved and used the following year, perhaps with an update or two. Lesson resources and plans created in electronic form ultimately save time in the long run.

Technology lets teachers and tutors share their best resources with colleagues, including those in different institutions. This can improve lesson quality and save preparation time. Currently, 58 per cent of secondary schools use technology for some form of collaboration on curriculum or resource development, and nearly half of these collaborations are with other schools (Kitchen et al 2007). However, there is great potential for further improvement.

> Technology saves time in lesson planning and improves the quality of resources – but we need to encourage a culture of greater resource sharing.

4. Technology tracks learners' progress

Technology makes it easier to collect data on learners' progress that lets the practitioner set individual targets for achievement. This allows the learning process to be better tailored to each learners' needs. In some schools, tutor groups have been replaced by one-to-one mentoring, because up-to-date progress information is always available.

Technology is increasingly used to reduce the amount of time spent marking and to support assessment for personalised learning, but its full potential has not yet been realised in either schools or colleges.

> Technology provides a better way to track learners' progress.

5. Technology simplifies reporting

Most teachers and tutors produce learners' reports electronically. Both schools and colleges state that it would take approximately twice as long to complete reports to parents and stakeholders if they did not use ICT. The evidence already shows that ICT allows time to be saved, which can then be reinvested in the key work of teaching.

> Technology frees teachers and tutors from the task of record keeping.

Technology frees time for teachers and tutors to concentrate on what they entered the profession to do: teach.

How technology motivates and engages learners

Maintaining a rewarding learning experience for learners is the goal of all good schools and colleges. Today, there is a growing body of evidence showing that technology can create a more positive, enjoyable environment for learners in primary and secondary schools and at further education level, when used alongside traditional teaching methods.

Improvements in motivation and learners' enthusiasm promote attendance and reduce drop-out rates.

1. Technology creates a better culture of learning

Parents, learners and practitioners agree that technology can improve learners' motivation (e.g. Golden et al 2006). Technology can be used to promote learners' autonomy and independence, suggesting its role in supporting learner-focused approaches. Particular technologies, such as interactive whiteboards, act as a focus for learners' attention and increase engagement in classroom-based learning.

Technology can reinforce a culture of learning, raising standards by opening the door for learners to express their creativity, to collaborate and develop important problem-solving skills. Crucially, research shows that young men, learners aged 16–18 and learners from minority ethnic groups are more likely to recognise the benefits of technology-based learning than are other learners.

> At a time when debate is raging on the challenge of de-motivated students, technology offers a real chance to engage the disaffected.

2. Technology is supported by teachers and tutors

According to teachers, the use of technology in schools brings clear gains in pupils' motivation to learn, classroom enthusiasm and attendance. Most primary school teachers (98 per cent) said that technology has a positive impact at Key Stage 2, a finding mirrored at Key Stage 3 in secondary schools (Kitchen et al 2007).

Nearly half of FE tutors reported that technology has a positive motivational effect on their learners (Golden et al 2006). A more personal approach enabled by the use of technology is also thought to enhance individuals' motivation and therefore the entire learning experience. Technology can also attract adult learners who might not otherwise take up learning (Becta 2006).

> Teachers and tutors see the benefits of technology in the classroom, especially at key phases of learners' development, like the move from primary to secondary school or when engaging in further education.

> "ICT has the power to transform young people's learning – both at school and beyond the school gate."
>
> **Schools Minister Jim Knight, 2007**

3. Technology boosts achievement with boys and hard-to-reach groups

Teachers have reported that technology can achieve exceptional gains in writing standards by pupils in years 4 and 5. The majority of these gains were the result of increasing motivation and hard work by boys. This was as a result of the support that technology gave pupils in the writing process, with knock-on effects for confidence and self-esteem (Somekh et al 2007).

The flexibility and visual power of some media technologies can often engage pupils from lower-achieving groups, especially reluctant readers or those struggling with numeracy (Ofsted 2004). Evidence also shows that learners from minority ethnic groups and those for whom English is a second language particularly report benefits from using technology in learning (GfK NOP 2007).

Technology gives greater choice of where and when to study. As a result, the evidence suggests that the way in which technology is used in learning motivates those who may not find it easy to study in traditional ways, such as busy parents and carers and those with mobility problems.

> Technology can help teaching in today's increasingly diverse and changing educational environment.

4. Technology benefits learners with special educational needs

Some forms of technology have added benefits in special educational needs settings. Ofsted found that interactive whiteboards in special schools help autistic pupils work together in literacy lessons: by mixing media, for example by using digital photographs in combination with whiteboards, pupils' involvement is stimulated (Ofsted 2005). Disabled learners or those with learning difficulties indicate that computers give them greater choice, underlining the importance of technology in promoting the engagement of all types of learner.

> Learners with special educational needs report that technology offers them more choice in their studies, helping them promote their independence.

5. Technology motivates learners to achieve results

High motivation and enjoyment ultimately benefit learner attendance. Research across primary and secondary schools and FE colleges where technology is already embedded revealed that behaviour and attendance improves through the use of behaviour-management systems and electronic registration. In 'e-mature' schools, the number of students reporting that they always enjoy school doubled in a year (Somekh et al 2006).

Work-based learning providers consider that e-learning gives a more tailored experience and improves learner retention and course completion rates – areas that many providers consistently struggle with (MacKinnon 2007).

> The use of technology for teaching and learning makes school more relevant and enjoyable across the curriculum.

Where technology is effectively used in classrooms, learners are more likely to be motivated and enthusiastic about their work. Technology allows teachers and tutors the scope to personalise learning, and learners the opportunity to express creativity and develop problem-solving skills.

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