

Wired to learn

What's holding up the school of the future?

By

Tom McMullan

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Introduction and summary

When New Labour came to power in May 1997, it came with a range of well-publicised commitments in the sphere of education. One of those commitments was to build on the power of Information and Communication Technology (ICT) to improve the quality of teaching and learning. To date, some £1.5 billion has been committed to a range of initiatives described as the National Grid for Learning (NGfL).

This paper outlines why ICT is important to the UK education system, identifies four key measures of the quality of ICT provision and indicates what has been done to date and what further measures are needed to ensure that the UK maximises the potential of ICT to contribute to teaching and learning.

Finally, and importantly, the paper outlines how ICT might change the nature of teaching, learning and institutional management.

Executive summary

In October 1997, the government set out its vision for Information and Communications Technology (ICT) in education, with a paper called *Connecting the Learning Society*. A year later, it set out its vision for the National Grid for Learning (NGfL), in *Open for Learning, Open for Business*. Those publications contained targets to be met by 2002, which included:

- connecting all schools, colleges, libraries, universities and as many community centres as possible to the Grid;
- ensuring that serving teachers feel confident and are competent to teach ICT within the curriculum, and that librarians are similarly trained;
- enabling school leavers to have a good understanding of ICT, with measures in place for assessing their competence in it; and
- networked software content, and a world leader in the export of learning services.

Below, we set out 4 key tests by which we can determine whether or not the UK is well placed to achieve these targets and maximise the potential of ICT in teaching and learning. The tests are:

- Are schools able to access an adequate, sustainable and manageable ICT infrastructure?

- Are schools effectively connected to each other, to their communities and to the Internet?
- Are teachers confident enough with their practice to know when and how to use ICT and when not to use it?
- Do teachers have easy access to a diverse range of educational online content?

Continuity

Our review of the provision of ICT infrastructure in schools concludes that whilst there has been considerable improvement in the number of computers available in schools, there remain key weaknesses in the supply model. We propose an end to the current model for supplying schools with ICT equipment, which is likely to lead to 'technological meltdown' in schools. Instead, we should give greater incentives for the private sector to provide one-stop managed services to schools.

Connectivity

Significant weakness remains in the provision of connectivity to schools. Although some 99% of schools are connected to the Internet, the vast majority of such connections are narrowband, with far too many computers per school connected via relatively slow links. Indeed, many children are likely to have a better online experience from their dial-up modem at home than from their 'connected' school. Those who do not have home connections will be disadvantaged: while those who do are likely become less than enthusiastic about the ICT curriculum that their school has to offer.

This lack of connectivity is part of a wider problem — a problem which has left the UK ranked 22nd out of the most developed countries in terms of broadband uptake. The process of local loop unbundling must be accelerated, and radical measures will be required to achieve this.

The government should accelerate investment in the UK broadband industry through a commitment to connect all schools to broadband by 2004 at the latest, and the establishment of a network of learning hubs which will host educational content and be accessible by students and their parents, and by local community networks, via the Internet.

Confidence

We need to generate greater teacher confidence about ICT. The New Opportunities Fund training initiative can achieve much, but in the absence of a comprehensive scheme to provide personal access to teachers, the full potential of ICT will remain untapped. There should be a universal laptop leasing scheme to ensure that all teachers who require it, have personal access to ICT within 2 years.

Content

The provision of a rich and diverse content marketplace is key. We note with concern the proposal for a public body (the BBC) to invest in the development of 'free' digital resources. The UK needs to encourage private sector investment in digital content to meet the diverse needs of the educational system and to maximise the commercial opportunities of export markets.

Therefore we call for an end to these plans for a 'backdoor nationalisation' of the UK educational content marketplace and the introduction of an e-credits system to stimulate demand for educational content and introduce further diversity and choice in educational provision.

Why is ICT important in our education system?

Let us take for example Karen (a 14 year old pupil) who has been asked, in a geography lesson, to join a small group of pupils in a project to study the impact of Acid Rain. Part of the assignment involves a presentation of the group's findings to the full class. We will look at the activities Karen was engaged in and how ICT might be involved.

What Karen did next

Karen's assignment was one of a number which came out of a class lesson on pollution where her teacher had used an appropriate mixture of whole-class teaching, group and individual work, to set the scene for a number of group activities. She and other members of the group have been able to source a wide range of information on her topic via the Internet, using CDs and DVDs available in the school, along with other more traditional sources.

Karen discovered a range of sources of information including web sites provided by government departments, specialist geographical institutions, environmental pressure groups and indeed some sites where the source of the information could not be determined.

Additionally, some of the members of the group have access to the Internet from home and were thus able to pursue further lines of enquiry and send their additional contributions to the other members of the group via e-mail outside normal school hours. An online conference set up by Karen's teacher has both facilitated discussion amongst the group and enabled them to engage with other students and experts from the other side of the world.

One result of such wider debate was the identification of a 'webcam' site which was recording the impact of pollution on a remote community.

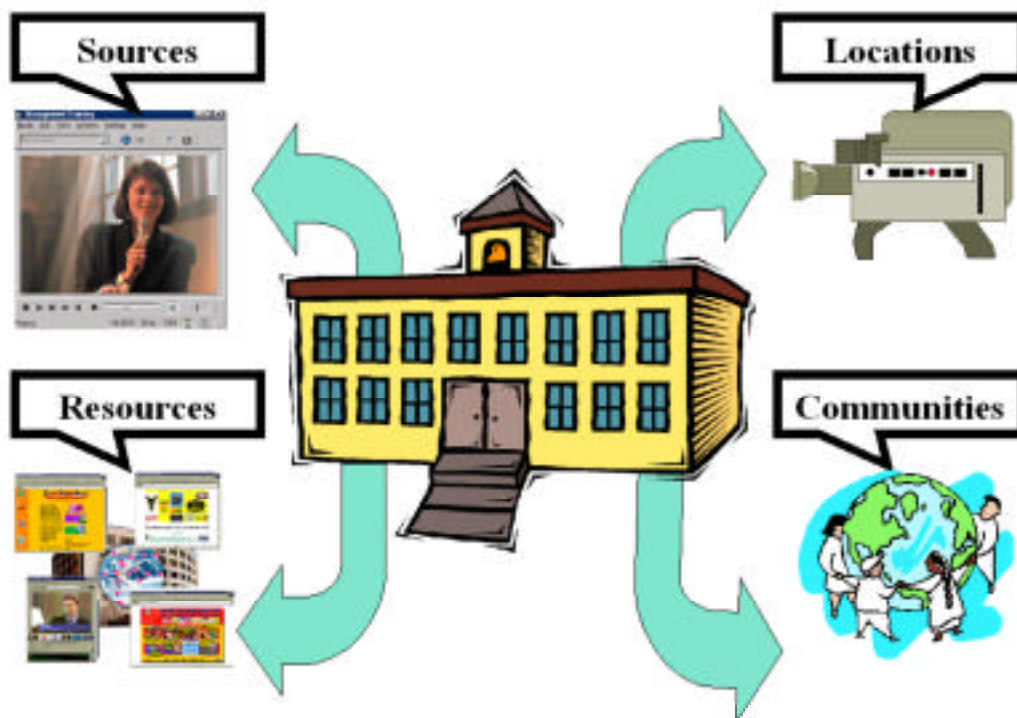
Following discussions between the members of her group and her teacher, the students were able to select some sources and reject others.

The group would then have produced a short report (published electronically) incorporating text, pictures, graphs and a short sequence of video images. This document was to be the subject of several revisions and improvements before being presented to the class, using a digital projector borrowed from the library. The document was published on the school web

site and subsequently enhanced by adding links to a number of audio interviews with known experts in the field.

Once published, Karen's parents were able to view her project online and drop a short email to her grandparents which included a link to the location of the document on the web.

Extending Karen's Range of Educational Opportunities



If we look at the key curricular activities that underpinned the contribution made by Karen to the work of the group, we can see that she was involved in **selecting and evaluating** sources of information, **designing, creating and composing** a document, **recording** her interpretation of sources and resources, **communicating and presenting** her conclusions. These key curricular processes and others such as **measuring, controlling modelling, testing and calculating** underpin much of what comprises learning, living and working in the modern world.

While of course each subject in the curriculum comprises a unique and distinct set of knowledge, skills and understandings within these common curricular processes underpin every subject.

Accepting that these key processes were around long before ICT, it is the ability of ICT to facilitate them, regardless of the particular subject or body of knowledge being studied, that makes it such a powerful tool for the modern educator — and even raises the question as to whether or not a subject-based curriculum remains the best approach for living, working and learning in a modern society. This is a topic to which we will return.

However, ICT has not only supported these key curricular processes; it has facilitated a wide range of teaching and learning styles. It supported Karen when she was working individually, when she was collaborating with other members of the group, and when she was presenting her findings to the whole class.

The critical importance of ICT to Karen

Many of the educational activities outlined above would have been possible before the development of ICT; they have just become much more possible (and more quickly, cheaply, and conveniently) since the more general availability of ICT in schools.

However in Karen's particular case it would *not* have been possible without ICT because she is visually impaired. For Karen the technology provided assistance with both reading and recording. In some cases this was the simple ability to alter the size of text and graphics to compensate for her visual impairment. In other cases speech recognition software was used to read passages of text to Karen. She was thus able to use the technology to compensate for this disability and get to be in the top 10% of her geography class.

The technology also supported Karen's teacher when she was initially locating lesson plans on the topic of pollution and seeking learning and assessment resources. But just as importantly, her teacher subscribes to a number of online newsgroups which specialise in supporting teachers facing the challenge of educating pupils with visual impairment and other learning needs.

Finally, once the Acid Rain project work was complete, her teacher was able to use the school's online assessment management software to record each student's assignment grade. These grades were also fed through automatically to Karen's pupil profile stored on the school management information system. Karen and her parents are able to access her profile via the Internet.

Enthusing and including

In summary therefore, not only can the technology facilitate key curricular processes; as a result of its interactive and multi-media capabilities, it can be used to engage and enthuse all pupils, and — as in the case of Karen — compensate for specific learning difficulties. ICT can bring an enormous range of educational sources and resources into the classroom, support autonomous, group and whole-class teaching and bring to life topics and concepts in a way which enables teachers to teach and learners to learn.

Testing the government's commitments on ICT

In October 1997, the government set out its vision for ICT in education in the paper *Connecting the Learning Society*. In 1998, in a document entitled *Open for Learning, Open for Business*, it set out its vision for the National Grid for Learning (NGfL). Those publications contained a range of targets to be met by 2002, which included:

- **connecting** all schools, colleges, libraries, universities and as many community centres as possible to the Grid;
- ensuring that serving teachers feel **confident** and are competent to teach ICT within the curriculum, and that librarians are similarly trained;
- enabling **school leavers** to have a good understanding of ICT, with measures in place for assessing their competence in it; and
- making Britain a **centre of excellence** in the development of networked software content, and a world leader in the export of learning services.

A further consultation paper, *Curriculum Online*, was published in April 2001, seeking views from interested parties on the future of the NGfL strategy and the development of digital content. The government's response to that consultation was published in December 2001.

Four key tests

In our view, there are four key tests that need to be applied in order to determine whether the UK education system is appropriately placed to benefit from the contribution ICT can make in improving the quality of teaching and learning. Those four tests are:

- (1) Are schools able to access an adequate, sustainable and manageable ICT infrastructure?
- (2) Are schools effectively connected to each other, to their communities and to the Internet?
- (3) Do teachers have easy access to a diverse range of educational online content?
- (4) Are teachers confident enough with their practice to know when and how to use ICT and when not to use it?

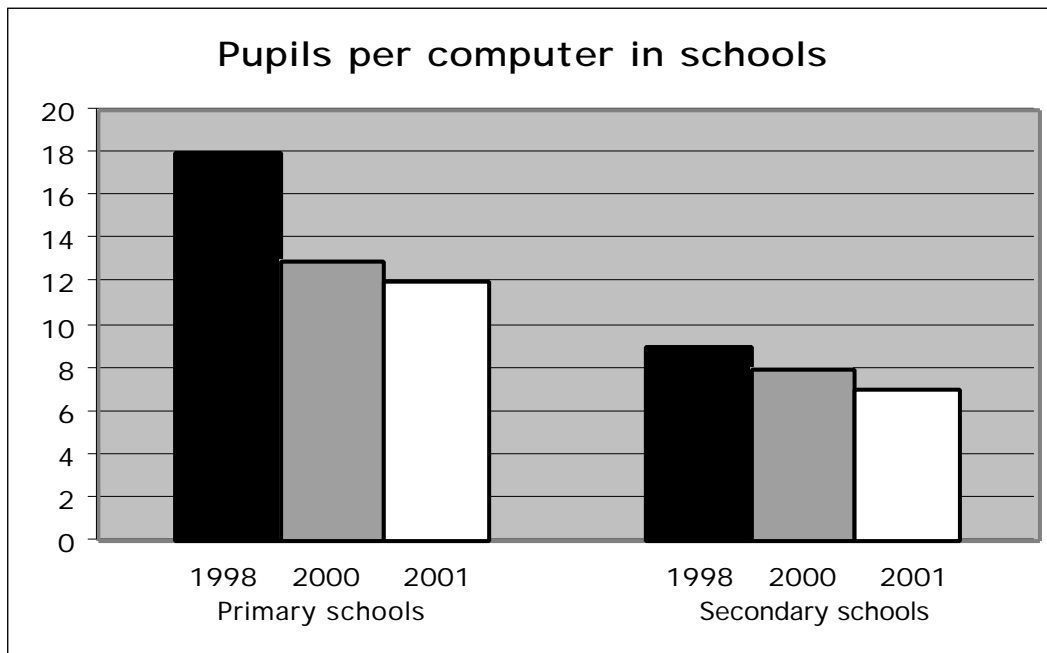
So let us go through these in turn and determine, if we can, what progress the UK has made against these tests.

(1) Adequate, sustainable, and manageable infrastructure

There has been a substantial investment in school infrastructure over the past four years, resulting in significant improvement in the number of computers in our schools. Whilst there are considerable differences in mechanisms for provision across the UK, the most detailed statistical evidence, summarised below, is in relation to provision in England.

Those figures indicate that in 1998, there was approximately one computer for every 18 pupils in primary schools and one for every 9 pupils in secondary schools. By 2000, these figures had improved to one computer for every 13 primary pupils and one for every 8 secondary pupils.

Initial figures for 2001 show further improvements with the average ratio in the primary schools now 1:12. Secondary school ratios have improved to 1:7 (see chart).



The government had set an NGfL target of a computer:pupil ratio of at least 1:11 in primary schools and 1:7 in secondary schools by 2002. This target is likely to be exceeded and new targets for 2004 have been announced. And in 1998, approximately 65% of the computers in our schools were more than 3 years old, though by 2001 that proportion had fallen to 37%.

So that's all right then?

Well, not really. The key measures of successful infrastructure provision must go beyond simple computer:pupil ratios and look to the issue of manageability and sustainability.

Manageability

The corporate world has long since moved away from simply buying lots of computers and then trying to network them, connect them to the Internet, set up virus protection, install Internet safety software, load application software, integrate new and existing equipment and find someone to fix it when it all goes wrong.

In schools the 'someone' all too often turns out to be the ICT expert who has had his or her teaching interrupted yet again because 'the computer in Room 32 has gone funny'.

The government and the LEAs are currently far too obsessed with the number of computers in schools rather than with the *ease* with which they can be supported and the *effectiveness* with which they can be used.

Schools need to begin moving rapidly towards the concept of an ICT 'managed service' where an IT specialist company is responsible for providing an integrated service of equipment, software and support with the costs spread over 3 to 5 years. This approach has the advantage of leaving the school free to concentrate on the effective use of the technology to improve the quality of teaching, learning and educational management.

Schools have to date tended to shy away from such managed service contracts because they are perceived to be more expensive than the existing arrangements and because there is a lack of clarity, consistency and dependability in relation to school budgets. These factors significantly militate against the 3 or 5 year support contracts typically required to demonstrate the value for money advantage of a managed service approach.

Consequently, of the approximately 1 million computers currently in our schools it is estimated that less than 10% will be under a comprehensive managed service contract. Unless this issue is urgently addressed, the government will have supplemented the bureaucratic burden on schools with technological burden, which the vast majority of schools neither want nor are equipped to deal with.

Sustainability

For an ICT infrastructure to be sustainable not only must initial capital and running costs be affordable, but the inevitable cost of regular updating and replacement must also be accommodated. The continued dependence of schools on capital grants from central government to fund their stock of computers points to a lack of sustainability in the medium to long term.

Recommendations

We should end the current model for supplying schools with ICT equipment and further encourage the private sector to provide 'one stop shop' managed services to education. Such service providers should be paid for delivering

educational ICT resources to learners, and not simply for the physical presence of equipment in a school.

Government needs therefore to move beyond simple measures of provision such as computer:pupil ratios and publish a more meaningful measure of provision. Rather than reporting simply the number of computers physically present in a school, government figures should indicate the number of 'embedded systems' available: that is, computer systems that are subject to a comprehensive service level agreement with a support provider, and whose replacement costs are considered affordable. Unless we are able to *embed* the provision of infrastructure, we will have little chance of embedding changes in educational practice.

(2) Are schools effectively connected?

One of the key priorities of the government when it came to power in 1997 was to connect every school to the 'information superhighway'. At that time some 83% of secondary schools and 17% of primary schools were connected to the Internet. By 2001 these numbers had increased to 96% of primary schools and 99% of secondary schools connected.

Four years ago, the vast majority of connections were via a single 'dial up' modem connection. By 2001, some 84% of primary schools and 93% of secondary schools had access to faster digital services, usually known as ISDN services. These services are between 4 and 10 times faster than dial-up connections.

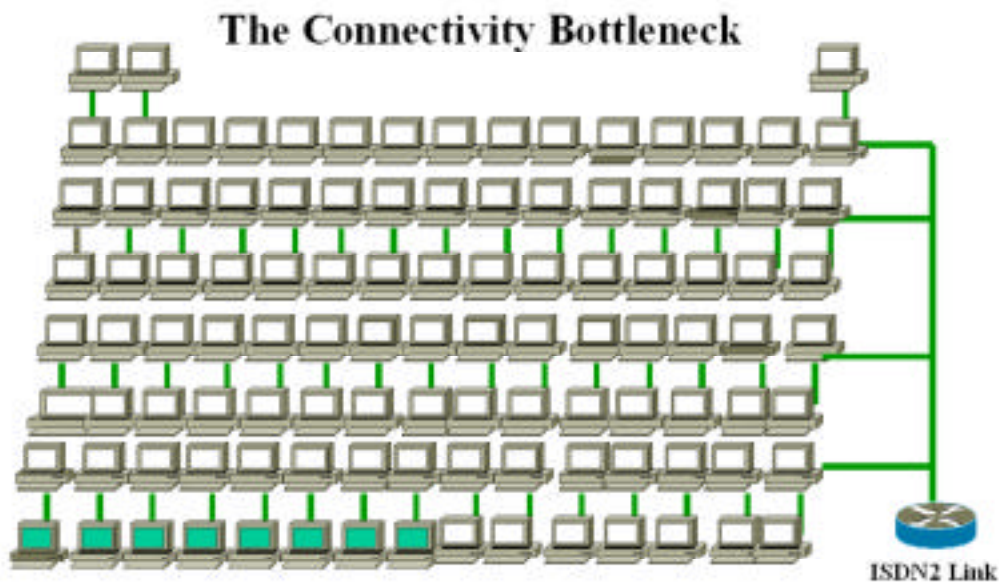
Additionally, during the past 12 months some 20% of secondary schools have been given access to 'broadband' connectivity services. A typical 2Mbit broadband service would be some 15 to 30 times faster than an ISDN service, and some 50 to 100 times faster than a dial-up connection.

So that's all right then?

No unfortunately not. There is still far too little access to broadband services. The vast majority of schools are still connected through narrowband services and the number of computers being used in each school is such that the quality of connection is very often far from satisfactory — a connectivity bottleneck (see chart).

Where there is broadband access, the broadband 'pipe' is delivering a level of service (2Mbit bandwidth) much below that which would be required if schools were to fully embrace a digital curriculum.

This is, of course, part of a more general problem. The primary vehicle for delivering broadband in the UK was to be local loop unbundling (LLU) — the process by which a wide range of service providers would be able to 'rent' the last few miles of cable between a subscriber's local exchange and their home, business or school. Once so 'rented' a wide range of connectivity and content services could be delivered, with competition driving down costs.



A typical Secondary School will have 108 computers and will have an ISDN2 line as its principal Internet connection.

An ISDN2 line can effectively support only 8 simultaneous users

Unfortunately, the process of local loop unbundling has become an administrative nightmare which has resulted in the vast majority of international telecom providers taking their investment elsewhere. It is reported that as at September 2001 less than 200 out of a total of 34,000,000 telephone lines in the UK have been 'unbundled'.

In the words of Oftel, the regulator responsible: 'There is no doubt that the actual practicality of unbundling has been a painful and often miserable process.'

This failure to deliver unbundling, coupled with the delicate state of the telecommunications sector generally, means that the UK industry is very reluctant to invest in broadband infrastructure until there is a clear demand for content-based services.

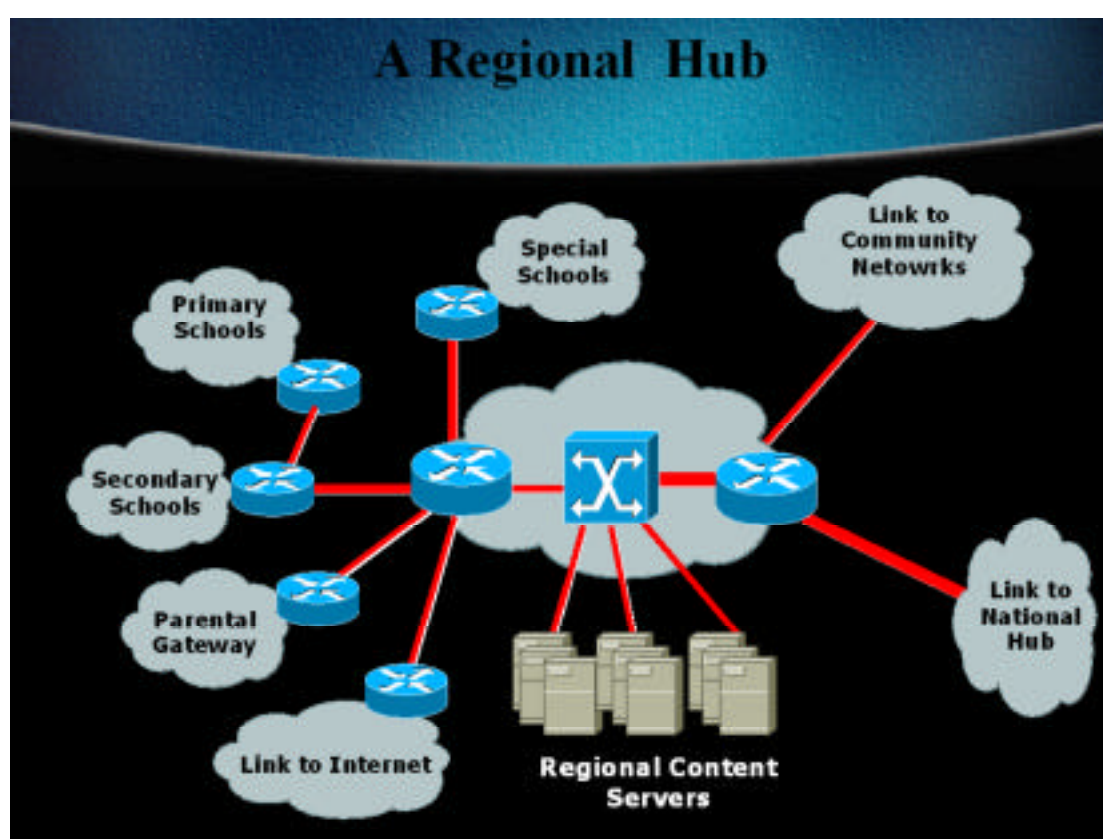
Content providers, for their part, will not invest in product development in the absence of a broadband infrastructure. This situation has contributed in no small way to the fact that in the June 2001 OECD report on broadband access, the UK was ranked 22 out of 30, outperforming only 8 countries such as the Czech Republic, Hungary and Mexico. The remaining 5 countries which the UK outperformed had a penetration so low they did not even register on the OECD graph.

As the OECD commented dryly: 'This ranking is lower than might be expected given the early roll-out of infrastructure competition in the United Kingdom'. Quite so.

Recommendation

The office of the e-envoy has been looking for some time now at the issue of broadband in the public sector. Mindful of its 'education, education, education' commitment, the government should make broadband provision for schools an immediate priority. It should commit to the delivery of an 8Mbps service to every primary school, and 34Mbps service to every secondary school by 2004.

And indeed, we should be striving for connectivity in education outside the school system too. To get the greatest value out of this initiative, schools should be linked via a number of educational content hubs, which would allow access to content by pupils, teachers and parents — and by local community networks and national resources — via the Internet.



Such an approach would help to kick-start broadband in the UK and provide much needed confidence to content developers to invest in suitable services. This in turn will unlock the key to the wider use of ICT in teaching and learning.

The costs of connecting all 23,000 schools in England to narrowband services would be in the region of £18 million per year. The provision of basic ISP services to the schools would cost a further £8 million, giving a total outlay of some £26 million per year.

The cost of providing a particular level of broadband connectivity to a school will depend on a whole range of factors including the technology used, the

location of the premises, the level of competition prevailing (particularly at the local loop end) and the timescale over which the initial investment is to be recovered.

Recognising those constraints it is possible to provide an order of magnitude estimate of the likely cost of our proposal. Assuming a unit cost of £10,000 pa for an 8Mbps connection to a primary school and £19,800 pa for a 34 Mbps secondary yields an annual cost for England of some £265 million per year. Such an investment, although substantial, would unlock the potential of ICT to transform teaching, learning and indeed the nature of schools. Additionally it could lead to substantial saving in areas such a professional development of teachers, and the sharing to specialist teachers between schools. But it is clear that a substantial investment needs to be found from somewhere — which takes us on to the importance of online content.

(3) Access to a diverse range of online content

The development of a wide and diverse range of digital content is crucial if we are to exploit the potential of ICT. Such content will comprise a range of resources including curriculum software, web pages, streaming audio and video, and DVD multimedia materials.

In setting out its policy in relation to the development of digital content the government identified two key objectives:

- that ‘by 2002 the UK should be a centre for excellence in the development of networked software content for education and lifelong learning, building upon a strong private sector educational software industry, and a world leader in the export of learning’; and
- that it intended to ‘ensure that nothing is provided at public expense, which otherwise could be provided commercially of good quality and reasonable cost.’

Both public and private sectors have played an important role to date. The UK software industry (initially via government funded initiatives such as the Microelectronics in Education programme in the early 1980s), has had considerable success in developing innovative and imaginative software products for use in schools.

Government has continued to provide stimulation of the marketplace by, for example, commissioning digital materials to support Maths, Latin and Japanese, and by ‘earmarking’ some 15% of NGfL funding for digital content. It is widely recognised that some of the most innovative products, which are fun and safe to use by children (such aswww.gridclub.net, which won a BAFTA) have emanated from public/private co-operation.

But to ensure the availability of a rich diversity of digital resources across the entire curriculum, the content marketplace will require further significant investment. Additionally, in order for the content industry to have the confidence to invest in digital resources they will need to be assured that schools have sufficient funding available long-term to sustain the market.

There is no good reason to spend public money on things that the private sector would do anyway. Indeed, such policies crowd out not just private provision, but investment, ingenuity, and innovation too. It is vital that the government bears this in mind as it responds to the BBC's proposal to spend between £135 and £160 million of licence fee money in developing digital resources and making them freely available to schools. Indeed, the computer games industry could be an avenue through which new educational resources could be developed and marketed — edutainment.

Since that proposal emerged (in the latter part of 2000), it has already had a significant detrimental impact on investment in digital content by the UK industry. No private sector company could justify investing shareholders' funds in developing material that has to compete with products that customers can get 'free' by virtue of their being subsidised by a public agency. There are better things on which entrepreneurs can invest their time, money, and mindpower.

Recommendation

In the *Curriculum Online* consultation, the government indicated its intention to introduce 'e-learning credits — money for schools to buy digital curriculum resources'.

This proposal is a welcome first step, but the opportunities presented by the digital curriculum go far beyond the simple delivery of online curriculum resources. We set out some of the possibilities later in this paper, and argue for the larger concept of an 'e-credit' — an entitlement by pupils to digital courses and resources.

What is certainly needed now is an end to the plans for a 'backdoor nationalisation' of the UK educational content marketplace; and instead, a significant investment in the introduction of e-credits to stimulate demand for online educational content and courses.

As a minimum, we suggest that the existing proposal of an investment of approximately £50 million in online content should be increased to at least £100 million a year for each of the next 3 years.

The government must also move to ensure that any involvement by the BBC does not damage the development of a viable and vigorous market in digital content in the UK.

(4) Teacher confidence

Of all of the issues which will impact our ability to improve the quality of teaching and learning the most important one is the ability of teachers to adapt their practice to embrace the new technologies.

The impact of NOF training

The last few years have seen an investment of some £230 million by the New Opportunities Fund (NOF) in ICT training for teachers. The objectives of this training were to ensure that our teachers were confident in the use of ICT.

Past surveys, however, reveal that the confidence gap is large. In 1998, some 64% of primary teachers said they felt confident in the use of ICT, and by 2001 that proportion had increased to just 76%. The picture in secondary schools was little better, with only 61% confident in 1998, rising to some 70% by 2001.

If the shortfall in confidence remains large, the shortfall in potential is even more concerning. In the primary sector a majority of teachers surveyed in early 2001 considered the benefits of ICT to be 'little or none' in 11 of the 14 subjects in the National Curriculum. In the secondary sector, ICT was perceived to be of little or no benefit by the majority of teachers in 8 of the 14 subject areas.

While it is true that the full impact of the NOF training is yet to be reflected in these figures, it is also clear that very significant work remains to be done in relation to teacher enthusiasm about the use of ICT. Many teachers today view the introduction of ICT as merely a burden: but the reality is that ICT should be an opportunity, empowering teachers and making learning more rewarding for their students.

The impact of personal access

If we contrast the general lack of ICT confidence among teachers with the results of an earlier study which promoted personal access for teachers by providing them with a laptop computer, the findings could not present a sharper contrast. Of the 1150 teachers involved in the scheme, known as the Multimedia Portables for Teachers Pilot:

- 93% agreed that their use of IT had increased substantially
- 95% agreed that the project had allowed them to develop their teaching
- 90% agreed that the school as a whole had benefited
- 86% agreed that their pupils had gained from the project
- 95% agreed that the money spent on the computers was worthwhile.

The views of the Minister of the day were also unequivocal:

"Teachers have been saying for many years that their competence with IT is low. The government is listening ... over 1000 teachers have transformed their approach to IT, with the aid of multimedia portable computers....

'The results are remarkable and unequivocal. They have come at the right time, just as schools and local authorities are preparing for the Information Age. I recommend that this report is read by every professional involved in building the National Grid for Learning.'

The government's response (in England) to the potential identified in its own report has been the Computers for Teachers Scheme. Though it has provided several thousand teachers with a subsidy to purchase an approved laptop, however, this scheme has provoked anger in the profession because of its limited scope and restricted eligibility criteria.

Additionally, recent emerging evidence from ImpaCT2 (a large government sponsored research programme into the use of ICT in schools) indicates that:

‘Many teachers lack confidence and experience difficulty integrating ICT into lessons. Observed lessons show that ICT is most frequently used for drill and practice.’

If the UK is to have any hope of turning the tide of teacher attitude in relation to ICT then it needs to act decisively in relation to personal access by teachers.

Recommendation

The government, the ICT industry and the commercial sector should devise a *laptop leasing scheme* to ensure that every teacher who requires it, and who has not benefited already through existing schemes, should have personal access to ICT within 2 years.

Such a scheme should involve maximising the economies of scale, not just of production but also of delivery and support. It might involve advertising and/or commercial sponsorship, and could have links to a number of retail ‘loyalty’ schemes as a mechanism for reducing the monthly costs.

The years ahead

If our recommendations are followed in relation to infrastructure, connectivity, content, and teacher capability then a new set of opportunities emerge which could radically alter the nature of our education system.

Key opportunities will lie in the areas of:

- diversity and choice;
- teacher workload; and
- the nature of the curriculum and the role of schools.

Diversity and choice

There is an emerging debate worldwide about how schools should be provided. Even countries that are solidly committed to state funding of education are beginning to allow or encourage greater diversity in terms of who actually provides schools and learning services.

Often, this involves initiatives by local parents, teachers, and community groups to take over the management of failing local-government schools, but with financial support being guaranteed by the state under some form of 'charter' agreement. In the UK, the management of failing state schools has been contracted out to for-profit and non-profit bodies, and there is a debate about whether churches and faith groups could run state-funded schools under licence. Other countries, such as the Netherlands and Denmark, have lived with state funding but diverse provision for many years.

Not only does such diversity give choice to parents; it encourages innovation and customer-focus, and bids up standards as schools strive to win the support of more parents and so increase their share of the state's funding.

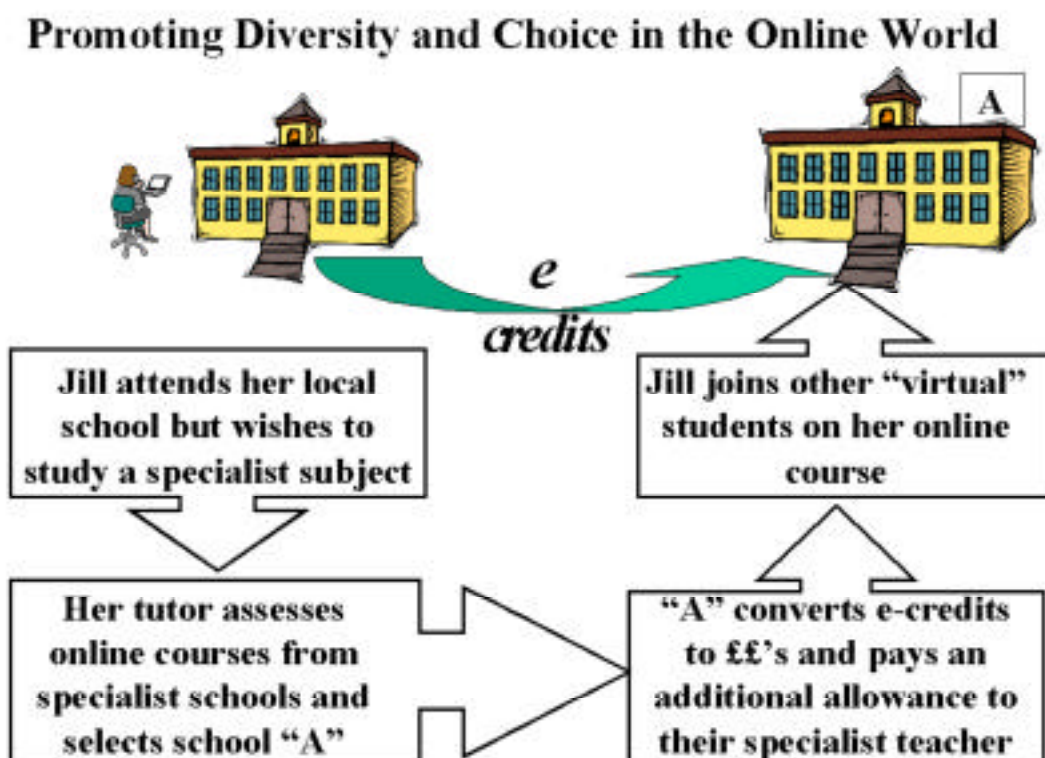
Online curriculum content and the other opportunities opened up by ICT are, we believe, other areas where the benefits of diversity will be clear. A sector which is moving so quickly, and which exists precisely in order to generate new ideas and new ways of working, is ill-suited to being managed and regulated by government-style institutions, which are inevitably rather bureaucratic and slow-moving. Rather, it should be regulated through the much more dynamic process of customer choice. But for that system to work, customers must possess the actual power to exercise their choices: and hence our proposals for the e-credit.

The e-credit

Under our proposals, students themselves would have an entitlement to e-credits, which would enable them or their school to purchase access to a range of online educational courses and resources. The availability of these e-credits (which could only be spent on digital courses and resources) would provide a stimulus for schools, educational publishers and others to do what a few pioneers have already done — to develop online curricula that could be purchased and used by other educational establishments or indeed individual learners. In the e-credit world, ICT funding would increasingly follow the learner.

A wide range of e-credit courses could be developed and pupils would be entitled to use their credits to pursue them. Allowing pupils to take their e-credits elsewhere will increase diversity, choice and competition, and push up standards. Some e-courses may involve home-based learning (properly monitored and supported), while others would be based almost entirely at a local school.

Such courses might well provide a mix of interactive multimedia materials, text and video conferencing resources and access to relevant experts. This opens up the possibility of students being able to follow courses from a range of educational providers, whilst still ‘attending’ the same school.



The e-credit could also change the economics of what is a viable school — in particular, creating the opportunity for smaller, community-based learning institutions to offer a broader range of professionally-constructed courses,

while they focus on improved tutorial support and/or pastoral care. And by mitigating physical capacity constraints, good schools that employ online learning strategies could continue to expand.

The e-credit could enhance the ability of a school to supplement (or replace) the work of an under-performing department, by buying in courses from other institutions. Once e-credits have been introduced via the pump priming funding mentioned earlier, they should become self funding as schools move resources from more traditional areas.

In the medium term, the evidence base for the impact of ICT on education costs and outcomes, and for the opportunities that it creates, will become clear and will inform future investment decisions. We will understand more and more how ICT enables the centralised regulation of schools to be diminished, how teachers' non-teaching workload can be reduced, and how better familiarity with information and communications technology will equip pupils far better for their adult life.

Impact on teacher workload

Widespread access to ICT facilities would enable much of the bureaucratic burden on teachers and schools to be removed. There are virtually no aspects of the teacher's workload which could not be improved through such access. Attendance recording, curriculum planning, assessment and reporting, and lesson preparation are but a few of the opportunities. The provision of educational broadband would facilitate the development of a range of competing educational support services, which would have the advantage of reducing the administrative burden on teachers.

Such educational support services would encompass a wide range of personal development and management functions and would go much further than many initiatives to date (that is, achieving little more than the use of technology to transmit bureaucracy at the speed of light).

But for significant progress to be made in this area, we must remove barriers to entry into the provision of schools and learning services — such as the surplus places rule — which potentially restrict competition and choice.

Finally, the ease with which sophisticated value-added measures can be produced by educational management systems should facilitate the introduction of value-added improvement targets for individual learners at every stage of their education.

The online curriculum and the role of schools

The role of ICT in the curriculum has been the subject of debate and argument since the late 1970s. In its early stages the debate focused on the need for computer studies courses and the extent to which they should be the vehicle through which computer literacy could be delivered.

In more recent times the role of ICT has been seen as much more cross-curricular, a facilitating and enhancing agent rather than one specifically structured around individual subjects. The cross-curricular approach has much to commend it, principally that it provides a meaningful context in which ICT capability could be developed and through which it could contribute to the development of higher-order thinking skills.

But initial findings from the ImpacCT2 study indicate that far from imbedding itself into educational practice, ICT has remained at best a 'coat of paint' applied to existing curricular practice.

A recent publication by the OECD suggests that this failure to embed ICT into existing practice is a result of the 'closed' nature of the school curriculum and that ICT will only become truly effective after a 'radical and systemic change' to the nature of schools (and what we teach in them).

Unfortunately, the government's *Curriculum Online* proposals anticipate much less radical implications arising from the use of ICT in schools. It is almost apologetic about the fundamental nature of the contribution of ICT when it states:

'We recognise very clearly that what we are proposing here is not a replacement for traditional and tried teaching methods, but should be integrated with them. New forms of accessing information, great works of art, sources of knowledge and imaginative ways of presenting traditional facts are complementary to, rather than a replacement for, the critical core skills on which we have placed such emphasis.'

This potential lack of vision in respect of the implications of the digital curriculum was challenged in the response of the General Teaching Council (the professional body for teaching in England) when it responded diplomatically:

'The Curriculum Online consultation paper articulates a vision of a 'digital education', which complements 'traditional teaching methods' in raising standards. ... Nevertheless the Council considers the dichotomy between teaching and learning enabled and shaped by digital resources and that construed as 'traditional' presented in the vision for Curriculum Online to be an artificial one. It is a view that oversimplifies the complex and changing landscape of pedagogy that Curriculum Online will enter.'

And later:

'Our concern is that the Curriculum Online proposals fall short of understanding and addressing the need to develop new pedagogical practice. Long-term success [will come] from the capacity of teachers to ensure coherent, relevant, supported and challenging learning.'

The truth, however, may lie closer to another emerging finding from ImpacCT2, which suggests:

‘ICT is not being used to its full potential to transform learning and teaching. Teachers need opportunities for reflective practice to embed innovation and change.’

Whatever else we know about education technology, we know that the technology will evolve a lot faster than educational practice. By not focusing enough on the role of the teacher, and how that needs to change in ICT-enabled learning, nor providing enough personal access to resources to allow teachers to develop confidence and capability, we have to a large extent contributed to the failure to the profession to fully embrace ICT.

If UK education is to benefit fully from the contribution which ICT can make to improving standards, it needs to remember the key lesson learned from the introduction of new technology into business: don't just computerise existing practice: change the practice to fully exploit the new opportunity.

That points to the need to consider the opportunity for fundamental curriculum reform. It is already clear that in the longer term the key contribution that ICT can make to such reform is its ability to:

- motivate pupils;
- encourage autonomous learning;
- facilitate differentiated learning experiences;
- allow the curriculum to be tailored to the needs of individual pupils;
- broaden the range of sources and resources available;
- provide improved feedback on learning outcomes.

The opportunities presented by new technology should also allow us to take a radical look at the role of schools and the way they work. In a world where, increasingly, learning can take place at any time and in any place we need to consider issues such as:

- the hours during which schools open;
- the role of teachers;
- the balance between number of teachers and other support professionals;
- the organisation of learning groups;
- the interaction with the home; and
- pastoral care arrangements.

These changes point to a dramatically improved opportunity to put the needs of the individual learner at the heart of our education system, and point to opportunities for change in the way schools operate.

Summary and conclusion

We have set out some urgent steps which need to be taken if we are to grasp the opportunities to improve the UK education system which ICT presents.

We have identified weaknesses in the supply model underpinning the ICT infrastructure in schools, and set out the need for urgent action in relation to the provision of broadband connectivity services to schools.

Dangers in relation to the content marketplace have been identified and an e-credit approach to stimulating demand has been proposed.

We believe a universal scheme to provide all teachers with personal access to ICT should move forward as a matter of urgency.

Finally we have set out some future opportunities which would flow from the introduction of our various recommendation, the most important of which would be the ability to put the needs of the individual *learner* and not the needs of the *provider* at the heart of our educational system.

About the author

Tom McMullan is a former teacher in Northern Ireland, where he pioneered the development of materials to support ICT in learning. In 1989 he chaired a ministerial working group on the development of cross-curricular ICT initiatives, and became director of the Northern Ireland CLASS project, responsible for developing and implementing a computerised management system in over 900 schools. In 1999 he directed procurement for the Northern Ireland Classroom 2000 project, which at 40,000 desktops was the largest educational ICT managed service initiative in the UK.