

Influence of Information Technology in the National Curriculum (*aims and implementation*)

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Abstract

Information technology is a major issue for the society of the 21st century and therefore for education, as the aim of teaching is to prepare students to match the needs of employment and everyday life in the future. There is much discussion and debate about this challenge by philosophers, politics, sociologists and of course those responsible for education. The aim of this essay is to address the impact of this new technology on education in UK after considering the global perspective on the means of communication in the 21st century world and their effects in terms of the global village concept and then advent of a new world consciousness to people.

British government has made a priority in its education policy to improve the use of ICT in schools and to give a minimum of knowledge and understanding in ICT to pupils by embedding this activity in the National Curriculum. The official Department for Education & Employment and its independent counterpart the British Educational Communication and Technology Agency have echoed the message of Tony Blair, “to build the biggest partnership in any education system anywhere in the world”. This resulted in the UK Net Year in 1998 which had for objective to give 75% of teacher and 50% of children an email address by the year 2002, and to boast the use of ICT in the NC activities.

This essay makes a point at the beginning of 1999 of this huge project, and the weaknesses that appear at this state of the project. The schools minister Charles Clarke and the chief executive of BECTA, Owen Lynch stated recently that the goal which had been fixed for 1998 have not been completely reached, and that the development of ICT structures and use in the NC was a bit out of steam. Their contributions to the general evaluation are quoted in this report, as they are the sources of future directives and investments in order to achieve the goal that has been fixed by the government.

The main weak points of the present situation are the co-operation between the education sector and the business sector on one hand, but also the reluctance or incapacity of many teachers to change their habits in delivering their teaching. The study of one implementation of ICT in a new technology college in Didcot, in terms of material, ICT teaching, and ICT cross curricular activities gives evidence of the difficulties of the new age revolution that the government is trying to put into gear, even if this example seems to be successful.

All this effort from directors, teachers, managers, and other executives seems very far away from the ease that youngsters show to enter the new age of learning and communication. But the observation of children playing with their play-stations and other video games should not hide the fact that there needs a global framework for the British society to enter into the new age, even if the co-operation between schools and business could seem strange to some observers.

In all changes in society, there is a minimum delay that remains in spite of what forces a government brings to hasten the movement. This can be considered like a limit to

the flexibility of man, but also like a proof of continuity in humanity. Anyway this is something that should be taken into consideration if the executives want to avoid the negative reaction that could result from too much pressure. This element will hopefully be taken into account, so that the targets are reached in reasonable time.

Introduction

Information technology is a major issue for the society of the 21st century and therefore for education, as the aim of teaching is to prepare students to match the needs of employment and everyday life in the future. There is much discussion and debate about this challenge by philosophers, politics, sociologists and of course those responsible for education. The aim of this report is to address the impact of this new technology on education in UK after considering the global perspective on the means of communication in the 21st century world and their effects in terms of the global village concept and then advent of a new world consciousness to people.

How does the UK manage to implement the new technology in the National Curriculum? What is the relationship between government policy and the market forces that are now more and more influencing the trends of education in this country?

On the other hand, how does the implementation of these decisions happen in the everyday reality of schools? What experiments are made in cross curricular teaching, embedding IT in traditional school subjects? How can we assess these initiatives?

This dissertation presents official documents and information that have been gathered on Internet about the new trends in teaching that include the use of IT. Very few recent books present this subject and IT specialists admit that although this domain is in complete evolution, they have not yet much information about what is done on a general basis. Most teachers experiment cross curricular teaching by themselves and in their own ways...

A review and a reflection about these trends are therefore of great interest, as, from this bubbling field of education, new strategies will soon emerge for the future. This is the aim of this dissertation, to summarise government directives and their echo from market forces on one hand, and the expectations of new pupils, born in this cyberworld, and the responses of teachers on the other hand. After presenting the place of IT in the National Curriculum, this essay will try to reflect on this challenge by searching information and results in the literature provided on this subject, and by observing IT and cross curricular teaching in St Birinus School of Didcot. Some experiences will be presented and we shall try to emphasis the problems related to this new approach.

1) Toward a global perspective.

The information and communication revolution (computers, Web, satellites TV) is changing our vision of the world and bring in the new concept of a global village [UVIC97]. The discussion of reaching a global perspective can be delineated in terms of three distinct

questions; what, why, and how. What are the elements of a global perspective? Without an understanding of just what a global perspective is, one cannot begin to formulate strategies to incorporate it. Why should we foster in our children and ourselves a perspective of the globe that contains within it the ability to accommodate all cultures, nationalities, religions, races, and any other characteristic of humanity and the world that has traditionally been a barrier to understanding. These barriers have been the cause of misunderstanding and conflict.

What is a Global Perspective?

Hanvey [HANVEY76] defined a global perspective as being composed of five elements or dimensions:

1. Perspective Consciousness
2. State of the Planet Awareness
3. Cross-Cultural Awareness
4. Knowledge of Global Dynamics
5. Awareness of Human Choices

Why a global perspective?

The growing interrelatedness of life on our planet has increased the need for citizens to possess the knowledge and sensitivity required to comprehend the global dimensions of political, economic, and cultural phenomena. Our nation's security, prosperity, and way of life are dependent in large part on citizens developing the capacity to comprehend trans-national, cross-cultural interactions and to participate constructively in decisions influencing foreign policy [NCSS82].

Global education is both an inevitable and a necessary curricular reform, inevitable because our society as a whole is moving toward global awareness; and necessary because our children and young people need to understand the world in which they live if they are to live in it happily and well.

Global Communication

For the global educator, global communication is one key to the a global perspective, and it is in this area that the Internet provides the most promise. Worldwide email is less expensive than using the post office in many countries, simple, and relatively easy to manage. It can be a powerful tool in the fight to get humanity to see past national interests [McLAREN95], [Wish.93].

2) The British approach

a) UK Net Year

The British attitude toward the IT revolution has been to boast the use of the Internet and e-mail in schools. This project called UK NetYear was launched in 1998 under the motto 'UK NETYEAR WILL HELP REVOLUTIONISE TEACHING AND LEARNING IN SCHOOLS'. UK NetYear, part of what Tony Blair referred to as "the biggest public-private partnership in any education system anywhere in the world" (Labour Party Conference September 1997), was launched simultaneously at venues in England, Scotland, Wales and Northern Ireland. David Wimpres, executive chairman of UK NetYear, said at the launch: "All our children and teachers could have access to the best information and educational resources available in the world if they had the Internet technology and the skills

to use it. Today, only 6,000 schools out of 32,000 have an Internet connection and the majority of these are based on just one computer connected to the Internet. "With an estimated 60 per cent of all computers in schools being out-of-date and the need to train 80 per cent of the UK's 450,000 teachers in the use of ICT, we have a huge challenge."

David Wimpres continued: "UK NetYear is at the helm of a massive effort involving a wide spectrum of companies. The initiative's main objective is to facilitate not only the connection of every school to the Internet, but also the provision of training and resources, so that all schools are using the Internet for teaching and learning by the year 2002. The Stevenson Report recommended that 75% of teachers and 50% of children have an e-mail address by 2002. UK NetYear, in conjunction with Excite, one of the UK's leading search and navigation services, announced that it was to offer e-mail addresses to all 10 million teachers and school children in the UK during 1998 - thus delivering those objectives four years early. These would be free for life and include the provision of comprehensive teaching and learning materials. Starting with the schools that currently had Internet access, Excite would roll out its free email programme at a rate of a million a month across 1998 until every UK school child and teacher has their own personal email address. In fact UK NetYear seems not to have achieved its goal and the Website that was dedicated to this project is presently unreachable.

But nevertheless co-operation between politics and enterprise still goes on, at least by the funding of schools in order to buy IT material, especially for the new technology colleges.

b) Government Initiatives

The Department for Education and Employment [DfEE99] is responsible for the National Curriculum, and has produced directives about IT in the NC.

The Government is fully committed to ensuring that all schools and teachers are in a position to deploy new information and communication technologies (ICT) to raise educational standards to enhance learning and to prepare young people with the ICT skills they will need in society and at work in the 21st Century. The Statistical bulletin "Survey of Information and Communications Technology in Schools" reports on a survey of ICT provision carried out in March 1998 and gives the picture before the Government introduced its implementation strategy and accompanying funding programmes. The data forms the baseline for monitoring and evaluating Grid development and the challenges the Government has set itself. Further surveys will be carried out annually each March.

In its manifesto commitments the Government pledged to set up a National Grid for Learning (NGfL) which will be an architecture of educationally valuable content on the Internet and a programme of equipping schools and other institutions with the necessary infrastructure and connectivity needed to access that content. To take this forward a consultation paper "Connecting the Learning Society" was published In October 1997 where the Government invited comments on its plans and proposed demanding targets for ICT:

- by 1999 all newly qualified teachers should become ICT literate to mandatory standards in order to receive Qualified Teacher Status;
- by 2002 serving teachers should generally feel confident and be competent to use ICT within the curriculum;

- by 2002 all schools, colleges, universities and libraries and as many community centres as possible should be connected to the Grid enabling perhaps 75% of teachers and 50% of pupils to have their own e-mail addresses;
- by 2002 most school leavers should have a good understanding of ICT based firmly on the standards prescribed in the national curricula across the UK.

Responses to the Government's consultation paper are summarised in "The Grid - Your Views" [NGfL99]. In November 1998 the full framework for the Grid was launched together with the NGfL Challenge "Open for Learning, Open for Business" which announced how the Grid will be taken forward following the consultation.

The Grid is being developed:

- to provide a national learning resource to help raise educational standards, especially to meet the Government's literacy and numeracy targets and improve the quality of life and Britain's international competitiveness;
- to deliver high quality educational software and services to teachers, pupils and other learners through public/private partnerships;
- to remove barriers to learning to ensure quality of access for all, including those in isolated rural areas, those with special educational needs or those in areas of urban deprivation
- to provide an information and learning resource for teachers to improve their ICT skills.

Substantial funding programmes of support are being made available to provide both for networking infrastructure, hardware, software and training to enable UK schools to connect to the Grid - over £700 million up to 2002 through the Standards Fund and other means and, for training in ICT for serving teachers to enhance their competence and confidence to use ICT effectively in their subject teaching - £230 million up to 2002 from National Lottery monies through the New Opportunities Fund. In addition, the Government has introduced a new National Curriculum in Initial Training Institutions for the use of ICT in subject teaching. From 1999, all newly qualified teachers will need to have a competence in ICT to mandatory standards in order to receive Qualified Teacher Status.

Schools Minister Charles Clarke stressed on 11 February 1999 the "massive priority" given by the Government to information and communications technology in schools and called for a partnership approach to overcoming barriers to creating an ICT culture in the classroom [DfEE99b].

Speaking at the annual conference of the National Association of Advisers for Computers in Education in Liverpool, Mr Clarke said:

"It is vital that we exploit new technology and ideas and educate both teachers and children in when and how to use technology. If we do this, we will ensure that every child can leave school prepared to take their place in the world of work or continue their education with confidence.

"I believe we have gone some way to achieving this objective, but there is still more to be done. We have to face up to the problems that exist and deploy the tools we have at our disposal to address those difficulties in a targeted way."

Mr Clarke said teachers needed to gain confidence in using ICT - a fact borne out by this week's annual report by her Majesty's Chief Inspector of Schools, which found that many

teachers lack the confidence and training to teach ICT well, while others are unable to apply ICT to their subjects.

"The way key ICT players relate to each other must also be improved upon: commercial ICT providers need to develop proper partnerships with the Government; and developers of schools ICT educational material should be working with those who play a part in developing material available from High Street stores. Schools could do more to develop relationships with local businesses which use cutting-edge ICT on a daily basis.

"There also needs to be a consistent support network at a local level so that schools and teachers can maintain their ICT and keep in step with the rapid pace of developments in the field. To achieve this we need to be clear about the nature and level of support schools need and the best ways of delivering that support. We must also ensure that those giving advice to schools are informed about the professional, technical and staff development issues.

"At present, the picture on the ground is mixed. Gaps in provision are unacceptable. I hope Managed Services which carry guarantees of quality will help. But schools need choice, a broad range of local support.

These are issues which NAACE will want to address."

Mr Clarke said: "Government investment in hardware and software equipment - £700 million up to 2002 - together with the £300 million training programme for teachers, will help create an ICT culture. Such investment will give teachers the confidence to use ICT in the classroom and to regard the National Grid for Learning as a key tool in the drive to raise standards.

"We can also influence - through guidance and grant-giving powers - the ICT purchasing decisions of schools and local education authorities.

"These are powerful tools which we can use to address the problems surrounding ICT in schools. Teachers are clearly a key audience: they must feel ownership of the ICT revolution if it is to succeed in the classroom. They are at the core of what we have to achieve and we can use their knowledge and experience to ensure they get the software and hardware they need to use ICT effectively in the classroom - whether it is teaching materials or a whiteboard.

"We also need to look at the relationship between home and school and the importance of ensuring every child can benefit from the ICT revolution, whether or not they have a PC at home. We have already gone some way to ensuring that we avoid a 'have and have-not' situation through initiatives like after school computer clubs and schemes which help break down the barriers between schools and the communities around them."

c) What is the place of IT in the national Curriculum?

IT is in every NC subject, but it is very loose. IT should be used where appropriate. There is one attainment target which counts 8 levels that describe the types and range of performance that pupils working at a particular level should characteristically demonstrate [IT/NC95]. In deciding on a pupil's level of attainment at the end of a key stage, teachers should judge which description best fits the pupil's performance. Each description should be considered in conjunction with the descriptions for adjacent levels. By the end of Key Stage 1, the performance of the great majority of pupils should be within the range of Levels 1 to 3, by the end of Key Stage 2 it should be within the range 2 to 5 and by the end of Key Stage 3 within the range 3 to 7. Level 8 is available for very able pupils and, to help teachers

differentiate exceptional performance at Key Stage 3, a description above Level 8 is provided. The scale does not apply at Key Stage 4.

Level 1

Pupils use IT to assemble text and symbols to help them communicate ideas. They explore information held on IT systems, showing an awareness that information exists in a variety of forms. They recognise that many everyday devices respond to signals and commands, and that they can select options when using such devices to produce different outcomes.

Level 2

Pupils use IT to help them generate and communicate ideas in different forms, such as text, tables, pictures and sound. With some support, they retrieve and store work. They use IT to sort and classify information and to present their findings. Pupils control devices purposefully and describe the effects of their actions. They use IT-based models or simulations to investigate options as they explore aspects of real and imaginary situations.

Level 3

Pupils use IT to generate, amend, organise and present ideas. They use IT to save data and to access stored information, following straightforward lines of enquiry. They understand how to control equipment to achieve specific outcomes by giving a series of instructions. They use IT-based models or simulations to help them make decisions, and are aware of the consequences of their choices. They describe their use of IT, and its use in the outside world.

Level 4

Pupils use IT to combine different forms of information, and show an awareness of audience. They add to, amend and interrogate information that has been stored. They understand the need for care in framing questions when collecting, accessing and interrogating information. Pupils interpret their findings, question plausibility and recognise that poor quality information yields unreliable results. Pupils use IT systems to control events in a predetermined manner, to sense physical data and to display it. They use IT-based models and simulations to explore patterns and relationships, and make simple predictions about the consequences of their decision making. They compare their use of IT with other methods.

Level 5

Pupils use IT to organise, refine and present information in different forms and styles for specific purposes and audiences. They select the information needed for different purposes, check its accuracy and organise and prepare it in a form suitable for processing using IT. They create sets of instructions to control events, and are becoming sensitive to the need for precision in framing and sequencing instructions. They explore the effects of changing the variables in a computer model. They communicate their knowledge and experience of using IT and assess its use in their working practices.

Level 6

Pupils develop and refine work, using information from a range of sources, and demonstrating a clear sense of audience and purpose in their presentation. Where necessary, they use complex lines of enquiry to test hypotheses. They develop, trial and refine sets of instructions to control events, demonstrating an awareness of the notions of efficiency and economy in framing these instructions. They understand how IT devices can be used to monitor and measure external events, using sensors. Pupils use computer models of increasing complexity, vary the rules within them, and assess the validity of these models by comparing their behaviour with other data. They discuss the wider impact of IT on society.

Level 7

Pupils combine a variety of forms of electronic and other information for presentation to an unfamiliar and critical audience. They identify the advantages and limitations of different data-handling applications, and select and use suitable information systems, translating enquiries expressed in ordinary language into forms required by the system. They use IT equipment and software to measure and record physical variables. They design computer models or procedures, with variables, which meet identified needs. They consider the limitations of IT tools and information sources, and of the results they produce.

Level 8

Pupils select the appropriate IT facilities for specific tasks, taking into account ease of use and suitability for purpose. They design and implement systems for others to use. They design successful means of capturing and, if necessary, preparing information for computer processing. When assembling devices that respond to data from sensors, they describe how feedback might improve the performance of the system. They discuss in an informed way, the social, economic, ethical and moral issues raised by IT.

Exceptional performance

Pupils evaluate software packages and complex computer models, analysing the situation for which they were developed and assessing their efficiency, ease of implementation and appropriateness. They suggest refinements, and design, implement and document systems for others to use, predicting some of the consequences that could arise. When discussing their own and others' use of information technology, they relate their understanding of the technical features of information systems to an appreciation of how those systems affect wider social, economic, ethical and moral issues.

d) British Educational Communications and Technology Agency

Becta is the Government agency tasked with ensuring that information and communications technologies (ICT) are harnessed to support the raising of educational attainment. Becta's remit is to work closely with the DfEE, other government departments and agencies, and local education authorities to provide the advice and support needed to assist the Government in meeting its objectives of:

- ensuring the technology supports closely the DfEE's efforts to drive up standards in core curriculum subjects, in the teaching of key skills, in school effectiveness, and more widely in the development of lifelong learning;
- ensuring that young people leave school and college with the information and communication technology skills that they will need for the 21st century;

- ensuring that, in both of these areas, the needs of people with special educational needs are addressed.

Becta has substantial experience of the use of ICT to support teaching and learning, and is dedicated to the realisation of the Government's vision of the Learning Age. As such, Becta welcomes the publication of The Learning Age and the contribution that it has made to the debate on the way to take forward the lifelong learning agenda. As a consequence of Becta's focus on the effective use of ICT in all education sectors, this statement will confine itself to those areas which relate specifically to the use of ICT to enhance and support learning, in particular for learners with special needs. The statement will also address the importance of ICT skills as key skills in preparation for work and community membership.

Summary

ICT has an important part to play in taking forward the Learning Age through:

- helping to remove obstacles to learning, through providing more flexible access to learning opportunities and providing support for different ways of learning beyond those currently available;
- supporting the promotion of Ufi through the use of modern marketing techniques and the provision of an infrastructure for communication between local and national providers and potential learners;
- facilitating learning situations which are attractive to those who are not currently participating in learning;
- providing the systems needed for management of individual learning accounts and enabling them to be used for the broadest possible range of learning opportunities and guidance;
- making a substantial contribution to the wide range of learning opportunities required. The full range will require new methods of delivery, complemented by better-established ones;
- creating the infrastructure for links between Learning Direct and the local partnerships needed for it to operate with maximum effectiveness;
- facilitating the communication and interaction needed to complement broadcast technologies in order for effective learning to take place;
- supporting the development of key skills and, in particular, ICT skills;
- enabling initial screening and guidance, allowing learners to consider options in a non-judgmental environment;
- providing the links between local centres and national and regional organisations, between novice and experts, between learners and those who support them, and between members of the larger learning community;
- ensuring that training in IT skills is widely available, as these are destined to become vital basic skills for the future.

During the BETT'99 exhibition, on 14 January 1999, Owen Lynch, Chief executive of BECTA had a talk on teaching and learning for the next decade. Is ICT indispensable? Is it sustainable?

He stated that today, for the first time, there is a pervasive impression that ICT's existence, purpose and future in education is assured.

“There is a feeling both of change and of arrival. The feeling of change is being generated by the emergence of multimedia and communication technologies. The sense of arrival is assured by the Government's emphasis on the importance of ICT in the future development of Education. Nevertheless, it is wise to pause a moment and to balance such optimism with a tinge of caution. After all over the past ten years we have not achieved through the use of ICT that for which many of us had hoped or, indeed, expected. During the last decade we have invested significant energy, creativity and resource to implement ICT effectively to improve the quality of teaching and learning. Yet there has not been the expected systemic change. There are still few establishments where ICT has become indispensable to teaching and learning.

Indeed, there is a recorded decline in our schools' perception of the importance of ICT's contribution to teaching. Furthermore, fewer schools have established quality infrastructures of sustainable ICT resource within LMS (Local Management of Schools, which means financial autonomy) budgets. Ironically and disappointingly, ICT's lack of systemic impact has taken place against a decade of significant educational change: change which, at times, has been revolutionary rather than evolutionary. During this period schools have adopted, responded to and personalised surges of innovation such as the implementation of LMS, the National Curriculum and Ofsted inspections. Yet these same schools have not fundamentally altered the delivery and management of teaching and learning through the use of ICT. There has been no revolution or indeed systemic evolution in the basic manner in which teachers approach teaching, pupils approach learning, or educational establishments approach the management of themselves.

Apart from some wonderful exceptions, it appears that - while investment on ICT infrastructure and practice has been significant and the development of the technology extraordinary - we have not yet reaped the expected educational rewards. Indeed, the ICT elements of our present educational landscape can at times appear bleak and depressing.

1. Firstly, a significant proportion of our teachers lack the appropriate capability in their ICT use. It is remarkable that, while we have expected them to use ICT effectively in their classrooms, we have not ensured that they are capable users of the technology. Undoubtedly, there is no a priori relationship between our teachers' ICT capability and their effective use of ICT in the classroom. However, personal capability is a significant prerequisite for our teachers' effective use of ICT.
2. A second issue for concern is teachers' access to appropriate levels of resource.
3. The third element of concern is the fragility of the evidence base linking ICT use with improvements in teaching and learning. ICT is an expensive resource and we have failed to provide and articulate a sufficiently robust evidential base for its use. Our inability to do so has allowed many to assume that ICT would not be indispensable to the educational opportunities it provided.
4. My final and most significant concern is that our schools have, in the main, been unable to develop sustainable ICT infrastructures. In the first instance we have failed to deliver resource infrastructures that allow high levels of pupil and teacher access. In the second instance we have failed to deliver infrastructures of ICT practice and purpose that are central to the school's delivery of teaching and learning. Our institutions have not evolved as quickly as we expected to accommodate and take advantage of the new opportunities.

The reason that these infrastructures have not evolved is complex. In part it is due to lack of resource, unconvinced senior managers, the costs associated with ICT use, the competition from other solutions and the fact that we are still at a relatively early phase of ICT development. However, in part it is also due to the fact that the pace of technological change is itself problematic.

1. Firstly, ICT development provides an ever-moving dynamic, with which pedagogical development constantly strives to keep up.
2. Secondly, the emerging technology is forever challenging our capability to make sensible and informed purchasing decisions.

Against this background of underachievement and patchy success, why the euphoria of the moment? The sense of new opportunities, excitement and anticipation? I offer four fundamental reasons.

1. Firstly, the quality of political will that has been demonstrated over the past twelve months by this Government is a source of confidence.
2. Secondly, our confidence is justified by the addition of two significant capabilities to our technological base. One of these is multimedia and the other is communications. These technologies provide new and significant opportunities for teachers and pupils alike.
3. Thirdly, we can have confidence for the future because our experience base of ICT in education has significantly matured. We can afford to be judicious on the purposes and impact of ICT use. There is no need and indeed no place for an evangelical advocating of ICT use. A partnership between the educational and commercial communities, based on an evaluative and critical consideration of the use of ICT, will help us to avoid some of the excessive and damaging claims made in the past. We have grown up.

"We are determined to create a society where, within ten years, information and communications technology has permeated every aspect of education."

The NGfL vision also incorporates two economic elements.

1. Firstly, it seeks to provide our students with the capabilities needed in a changing commercial and cultural world: one which is set on developing their capacity to take advantage of the opportunities that revolve around the creation, transmission and use of information in the market place.
2. Secondly the vision incorporates the need to provide opportunities for British industry to take advantage of the present large-scale investment in the ICT infrastructure - opportunities, which are not solely confined to selling infrastructure, but which are of equal importance in developing the software and services that will give life and purpose to that infrastructure.

The process must take advantage of three particular partnerships. These are the partnership between education and the commercial world, the partnership between the national and local contexts, and the partnership between the home and school. Teachers and schools need solutions which require little additional investment of their time and which clearly and neatly slot into existing curriculum structures and today's pedagogical practices. They need software, which delivers learning more effectively and efficiently than the teacher can provide without the use of ICT. Too often in the past there has been insufficient dialogue between the educational and commercial communities on product development. Frequently the

process has been characterised by suspicion and ignorance. This is clearly unacceptable. If the NGfL is to succeed, then the educational community must more readily influence, inform and support the creative capability of the commercial community.

Within the local context it is crucial that the school takes full advantage of its relationship with the home. The day is dawning when pupils will access their work at home not only as an extension of their day's learning at school, but also as a natural and seamless continuation. This potential extended partnership between home and school, delivered through communications and digital broadcast, is one that is rich in its capacity to radically influence standards. Schools will need to evolve new frameworks and strategies to take full advantage of this key opportunity.

To date, we have an infrastructure of resource in schools that is varied, often not compatible with itself and unsuited to the increasing opportunities provided by communications, multimedia and networking. That infrastructure was purchased with varying degrees of knowledge and understanding of the technology and with varying degrees of strategic intent. With the advent of communications and networks, the constantly changing nature of the technology and the difficulty of marrying new technology with that in established use, the purchasing process for senior managers has become more and more complex. The challenge is to provide a process by which schools can purchase quality technology and services that are relevant to their educational needs. Part of this challenge will be met through managed services. I am not suggesting that it is the way all schools will or should purchase. Rather, it is a process that will satisfy the needs of many educational communities.

Over a four-year period, the Government is providing an additional £750 million for infrastructure. This is a enormous investment. If we wish to sustain this development, then the educational community will have to rise to the challenge.

We have all heard the observation that we are teaching our students for the twenty-first century in nineteenth-century establishments. However, the real limitations of the present are not in the physical buildings, but in the lack of emerging creative responses to managing learning and teaching differently. In the coming years we will need to establish teaching and learning frameworks that take full advantage of the capacity of the technology to diagnose, differentiate, demonstrate and deliver from afar.

Given good fortune, most of our students in schools will live 70 to 80 years into the next century. Indeed, some of them may even live into the 22nd century. These students have an entitlement to an education system which takes full advantage of the ability of ICT to influence the quality and scale of their achievements and the style in which they will both learn and earn in the future.

Our challenge for the next three years is to prove both that ICT is educationally indispensable because of what it offers to our teachers and learners, and also that it is sustainable within our financial frameworks. Furthermore, we must demonstrate that it is indispensable and sustainable across the educational system, empowering our profession, our pupils and our schools. If we fail to deliver within the opportunities of the present, we

will set back the opportunity for systemic change for another decade, returning to a pattern of isolated islands of excellence in a sea of mediocrity and failure.”

This speech shows the difficulties that harm the development of ICT in teaching, mainly because of resistance from the teachers in changing their delivery on one hand, but also some slowing down in the enthusiasm for ICT in schools. Although the government and its agencies offers much help to develop the new technologies in schools, the co-operation between schools and ICT providers does not work properly.

e) Implementation of the directives

The implementation of the government directive is done by the Initial Teacher Training National Curriculum for the Use of Information and Communications Technology in Subject Teaching [TTA99] on one hand, and the aims and syllabuses of schools on the other hand. A summary of the Teacher Training Agency consultation document can be found in the annexe 3, and some schools aims and syllabus on the subject are presented in the annexe 4.

Teachers are required to have an "essential core of knowledge, understanding and skills" in ICT, especially new qualified teachers, in order to embed IT in their teaching wherever it is useful.

The syllabuses of schools emphasis on their IT courses to attract pupils, even a Language College like the Didcot Girls School that provides a GCSE information technology course which covers: Information Handling, Communication, Measuring, Control, Modelling, System Design, Application and Effects. This is probably made in co-operation with the St Birinus School in Didcot which is a Technology College.

3) Example of the St Birinus school in Didcot

- The mission statement of this technology college is:

Developing in young people the skills and abilities they need to meet the technological challenges of the 21st Century with confidence and success.

- The core aims are:

1. To raise the achievement of all pupils across the curriculum, with an emphasis on mathematics, science and technology.
2. To increase the take-up of mathematics, science and technology.
3. To provide a wide range of teaching and learning opportunities in the key subjects throughout the school by making effective use of new technology.
4. To further develop our partnership with the local business community.
5. To ensure that staff are well-trained and motivated in order to achieve our goals.

There is a basic IT course for Year 7 and 8. The syllabus includes the use of the network in the school, use of email, Internet and the programs on the school network, i.e. office 97. OfSTED controls every 4 or 5 years what the school does in relation to the directive document ‘delivering and assessing IT’ [NCET98].

a) End of year 8

By the end of Year 8, there is a big assessment in form of a project: 'disco in the school'.

This project consists in the following parts:

- Write a questionnaire asking what pupils want to have in a disco (services like drinks, food, day in the week, etc)
- Then they build a database with the answers.
- They interrogate the database and make a report to their head teacher, with the list of the best day, food and drink.
- They make a spreadsheet on the costs, this work models the running of the disco.
- They design the posters for adverts and the tickets, using the software Publisher.
- Then they make a report on what has been done so far and why they have used Word, Publisher, Excel and the database software.
- They use Internet for getting information about the costs of discos and DJs. This activity provides the real costs and contacts with the professionals on the Internet.

The whole project lasts two terms (22 weeks) and is supervised by the IT co-ordinator.

b) Year 9

From Year 9 and plus, IT is across the Curriculum, which means that it is embedded in the teaching activities of the different subjects. IT goes into the different departments of the school and the IT co-ordinator meets the heads of departments on the one to one basis on order to discuss the progression of IT in school teaching.

c) Year 10 and 11 (Key Stage 4)

IT is practised within the departments, following the document 'Information technology key skills' [ITKS97] which consists in 3 levels. This document summarises the performances that have to be achieved by the pupils and the assessment for it. Each pupils has such a file which is managed by the IT co-ordinator, from the observations of teachers of subjects in cross-curricular activities. The directives to manage this file are given by the document 'Key skills units in Information Technology at Key Stage 4' [BTEC97] and give specifications and guidance for teachers. This subject will be compulsory for all 6-formers from September 2000.

The main points of this Key Skills accreditation are as follows:

Background

- The pupils have to prepare, process and present work using ICT and evaluate the effectiveness of the ICT.
- The course has three levels, Foundation, Intermediate and Higher.
- The majority of pupils will reach intermediate / higher by the end of Key Stage 4. Assessment is by simple teacher assessment and a small portfolio of work (8 examples)
- Assessment will have to be completed by Easter 2000.

What do subject teachers do?

- Subject teachers will not be required to teach anything new.
- The only requirement is that some of the pupils' work, either coursework or classwork is completed using ICT.
- A simple written record of the pupil's performance in the class is kept.

- Once completed a copy of the work must be given to the ICT department for assessment and recording along with the pupil's performance record.
- Work for assessment can be e-mailed or named printed copy of the work handed into the ICT department.

What do pupils do?

- The ICT department will produce the class recording chart for each subject group.
- A simple tick / cross record of the pupils performance is all that will be required.
- To help staff familiarise themselves with this work the ICT co-ordinator will spend time going through what is required before the pupils undertake the work.
- If necessary, there will be class support to help with the delivery of the work.
- A recording chart will be provided by the ICT department along with guidelines for the work.
- It is essential that all pupils in the group undertake and complete the task and the results are handed in.
- The ICT department will provide as much help as possible but it is up to the department to provide the evidence for assessment.

These assessments match the NC, provided that the pupils do some technology in their IT activities. However, in the year 2000, technology measurement and control will go out of IT and join the technology subject. Thus the NC is due to change at that time and IT will consist in word processing, spreadsheet, database, publishing and the Internet activities. The assessment is done by the IT co-ordinator of the school, with an external verification. The pupils send their work to the IT co-ordinator by email. Then the IT co-ordinator tracks the pupils with their file 'Information technology key skills' [ITKS97]. This organisation of IT activities within St Birinus School has started in May 1998, the work was set between September and Christmas 1999. The real start was in February 1999, which is one term and a half late, from the prevision. But the IT co-ordinator stresses that putting into gear a new teaching in less than one year is a good performance.

4) Conclusion

The different aspects of this report show the enormous concern of the British government for ICT in school, in order to prepare the youth of this country to one of the main challenges of the 21th century. The technology revolution takes more time to take place than expected. Considering the main points of weakness of ICT development at school, there is probably a lack of co-operation between two parts of the society that used to ignore each other, that is education and economics. But the political trend is to match them together, in order to bring the money to school from the sponsorship of industry and to prepare the future workers to the demands of economy. This is probably the result of the education policy that has been initiated by Mrs Thatcher. Secondly the delay between the directives which have been supported by the governmental Department for Education and Economics (DfEE) and the non governmental British Educational Communications and Technology agency (BECTA), is mainly due to the problems for teachers of changing their habits of teaching into a more embedded ICT delivery, but also due to the lack of proper software to use in their teaching.

On the other hand, there is the youth of UK that was born with the revolution of information technology, and that is play-station and video games addicted. Youngsters seem to have no problem in dealing with ICT, as it is part of their life. Computers are now available at low cost and the money is also there thanks to the huge investments made by the government.

This evidence shows that even with political will, money and consensus, it is not possible to go faster than the speed of society toward changes. The only advantage of bringing so much effort in speeding the change toward the new age might be to shorten the duration of this change to the minimum, if there is not a reaction of apathy from the participants in change. If the expected results of the UK NetYear are reached by the end of Year 2000, the British should be satisfied to have brought the new age in gear in so little time.

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Annexe 1: Equipment in UK, some data

Survey of UK Secondary School Libraries (http://www.la-hq.org.uk/ssl97f_a.htm)

10. ASPECTS OF IT

Network in the library

10.1 Overall, 38.8% of schools had a computer network that included the library; there were notable differences between countries with Wales (43.3%), England (42.3%), Northern Ireland (31.0%) and Scotland (22.1%). There was also variation between types of school with 12-17 (20.0%), 'Other' (27.4%), 11-16 (37.5%) and 11-18 (42.8%). There were larger differences between sectors with special (11.5%), independent (30.3%), 'Other' (37%), LEA (40.2%), grant maintained (48.6%) and CTC (75.0%). Not surprisingly the percentages for the increasing size of school in terms of pupil numbers were: less than 50 (12.5), 50-100 (11.3), 100-500 (26.1), 500-1000 (41.6), 1000-2000 (45.9) and 2000 plus (54.8).

Automated Library Management System

10.2 Overall, 57.4% of school libraries have an automated library management system; the main differences being by type of school: 'Other' (35.6%), 11-16 (56.1%), 12-17 (60.0%) and 11-18 (62.5%) - note that the 'Other' category is comprised of special and independent schools and so does not reflect a single group. By sector the possession of an automated library management system is : special (9.6%), independent (47.5%), 'Other' (57.8%), LEA (59.6%), CTC (62.5%) and grant maintained (70.2%) .There is a noticeable trend by size of school (percentages with increasing pupil numbers): less than 50 (15.6), 50-100 (10.2), 100-500 (29.9), 500-1000 (62.2), 1000-2000 (74.8) and 2000 plus (75.6).

Access to the Internet

10.3 Overall, 30.7% of school libraries have Internet access; 36.5% for 11-18 schools compared with 23.1% for 11-16 schools. Scotland at 50% is well ahead of the other countries on Internet access; special (3.5%) and independent (19.5%) schools also lag behind. As would be expected, there is a tendency for larger schools to have access (percentages with increasing pupil numbers):less than 50 (6.3), 50-100 (3.9), 100-500 (15.9), 500-1000 (33.9), 100-2000 (38.8) and 2000 plus (50.0).

CD ROM equipment

10.4 Overall, 87.3% of school libraries have a CD ROM player; 86.2% for 11-16 schools compared with 91.8% for 11-18 schools. Scotland with 92.7% and Northern Ireland with 91.9% lead England (83.8%) and Wales (75.8%). Special schools (35.7%) and independent schools (75%) also find this item less popular. Again with increasing size of school (in terms of pupil numbers) the percentages are: less than 50 (34.4), 50-100 (30.8), 100-500 (72.6), 500-1000 (92.6), 1000-2000 (96.6), 2000 plus (100); a very strong trend.

Annexe 2 : BECTA'S NEW ROLE, STATUS AND REMIT [BECTA99]

STATUS

Becta is a controlled executive NDPB serving the needs of the UK as a whole. It is a company limited by guarantee with charitable status.

BUDGET

In 1997-98 Becta received a core grant of £4.83 million from the sponsoring government departments. In addition to this the organisation receives, from government and other organisations, 'earmarked funding' for specific projects. Over recent years, Becta's earmarked funding has ranged from £5-£8 million, giving total annual turnovers of between £10-£13 million. In the current year, the Secretary of State has agreed earmarked funding of approximately £23 million for Multimedia Portables for Teachers Initiative.

REMIT

Becta's remit is to ensure that technology supports the DfEE's drive to raise educational standards, and in particular to provide the professional expertise the DfEE requires to support the future development of the National Grid for Learning.

The organisation has been tasked by the Minister to work closely with the DfEE, other government departments and agencies and LEAs to provide the advice and support needed to assist the Government in meeting its objectives of:

- ensuring that technology supports closely the Department's efforts to drive up standards in core curriculum subjects, in the teaching of key skills, in school effectiveness, and more widely in the development of lifelong learning;
- ensuring that young people leave school and college with the information and communication technology skills that they will need for the 21st century.
- and in both of these areas, ensuring that the needs of people with special educational needs are addressed.

In addition, Becta has a role in the further education sector's developing use of ICT and in the evaluation of new technologies as they come on stream. It is also required to keep itself generally informed of international developments in the educational use of ICT.

UK ROLE

The organisation has a UK remit and is expected to ensure that its work is appropriate to the needs and identities of the different UK countries. An identified director will assume responsibilities for Becta's work with each of the four UK countries, with a head of department and information officer identified to support this work. The Chief Executive will co-ordinate work across the four UK countries.

Annexe 3 : Training teachers for the use of ICT in schools

<http://www.adastral.demon.co.uk/ma3/ttaictnc.htm>

This is a summary of the Teacher Training Agency consultation document: Initial Teacher Training National Curriculum for the Use of Information and Communications Technology in Subject Teaching

The document specifies an "essential core of knowledge, understanding and skills", equipping trainees "to make sound decisions about when, when not, and how to use ICT effectively in teaching particular subjects". It also places a responsibility on the training provider to ensure that training is "firmly rooted within the relevant subject and phase, rather than teaching how to use ICT generically or as an end in itself".

The document is split into two sections:

- 1) Effective teaching and assessment methods. Section A covers traditional teaching and assessment methods but specifically relates those methods to teaching using ICT.
- 2) Trainees' knowledge and understanding of, and competence in, ICT. Section B covers the more technical skills and competence required when teaching using ICT. ITT providers are expected to audit trainees' current skills and competence and to provide appropriate training to fill gaps in their knowledge.

Teachers will be expected, throughout their careers, to "continue to improve their skills in using ICT for professional purposes", and "keep up to date with the use of ICT in the subjects they teach".

Since this document will be of interest to teachers, I have phrased the requirements of the document in terms of requirements on teachers. This is a summary document, so there has been no attempt to give examples of practice (as there are in the actual document). The numbering of sections below does not necessarily reflect the numbering in the original document, but the order has been preserved.

Section A : Effective teaching and assessment methods.

1. Teachers should have the ability to decide whether use of ICT is appropriate, considering:

- speed and automation of ICT applications
- capacity and range of ICT
- provisional nature of information stored
- interactivity of ICT

Each of the above can influence teaching and learning positively and negatively.

2. Teachers should be able to identify in planning:

- how use of ICT meets teaching and learning objectives
- techniques for directing and stimulating learning
- methods of assessment
- criteria for assessment of work independently of effects of using ICT
- effect of using ICT on classroom management
- appropriateness of ICT to subject and pupils, taking into account pupils' current skills

3. Teachers should be able to maximise the effectiveness of use of ICT in subject, by:

- use of ICT to achieve teaching and learning objectives, not just as a motivational tool
- not using ICT when other methods would be more appropriate
- knowing what preparation of resources is required beforehand
- avoiding the improvement of presentation at the expense of content when ICT is used
- structuring pupils' work
- expecting pupils to use ICT in subject-related work independently of directed ICT use
- making explicit the reasons for using ICT for particular work
- making explicit the impact of ICT in everyday life

4. Teachers should be able to organise ICT resources in the classroom, including:

- using a single screen to introduce or review a topic covered using ICT
- organising groups or pairs for collaborative work, interacting with groups when necessary

- reviewing the work of individual pupils using ICT to ensure that use is effective
 - making ICT resources available for spontaneous ICT use, and that the use is effective
 - positioning resources for ease of use, and to minimise distraction
 - considering health and safety issues
 - ensuring that the use of ICT supports teaching rather than dominating it
5. Teachers should recognise how ICT can assist in teaching SEN pupils in mainstream classrooms
6. Teachers should be able to choose suitable ICT to meet teaching objectives, including:
- deciding whether or not software should be used
 - assessing the potential of software to meet teaching objectives
 - judging the suitability to pupils, taking into account prior experiences and other factors
7. Teachers should be able to contribute to the development of pupils' ICT ability, by:
- explicit discussion of ICT applications within the context of the subject
 - teaching of ICT applications where necessary
 - using ICT terminology accurately and appropriately
 - using ICT in ways which provide models of good practice
8. Teachers must be able to monitor, assess and evaluate teaching and learning using ICT, by:
- monitoring pupils' progress using intervention and questioning where appropriate
 - recognising individual achievement in respect of expectations
 - insisting that information gathered from multiple sources is acknowledged appropriately
 - determining the achievement of individuals within collaborative projects
 - ensuring that assessment of work is subject-based and not ICT-based
 - knowing how formative, diagnostic and summative assessment are appropriate when using ICT
9. Primary teachers should recognise the importance of introducing ICT to this age range, by:
- encouraging pupils to become familiar with the use of ICT
 - ensuring that pupils have appropriate opportunities to access ICT
 - identifying and teach key skills for handling input devices
 - using ICT to support the development of language and literacy
 - using ICT to support the development of numeracy
 - using ICT to support pupils' creative development

Section B : Knowledge and understanding of, and competence in, ICT.

NB Items 4, 5, 6 and 7 will have differing amounts of relevance to different subjects

1. Teachers should be able to use a range of resources including:
- the use of common user interfaces
 - simple connection of hardware
 - installation of software
 - file management
 - seeking help information
 - coping with everyday problems
2. Teachers should know about and be able to use information handling skills, including:
- evaluating information in terms of accuracy, validity, reliability, plausibility and bias
 - searching for information from a variety of sources
 - knowing that sources of information can be linked dynamically
 - knowing that information can be easily shared with other people at remote locations
 - knowing that information must be stored somewhere and that it can be changing or static
3. Teachers should be able to use ICT to find things out, including:
- choosing search resources
 - planning strategic searching
 - structuring and storing found data

- interpreting data and considering its validity, reliability and reasonableness
4. Teachers should be able to use ICT to try things out, including:
 - exploring alternatives through models
 - modelling relationships
 - considering cause and effect
 - recognising patterns
 - predicting patterns and rules
 - hypothesising
 5. Teachers should be able to use ICT to make things happen, including:
 - giving instructions
 - sequencing actions
 - defining conditions
 - understanding feedback and its implications
 6. Teachers should be able to use ICT to communicate or exchange ideas, including:
 - choice of appropriate content appropriate to audience
 - choice of appropriate media
 - choice of appropriate communication methods
 7. Teachers should be aware of the ways in which ICT supports teaching and learning, including:
 - speed and automation of ICT applications
 - capacity and range of ICT
 - provisional nature of information stored
 - interactivity of ICT

See the TTA ICT NC document for more detail (paragraph 14)

8. Teachers should be aware of the potential of ICT in preparation and presentation of teaching
9. Teachers should understand the place of ICT within the National Curriculum, including:
 - links with subject or phase curriculum
 - links with IT curriculum
 - ensuring that use of ICT is relevant to the phase and subject in which it is being used
10. Teachers should know how the following are relevant to their subject and phase:
 - generic procedures and tools
 - reference resources
 - software and tools specific to subject
 - courseware (e.g CAL and ILS applications)
11. Teachers should be aware of health and safety, legal and ethical issues in relation ICT
12. Teachers should be aware of:
 - current research and inspection evidence regarding the teaching of ICT in their subject
 - the location of other sources of support, including the NGfL Virtual Teacher Centre
 - the ways in which ICT can support them in continuing professional development

Annexe 4: Examples of schools aims and syllabus in ICT

ICT companion (part of the Painsley Intranet)

<http://www.painsley.org.uk/ictcompanion/gcse/gcsedesc.htm>

This site contains resources, tools, news, notes, presentations, worksheets and discussion areas especially tailored to the teaching of I.C.T in the U.K curriculum. It is designed as an aid for students and teachers.

The syllabus encourages the investigation and study of Information Technology in a variety of contexts, home, school, recreation, community, business and industry. In these contexts candidates are given opportunities to acquire competence, capability and critical skills through the creation, implementation, use and evaluation of a range of information systems. Candidates from all cultures and both genders can develop their interest in, enjoyment of, and critical reflection about information technology as an integral part of modern society.

The syllabus uses a range of assessment techniques to enable candidates to respond graphically and in writing through practical and investigative work. In the final assessment, 60% of the marks are based on coursework which allows candidates to experience an appropriate variety of roles relevant to information technology: user, designer, maker, manager and client. The remaining 40% of the final assessment will be by differentiated terminal examination papers testing Grades C-G and Grades A*-D.

The syllabus will aim to:

- develop the competence of candidates through the use of information technology in reasoned ways to solve significant problems using appropriate principles, techniques and equipment effectively and safely;
- develop the capability of candidates through the practical use of information technology for a variety of appropriate purposes in ways which produce effective responses to identified needs and opportunities in the whole curriculum;
- develop the knowledge, concepts and skills which enable candidates to develop a broad and balanced view on a range of information systems and their applications, an understanding on their capabilities and limitations and an ability to evaluate them critically;
- develop the abilities of candidates, through the appropriate knowledge and concepts, to comment and reflect on the significant legal, political, social, environmental, economic and aesthetic applications, implications and effects of information technology;
- encourage precise and accurate communication skills in a variety of media.

Assessment Objectives

The following statements are intended to provide a general indication of the knowledge and abilities which the examination will be designed to test.

Candidates should be able to:

- demonstrate their knowledge, skills and understanding of information technology and apply these to a range of situations;
- identify appropriate needs and opportunities for using information technology, analyse and evaluate the most appropriate ways of addressing these;
- analyse and evaluate the use of information technology in a range of situations and develop understanding of the wider applications and effects of information technology;

- design, implement, test, evaluate and document suitable ways of using information technology to address needs and opportunities;
- reflect critically on the way they and others use information technology;
- make informed judgements, discuss and review the impact of information technology and its applications in a range of contexts and formulate reasoned views on the benefits and drawbacks of these;
- consider the social, legal, ethical and moral issues which surround the increasing use of information technology.

Candidates will be assessed on their ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking into account their use of grammar, punctuation and spelling.

Didcot Girls' School (*Promoting excellence through partnership*)

<http://www.dgs.oxon.sch.uk/depts/it/gcse/index.htm>

GCSE INFORMATION TECHNOLOGY AT DGS

The course provides opportunities for pupils to develop an awareness of the nature and importance of Information Technology in a rapidly changing society, and enables pupils to develop their application of knowledge, skills and understanding.

The following content will be covered: Information Handling, Communication, Measuring, Control, Modelling, System Design, Application and Effects

The course is taught as a discrete subject but in half the time recommended by the examination board. Pupils will therefore be expected to practise their skills across the curriculum or outside school hours for the equivalent of another period a week. Some of the content, which has already been covered during IT lessons earlier in the school, will not be repeated.

The work carried out during Years 10 and 11 will mainly involve the planning, implementation and presentation of a chosen project for the final coursework assessment. The project will involve a survey and may make use of similar work done for any other subject, either as a part of the normal coursework or for the examination.

Most pupils will be entered for Foundation Level, grades C to G, but those who demonstrate a very high ability in the mock examination will be offered the chance to take the Higher Level paper, grades A to D. Such candidates will have also spent time outside of their normal lessons for the preparation of their work to a higher than average standard.

Examination and Board: Midland Examining Group (MEG) Information Technology: Short Course (3453)

Method of Assessment

All work done since Year 7 should be kept safely and made use of when revising for the written examination. Please note that this earlier work will not form any part of the coursework assessment, as it has in previous years.

Coursework assessment: 60% Written examination: 40%

Annexe 5 : Teaching on the net: educational resources

- <http://www.educ.uvic.ca/faculty/triecken/global2.html>
- <http://wfs.eun.org/>
- <http://ultralab.anglia.ac.uk/>
- <http://www.teachernetuk.org.uk/>
- <http://academic.com/math/premath.asp>

French sites

- <http://perso.wanadoo.fr/gech/index.htm> (histoire / géographie)

Training for IT teaching

- University College Chester School of Education
<http://www.chester.ac.uk/~mwillard/ict/index.htm>

INITIAL TEACHER TRAINING NATIONAL CURRICULUM FOR THE USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY IN SUBJECT TEACHING

Official web sites

- **DfEE:** *<http://www.dfes.gov.uk/nc/index.html> <http://www.dfes.gov.uk/nc/itindex.html>*
- **BECTA** *<http://www.becta.org.uk>*
- **National Grid for Learning** *<http://vtc.ngfl.gov.uk>*
- **Education High Street** *<http://www.education.co.uk/>*
- **Teacher Training Agency** *<http://www.teach-tta.gov.uk/teach/home/a1.html>*
- **Oxford University libraries** *<http://www.lib.ox.ac.uk/>*