The challenge of new technologies: doing old things in a new way, or doing new things?

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In this chapter we try to illustrate that the potential of new technologies has considerable implications for our current notion of knowledge, as well as for the relationships and roles of teachers and learners. We conclude that while discussion of ICT is restricted to the domain of how to teach and learn, its real potential will remain limited. Similarly, viewing new technologies as merely an opportunity for faster or easier access to information will severely restrict the opportunities for positive educational change, and many even bring about change in the wrong direction. For genuine (and cost-effective) change to take place, we need to address — as an urgent policy issue — what kinds of new knowledge is made accessible by the technology, and how these fit with the needs of the citizens of the twenty-first century.

It is, perhaps, inevitable that the emergence of a new technology is accompanied by a confusion as to what might be done with it. It took many years for the printing press to be used for anything other than reprinting the bible or for the car to be thought of as more than a horseless carriage. The latter example is instructive as the transition from horseless carriage to a new kind of transportation was dependent upon and shaped by the emergence of an infrastructure on which horseless carriages could actually be driven at a greater speed than a carriage. Technologies and infrastructures to make those technologies work emerged together, although not in an unproblematic or necessarily harmonious way (Noss, 1992).

For educationalists the challenge of new technologies poses interesting and not always soluble problems. As each technological innovation (radio, television, video etc) has come and gone, it has left education with a feeling that something good has happened but that nothing fundamental has changed. Only a couple of years ago, hypertext and multimedia were going to be the panacea of educational change. Yet all that has happened so far has been the translation into hypermedia of the pedagogic approaches which characterise technologies of a previous era. And now the Internet has arrived. Or rather, educationalists have noticed its arrival. Many of the questions raised by its

arrival are, of course, the same as those raised by other technologies before it. What kinds of pedagogy are appropriate to using this technology and, more fundamentally, how does this technology change the epistemologies of what may or may not be taught in schools and indeed whether schools, as we know them, continue to have the educational (as opposed to social) function that they currently have?

The introduction of a new variable into the teaching and learning process has considerable implications for the role of the teacher and her relationship with the learner. One of the fundamental challenges of ICT for educational purposes is to ensure that it actually enhances the quality of the learning experience. In order to understand how ICT might contribute, teachers need to possess not only the requisite technical skills but also to understand the relationship between the system and the learner as well as the implicit and explicit values and assumptions of ICT applications about the way learning happens. The inclusion of ICT, in the context of formal education, impacts on the dynamic interplay between teachers and learners and can – with careful design – enhance what has previously been taught and done in schools. It can also make new things possible in new ways (Bonnett, 1997: 145, 151).

In this chapter we argue from the premise that the learner, as an active meaning-maker and problem-solver, is central to the learning process and that learning takes place in the context of social interaction between the teacher, the learner and others. In such a model, ICT can represent a valuable attribute but, in itself, is no viable substitute for pupil-teacher and pupil-pupil interaction. On the contrary, we will show that effective use of ICT makes more complex the relationship between teacher and learner, and more urgent the need to reconsider effective pedagogies, and the knowledge they are designed to teach.

NATIONAL CONTEXT AND BACKGROUND

The history of Information Technology (IT) and more recently ICT in education in the UK is characterised by a focus on the installation of hardware on the one hand and by the concept of technology as a “thing” – often a panacea – on the other. Where at one

time technology might have appeared as the solution, particularly to educational administrators, experience has shown that it is neither a replacement for the teacher, nor a particularly cheap option. Educational computing can be seen to have evolved through three stages: topicality (the computer is seen as the focus), surrogacy (characterised by the development of ‘educational software’ and a view of the computer as a surrogate teacher) and progression (the use of sophisticated generic software tools for problem solving activities) (Heppell, 1993: 230-2). Significant pedagogic evolution, which ‘requires us to be aware that computers not only bring something new to the learning environment but that they change it and they change learners too’ (Heppell, 1993: 233), has, however, yet to emerge as a serious facet of ICT use.

The second half of the 1990s has seen technology gain prominence in UK educational policy making; the number of documents and reports that have been published by a range of governmental, quasi non-governmental and non-governmental bodies arguing the case for ICT is extensive. One such report argued that if no steps are taken to intensify the use of ICT in schools ‘a generation of children - and a generation of adults as teachers - will have been put at enormous disadvantage with consequences for the UK that will be difficult to reverse’ (Stevenson 1997: 4).

The claims made for the educational purposes of ICT are not new. There is, however, one fundamental contextual difference of late: education is moving beyond the school. According to McKinsey & Company, there were already just over 5 million home computers in 1997 representing 22 percent of UK households; and they predict this number to grow to 45 percent or even 50-55 percent by 2000-1 (McKinsey & Company 1997: 18). These figures are in stark contrast to the availability of suitable hardware in schools. For example, according to a report by the quango advising on ICT, the National Council for Educational Technology (NCET), it is doubtful whether the government’s target of getting all schools wired up by the year 2002 can be met due to outdated equipment (Pyke 1998).
HARNESSING NEW TECHNOLOGIES FOR EDUCATION

The National Grid for Learning (NGfL)

We see the question of pedagogy as intrinsically connected to the question of epistemology. In our view, in the area of new technologies and indeed more broadly, they are not separable. We begin by examining what vision current policy makers have for harnessing the Internet as the most recent and highly acclaimed new technology in the service of education. That vision has been clearly spelled out in the recent government document Connecting the Learning Society, and can be summed up quite simply as “the delivery of subjects” (DfEE 1997: 5). The National Grid for Learning, it explains, is “a way of finding and using on-line learning and teaching materials” and “a mosaic of interconnecting networks and education services based on the Internet, which will support teaching, learning, training and administration in schools, colleges, universities, libraries, the workplace and homes.” (DfEE, 1997: 3) Although these two summaries of what the ‘grid’ actually is are merely synoptic, the vision that is produced throughout the document is rather clear: teachers will be linked to the centres of power; the DfEE will be able to communicate directly with schools and issue its latest instructions; schools will be able to send performance data directly to each other and to the DfEE; and, an aspect with increasingly high profile in the media recently, teachers will be able to download worksheets directly into their classroom.

“Mr Blunket said multimedia computers would lift the bureaucratic burden on teachers by allowing them to download work schemes and integrated learning systems from the Internet and grid, and to share good practice with colleagues at other schools” (Thornton, 1998: 10).

The state of thinking about the kinds of knowledge that might be introduced into schools, or the ways in which existing knowledge might be genuinely transformed by new technologies, have clearly not advanced beyond that of the bible or the horseless carriage.

The Initial Teacher Training National Curriculum for the use of ICT

On the pedagogical front, we can get some idea of the current state of policy thinking by examining the Initial Teacher Training National Curriculum for the use of Information and Communications Technology in subject teaching (DfEE, 1998). We do not mean to suggest that the last word on pedagogical issues for ICT is to be found in this DfEE circular. Nevertheless, it serves to focus our thinking on the issues as they are seen by policy makers and allows a platform from which to offer a critique. The document is nothing if not exhaustive; indeed, it is hard to see how a student teacher might attain the exhaustive list of skills in the nine months of their course even if they were to do nothing else. But we do not mean to carp at its exhaustive nature. After all, it is reasonable for any curriculum for teacher education - if it is reasonable for a government to impose such a curriculum at all - to attempt at least to be exhaustive. And there are some aspects of the document which are laudable. For example, on page 17 we read that “it is the responsibility of the ITT provider to ensure that the ways trainees are taught to use ICT are firmly rooted within the relevant subject and phase, rather than teaching how to use ICT generically, or as an end in itself.” (DfEE, 1998; bold in original) This seems to represent a welcome change of heart on the part of policy makers and replaces what had previously become the fetishisation of ICT for its own sake and an endless succession of injunctions to teachers about the need to introduce children to technology for the good of the nation’s economic well-being.

Nevertheless, we had better state that we believe that the understanding in policy circles of the consequences for education of ICT is rather short-sighted. And at the risk of pre-empting the remainder of this chapter, we believe that government would do better to support and encourage the mapping out of the kinds of deep changes that are inevitable even within the next ten years and to try to equip teachers not only with knowledge about what they might do with technologies as they currently stand, but how they may contribute to shaping those technologies in the service of the educational system.
We begin our own analysis by considering the National Grid for Learning, perhaps the most obvious manifestation of governmental commitment to the new technologies. How significant is it? Our answer is that it must be an interesting and perhaps necessary first step and it is certainly something which we would applaud. The explosive growth of Internet connectivity in homes has to some extent pre-empted the modest suggestion that schools should be connected. But given that home use is heavily contingent upon social class, we cannot but support the attempt of government to open access to all through the schools.

It is, as we have already said, significant that the vision of connectivity is one of delivery, and this has technological implications as well as pedagogical ones. One might believe that even with limited financial outlay, it would be better to aim for schools to equip each child with a computer than to ensure that each school and each teacher can download pre-existing work schemes for the delivery of schemes of work conceived in ways which take little if any account of the technology. There is no mention of the computer as a potential source of empowerment either for the student or for the teacher, or as a way of the student coming to grips with knowledge of any kind. Indeed ‘knowledge’, what rather than how, is absent from current policy. Rather than the general but vague aims of “improving the quality and standards of pupils’ education” and “supporting teachers, both in their everyday classroom role … and in their continuing training and development” (DfEE, 1998: 17), it might be better to have as a short term goal the serious engagement of teachers with the substantive ways in which the computer might afford students the exploration of deep and hitherto inaccessible conceptual knowledge.

To its credit, there are some signs that policy is turning in this direction. If the new (lottery-funded) programme of teacher education is successful in encouraging teachers to do more than simply acquire ‘skills’ related to ICT — there is, for example, a clear focus in preliminary documents on subject knowledge — then there may be a real opportunity for teachers to control the complexities of the new technologies, and harness it to their — and their students’ — advantage.

But there are, unfortunately, countervailing tendencies. It is, for example, difficult to see how this process can proceed very far in relation to ‘literacy’, when the government has decreed the narrowest of definitions for the knowledge involved, and determined to the nearest ten minutes how it should be taught. Neither can the current obsession with ‘numeracy’ sit easily with imaginative or even cost-effective uses of new technologies which, in mathematical and scientific realms, are now beginning to offer genuinely novel and exciting potential (see, for example, the reconceptualisation of geometric ideas (Laborde, 1995), of the ideas of calculus (Kaput, 1994) or of the important topic of probability (Wilensky, 1997). Instead, numeracy is restricted to basic number, pedagogy to ‘whole class teaching’, and new technologies — at least in the case of the calculator — are all but banned.

We can, of course, continue in the old way. Perhaps it will be possible to download schemes of work from the Internet so that teachers may more effectively teach long division, or laboriously construct programmed learning systems to drill learners in calculational skills: but there must be a certain irony in harnessing such a powerful technological engine to drive such a rusty — and anachronistic — vehicle. Yet, the DfEE seems to view the technology in just this anachronistic way. Specifically, the function (sic) of ICT are:

- its speed and alteraticity;
- its capacity and range;
- its provisional nature, how the provisional nature of information stored allows work to be changed easily; and
- the interactive way in which information is stored (DfEE, 1998: 19).

Here then are the DfEE’s assumptions about the role of ICT: it is a fast, wide-ranging, editable and interactive system for the storage and location of vast amounts of information. From this epistemological standpoint, there flows an inevitable pedagogy. It is a pedagogy based on marshalling resources, accessing information, of swapping details of data and assessments, in short, of doing more quickly, reliably and interactively what teachers have always done. And because there is no attempt to raise the vision of teachers beyond doing with new technology what has been done with the old, there is no attempt to encourage teachers to think what might be done better. We read how ICT must be used to support the development of language and
literacy or to support the development of numeracy. We even read that ICT must support pupils’ creative development through the use of computer programs which encourage them to explore and experiment with pattern, shape, pictures, sound and colour. But we read nothing of the need of the children of the twenty-first century to acquire new knowledge, solve new problems and employ creativity and critical thinking in the design of new approaches to existing problems or, indeed, to new ones.

THE TRANSFORMATION OF KNOWLEDGE

The ways in which ICT interfaces with the learner obeys certain rules and conventions and elicits from her specific responses. Accordingly, teachers and learners have to be aware of them (Moro, 1997: 69). In today’s information-rich society, learners grow up in an environment which is semiotically diverse and complex and which requires of them new skills and broader forms of literacy than were required hitherto (Heppell, 1993: 233); an environment, it could be argued, in which access to information and its active cognitive processing rather than passive consumption are essential. The key point is that in mediating the flow of information to the learner, the information itself is transformed:

“The ‘dialogue’ between ‘information author’ and ‘reader/viewer’ has grammar, ground rules, aural and visual cues and clues which are used to signify meaning, to indicate generic structure, and to reference the information web.” (Heppell, 1993: 234).

The design structure of information through hypermedia shows a trend towards plurality – the user is no longer required to take a prescribed route but can determine her own path. The design can differ significantly from traditional, sequential and linear taxonomies and can be made up of a convergence of textual, visual and audio components. Random access to information is a characteristic of content-rich hypermedia such as CD-ROM and the Internet.

Bernard Moro suggests that the emergence of ‘zapping’ is linked to the retreat of the sequential mode and describes this phenomenon as “nothing short of a revolution affecting how the media are both designed and consumed” (Moro, 1997: 72). He

describes zapping as “multiple tapping from a variety of sources which the child handles in a synecdochical way, i.e. by constantly reconstructing the whole from fragmented glimpses, so that he (sic) is capable of reading several programs at the same time” (Moro, 1997: 72); this is considered to be akin to natural, random information gathering.

Moro suggests that the rapport between the learner and knowledge is in the process of being re-defined:

“admiration … for the erudite has become obsolete, what matters is that intellectual energy must be devoted to the real tasks at hand. What matters is no longer to massively store facts, but to sort them, integrate them and reveal their relationships. … Facts are now instantaneously accessible, they are no longer the first and foremost object of learning. Handling them is what matters.” (Moro, 1997: 73)

‘Critical media literacy’ (Collins et al, 1997: 62) is becoming vital. Compared to books, with hypermedia “it is almost as if authorship and ownership get lost” (Collins et al, 1997: 64). There is consequently the danger that hypermedia “will present itself as the ‘truth’ rather than the truth according to a certain author or authors” (ibid). This is coupled with the arguably high face validity of computers, particularly with (male) teenage learners.

The proliferation of information which ICT makes possible renders the notion of the teacher as the source of all knowledge untenable and potentially undermines the authority of the teacher. Similarly, the representation of knowledge and simulation of reality through hypermedia is problematic, despite the apparently greater authenticity in portraying ‘reality’ afforded by the ‘multimodality’ of text, images and sound. Technology increasingly determines what knowledge is acquired and how it is processed; there is a danger of the medium determining the message. (Collins et al., 1997: 84-5)

“Just as the supermarket chains shape the commodities we buy and the way we eat, will the spread of multimedia determine the knowledge which is presented to us and the way in which we ‘consume’ it?” (Collins et al., 1997: 85).
The same possibilities and pitfalls abound in the sciences. We can now manipulate geometrical figures in ways which were unthinkable to Euclid; we can solve a substantial proportion of school mathematical problems by pushing buttons on handheld devices; we can manipulate physical systems on screens, and explore relationships which were previously only accessible via mathematical equations. Yet simply to do these things — and they are an infinitely more inviting prospect than downloading schemes of work — is to miss the point. For each of these possibilities raises new problems, new forms of knowledge. Computer mathematics is not the same as pencil mathematics, the relationships between screen objects is not the same as the interaction between real objects. The relationship is close and complex: and we need to find ways to help teachers and students to problematise these relationships. They cannot be waved away by pretending these complexities do not exist, or by claiming the ‘effects’ of new technologies on learning as if what is to be learned remains the same.

Yet claims of this sort for ICT-based learning are wide-ranging. Wolff, for example, argues that ICT can help learners make the knowledge construction process transparent and raise consciousness as well as provide classificatory systems which simplify knowledge processing (Wolff, 1997: 20). ICT, it is claimed, can also allow for active participation and cognitive interaction of the learner in the learning process. There do exist applications, such as modelling, simulation and emancipatory software with huge potential, for instance, for saving time, cutting out ‘inauthentic labour’ or exposing the learner to certain material and processes. Some, however, have pointed to the danger that these learning experiences may remain “an inadequate substitute for the real thing” (Collins et al, 1997: 124) — although we should be aware that our definition of ‘the real thing’ is subject to evolution in the light of presence of the new technologies.

Michael Bonnett rightly points out that the liberating potential, for instance, of the word processor (in helping the user organise and reorganise thoughts quickly, correct spelling and produce good quality products) and its facilitation of engagement with the meaning of information beyond the mechanics of writing does not, in itself, guarantee that the desired outcomes will actually occur. Furthermore, its liberating

potential might lead to a preoccupation with presentation at the cost of quality of content (Bonnett, 1997: 152). With regard to CD-ROMs Bonnett makes the point that the random presentation of information makes it hard to assess what cognitive links learners have made or whether they suffered from information overload.

“Volume of content does not equate with richness of experience. … One of the chief dangers of information overload is that it can, at one and the same time, inhibit authentic thinking and seduce us into believing that all we need to solve our problems is yet more information,” (Bonnett, 1997: 155).

In the wake of the behaviourist drill and practice tradition characteristic of early educational computing currently instantiated in the weakly conceived Integrated Learning Systems (ILS), there is every danger of promoting, through the use of ICT, “a passive mentality which seeks only the ‘right’ answers, thus stifling children’s motivation to seek out underlying reasons or to produce answers that are in any way divergent” (Bonnett, 1997: 157-8). In part, ILS systems embody the failure to deliver what Artificial Intelligence (AI) has consistently promised. The latter has now retreated from the ambitious aim of Intelligent Tutoring Systems in education “which aimed to model enough of the domain (of knowledge), the learner, and relevant pedagogy to be able to give detailed instruction, remediation, and explanation, perhaps eventually - although this aim was kept implicit - to rival a human tutor” (Cumming et al, 1994: 109). Instead, a ‘dual interaction view’ appears to be gaining support. This can be described in terms of learner interaction at task and discussion level (Cumming et al, 1994: 108). In this model, the computer is used to provide a context for meaningful learning to take place; teachers in this model have a crucial role to play, for instance, in providing lead-in, interaction and exploitation tasks to render ICT-based stimulus material effective.

“Pupils should encounter computers as mediational resources incorporated within suitably rich settings of activity; that is, settings with authentic goals and purposes for those pupils, and settings that are explicitly integrated with other experiences of knowing and understanding as they get organised at other times.” (Crook, 1994: 43).

Despite the sometimes negative images associated with educational computing, (see, for example, Light, 1993: 41), one of the most fundamental impacts of the use of new

Technology in education is the potential it affords in providing a learning environment which is collaborative and communicative: the “synchronous, located nature of the traditional classroom now has dimensions that extend to asynchronous and distributed” (Heppell, 1993: 234).

In other words, with e-mail and video conferencing the need for teachers and learners to coincide in time and location recedes. Not only is this development conducive to the inclusion of learner groups which have, up to now, been excluded, it also affords the possibility of drawing increasingly on sources, including expert opinion, from outside the classroom and the school. It is this potential for joint project work which has caught the imagination of many teachers as it provides added value in terms of tangible learning objectives which tend to be perceived as relevant and real by learners.

Computer-mediated communication (CMC), as Bernadette Robinson rightly points out, requires of users to adapt “their social and linguistic behaviour to the medium in order to engage with other people” (Robinson, 1993: 125). This involves an awareness of differences in discourse patterns in CMC, such as a relatively informal colloquial style of written utterances akin to spoken language or multi-strand interchanges. Given the importance of language in the learning process across the curriculum, this potential has huge implications for the way we conceive teaching and learning.

Mark Peterson’s summary of competing hypotheses of positive and negative ‘effects’ in the following table (Peterson, 1997: 35) gives a succinct overview of some of the challenges facing teachers exploring the application of CMC for classroom-based, formal teaching and learning purposes.

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
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<tbody>
<tr>
<td>Asynchronous conferencing</td>
<td></td>
</tr>
<tr>
<td>• opportunity for reflection before responding</td>
<td>• loss of impetus to reply</td>
</tr>
<tr>
<td>• opportunity to revise written work</td>
<td>• slowness in decision-making</td>
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<tr>
<td>Synchronous conferencing</td>
<td></td>
</tr>
<tr>
<td>• opportunity for more authentic dialogue</td>
<td>• need for a skilled moderator to facilitate</td>
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<tr>
<td>• immediate response</td>
<td>(control?) dialogue</td>
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<td></td>
<td>• technostress</td>
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Learner autonomy
- removal of time distance constraints
- promotion of interactive learning

Anonymity
- increased written output
- increased participation by minority groups
- learners take control of their learning
- ‘empowerment’ of learners
- increased self disclosure

Collaboration
- increased collaboration between learners and between teachers and learners
- language skills enhanced through activity in the TL

Technical issues
- learners gain vital computer skills
- new opportunities for inductive ‘learning by doing’

- ‘contextual deprivation’
- reduced feedback

- less reading
- reinforcement of existing inequalities
- information overload
- lack of accountability
- ‘flaming’

- ‘aloneness factor’
- greater regimentation of learning

- high costs of new technology, dangers of monitoring and control
- ‘dehumanisation’ of learning

Peterson’s points clearly illustrate that the transformation of the learning process by new technologies comes at a cost. Whilst, for example, CMC makes educational project work amongst partners at a distance in place and time possible, unless these projects are planned and managed carefully, there is the danger of learning being ‘dehumanised’, learners becoming or remaining isolated, suffering from information overload or of them using inappropriate language (‘flaming’) because of the relative anonymity resulting from not knowing their interlocutors personally or from being ‘in character’ or ‘in role’.

Viewed in this light, the impact of the introduction of ICT across the school curriculum will clearly affect not only the epistemologies of what is taught in schools and how but also the way in which learners construct personal meaning. This, however, is a lesson which is only slowly being learned. “They won’t have to change what they learn: You won’t have to change what you teach” announces a recent advertisement for a particular brand of computer (TES, 1998). The advert reassures: everything will stay the same, there is no need to engage critical faculties, only to ‘deliver’ and acquire sufficient ‘skill’.

Yet the computer could — if we allow it — change everything. It could transform our classrooms, the kinds of things we teach, and the things our students learn. And it could transform the teacher’s role.

TRANSFORMING THE ROLE OF THE TEACHER

Managing ICT use in educational contexts requires decisions, such as choice between centralised delivery through networked computer rooms or distributed approaches through stand-alone machines in classrooms (For a more detailed discussion of these issues as well as a framework for evaluating ICT applications see, for example, Pachler, 1999). But technical choices of this kind are relatively simple, compared to the organisational and classroom management questions posed for teachers, eg whether learners should work on the computer individually or in pairs/small groups.

Work with new technologies invariably involves the delegation of responsibility to learners and successful learning outcomes will depend on learners’ ability to work independently and autonomously from the teacher and, increasingly, to take control of the learning process themselves.

There is no evidence whatsoever to suggest that the introduction of technology will decrease the teacher's role, at least, not if any serious attempt is made to exploit technology. It is true that a typical use of an Integrated Learning System, for example, is one in which half of a class can be marginalised for all or part of a lesson while the teacher concentrates on those who are not tied to their computers by a set of headphones. But, in relation to uses of technology which genuinely exploit its potential, all the research to date suggests that the teacher needs to spend a great deal of time monitoring, directing and assisting in the learning process. Whilst new technologies might diminish certain aspects of the teacher’s role, such as the collation of material and information, her agenda will remain central to ensuring a well structured and sequenced learning process. Eunice Fisher sees this process as a shift of the locus of control and a movement towards less didactic and more open styles of teaching (Fisher, 1993: 60 and 62).

It is difficult, in our view, to sustain the notion that the moderating force of teachers’ professional judgement will no longer be required in an ICT–rich learning environment. In view of the randomness both of the information accessible through new technologies as well as the ‘multi-stranded’ nature of CMC, teachers will continue to play a key role in providing ‘scaffolding’, ie mediating support in the process of acquiring new skills, knowledge or understanding (Bruner, 1985: 24-25).

In fact, in order to maximise the effectiveness of the contribution of ICT to the learning process, teachers will need to develop higher order skills relating to, for instance, the selection and evaluation of appropriate resources:

(1) “very nature of multimedia, vast, non-linear and readable only through the computer screen, means that it is difficult to assess the scope and quality of a title or source without spending considerable time on it. There is no equivalent to picking up and flicking through a book which will give an experienced teacher a clear view of its coverage and relevance.” (McFarlane, 1996: 4)

The teacher needs to ask herself in what way the respective technological aid will support learning objectives and what kind of teacher-pupil and pupil-pupil interaction is likely to take place. Invariably, ICT applications are designed with certain assumptions about the subject domain, the nature of the learning process, prevailing teaching methodologies and other relevant knowledge from adjoining fields and disciplines.

It is worth quoting from the Committee of Advisors on Science and Technology (1997), Panel’s Educational Technology, a Report to the U.S. President on the use of technology to strengthen K-12 education in the United States:

(1) “panel believes that the principle focus of an education schools technology programme should be the ways in which elementary and secondary school teachers can use information technologies to facilitate thinking and learning by K-12 students” (President’s Committee of Advisors on Science and Technology, 1997)

This statement is supported by asserting that the choice regarding technology is to determine whether American children are “prepared to hold high wage, high skilled
jobs that add significant value within the world market place, or are instead forced to
compete with workers in developing countries ... for the provision of commodity
products and low value added services.” (Executive Summary, President’s Committee
of Advisors on Science and Technology, 1997) That choice confronts the British
situation as well, and it seems, at least as judged by recent government
pronouncements, that the focus will be on basic numeracy, basic literacy, and now,
basic skills in relation to ICT. Whether this is a deliberate policy, and one which runs
counter to that of the United States, or whether it is simply a failure to understand just
how technology might change the educational process is unclear.

In the US, the panel are unequivocal: in the words of the Director of Learning
Technologies at the Council of Chief State School Officers, “The US work force does
not need knowers, it needs learners” (Section: Potential Significance, President’s
Committee of Advisors on Science and Technology, 1997). If, on the other hand,
policy commitments are aimed at the low wage basic skill end of the spectrum, it may
indeed be that the huge potential of the technology can be channelled into drill and
practice sessions focusing on the acquisition of isolated basic skills downloaded from
the Internet. In that scenario it will be likely that pedagogy would become
unproblematic, time (and money) would be saved, and teachers further de-skilled. But
in any other scenario, and particularly those in which the technology is fully
integrated into the learning process, the teacher's role will be altered fundamentally
and there is no sense in which the teacher will be relegated to mere support of ICT-
based learning. New skills will be needed to help children make the most of the
information they have at their fingertips; new conceptual frameworks will be required
to encourage children to make sense, for instance, of the mathematical and scientific
visualisations that are now routinely accessible on computer screens; and new
complexities of pedagogy involving, for example, collaborative learning with
computers will have to be addressed (just how complex this question is even in one
learning domain such as mathematics has been amply illustrated by Healy et al.,
1995).

CONCLUSION

In this chapter we have considered the potential impact of ICT on the teaching and learning processes. We have suggested that the potential of new technologies has considerable implications for our current notion of knowledge and the teaching and learning processes as well as for the relationships and roles of teachers and learners. Whilst we have tried to demonstrate what ICT use means for currently prevailing concepts of education and schooling, we have also called these concepts into question by stressing the importance of preparing the teachers of the 21st century adequately so as to be able to provide the relevant knowledge, skills and understanding requisite of the new conceptual frameworks made possible by new technologies.

“(Computers) are redefining what capabilities their tasks require, and in ways that cannot but feed back eventually into the school curriculum. These changes are not only in individual techniques and skills, but are also altering the whole balance in thought and action between the intuitive and the explicit, and between the rationally simplified and the qualitatively complex. These are changes that teachers not only should not, but in practice cannot, ignore.” (Scrimshaw, 1997: 109)

The challenges of new technologies for education are manifold. It would be too much to expect that educationalists and policymakers should, in a mere two decades, have faced all the complexities, developed the software, and solved the problems which confront us as users of ICT. But we can at least recognise this complexity, and identify new things that we can do, alongside the old things we can do in novel ways. Anything less will lead at best to a waste of time and money, as well as a diversion from important educational tasks. At worst, it would lead to the further deskilling of the teaching profession, the dumbing down of school knowledge, and a shameful failure to equip children for the challenge of the new century.

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NOTES

1 For a historical (and somewhat quaint) review of this recurring pattern, see Cuban 1986.

2 For a detailed discussion of the notion of learning as a collaborative activity, see e.g. Williams and Burden, 1997, and the role of computers within it, see e.g. Crook, 1994.

3 Although we have no intention of exploring it here, this ubiquitous (in the UK) acronym nicely encapsulates the idea of the technology as a ‘thing’, easily summed up and delivered. Reducing the complexities of the technology to three letters is convenient but dangerous. In this paper, we will opt for convenience while pointing to the dangers.


5 Now the British Educational Communications and Technology Agency (BECTA; URL: http://www.becta.org.uk/)

6 URL: http://www.open.gov.uk/dfee/circular/0498.htm

7 URL: http://www.ngfl.gov.uk/


9 Some indication of just how restrictive this is can be found at http://www.standards.dfee.gov.uk/literacy/theresourcearea.

10 See Noss, 1997, for a discussion of the idea of numeracy and a critique of restrictive definitions of the term.

11 In case we are misunderstood: a facility with number is essential for any mathematical or scientific learning. Our point is simply that there is little evidence that the computer is especially useful in developing such facility, and even less that the technology is most usefully employed in this way.

12 For a detailed discussion of the notion of multimodality and the importance of visual literacy, see Goodman 1996.

13 Peterson’s summary also includes the rubric ‘teacher/learner’ roles which be omitted here as it is the focus of a later section of this chapter.

14 TL = target language; in modern foreign languages teaching and learning the term refers to the use of the foreign language as the medium for instruction of and interaction with learners