# Enhancing Learning

## Students as active learners

While curriculum, national strategy and Government requirements all demand that students be taught both about ICT and to use the whole range of ICT systems and equipment, we must appreciate that students will do so as active 'users' rather than as passive 'watchers'. Observe a student using a computer system and you will see a high level of interaction, even with simple software such as a painting program. They are in control, within the limitations set by the software. They are also in control of the computer games played on their home computer – here the level of control often rises as each level of the game is achieved. In both cases, the student is learning by doing – through concrete experiences, even in a virtual reality context.

Interactivity is a vital aspect of ICT that makes it different from all other educational media. A video or a book may well provide the same information as a CD-ROM or Web site, but does not allow the user to select the information they need and paste it straight to their notebook; nor can they follow hypertext links to associated information. These features offer students a level of control over their own learning that some teachers may find disconcerting. Yet good teachers have always encouraged students to explore and develop their ideas; the unintended learning outcome needs to be welcomed.

Of course, there are occasions when the computer does usurp the teacher's role. This is the case with integrated learning systems (ILSs), where student control and the opportunity for open exploration are denied. The natural spontaneity (even when this is directed by the teacher) of computer use is given over to programmed learning, the pace of which is decided by the user's response to questions decided by the author of the package. While perhaps a more patient teacher than any human might be, this narrowness can be quite stultifying.

It is important that schools recognise the relationships between students and computers during educational activities. In particular, regular opportunities should be provided for students to use computers as tools; in other words, there needs to be situations where students are given appropriate levels of control. Without this relative autonomy, students will not be able to develop the levels of ICT capability expected of them. Experience will dictate the nature and extent of this aspect of good practice.

## Open and experiential learning

As with so much ICT work, it is the software rather than the hardware that is important. The computer system itself is merely the vehicle that enables the software to be run.

The terms 'open' and 'experiential' learning are sometimes frowned upon in the context of a tightly controlled curriculum, but are essential if a broad and balanced approach is to be maintained. True open learning involves the use of content-free software such as word processors, painting software and spreadsheets. These are

an electronic equivalent of the blank sheet of paper and pencil, with the added advantage that they are far more powerful tools in terms of their ability to allow manipulation of the information put into them. The computer, via a Web browser, can also be a tool for open learning where there is a need to locate specific content, typically information on a given subject. While the teacher sets the parameters of the task, the student has freedom in the way that they tackle the problem or search for information.

Schools must be aware of both the abilities and expertise of their students as well as the requirements of the National Curriculum. This means enabling progression such that the simple word processing by younger students is developed into multimedia and Web page authoring by those in the later years.

## Exploration and investigation

A real benefit of ICT lies in its facility to enable exploration and investigation of things that could not be undertaken in real life. At one level this may be through the use of simulations and models. While affordable virtual reality is still some years away, the simulation program has been with us since the early days of the computer. The original BBC systems came with a program called Kingdom, in which the user ruled a land where crops had to be sown, tended and harvested, dykes maintained and raiders repelled. The graphics were primitive but the concept quite compelling.

Nowadays, these simple simulations are incredibly sophisticated and available for a vast range of scenarios. Most are of limited educational value, though the skills of strategy needed to succeed are very real, and mirror the wider world rather well. Others are very sophisticated, eg some PC flight simulator applications. The best are so good that they form part of the training of light aircraft pilots.

Schools' simulations are more basic in comparison. However, they may still mirror the complex models used in business. For example, a simulation is available that allows the user to be Chancellor of the Exchequer, managing the economy and trying to win elections – useful for citizenship courses. Others explore marketing strategies for a business or environmental management. At a more basic level, simple spreadsheet models allow exploration of anything from simple business plans to the siting of a Medieval town or cost-effective coastal flood prevention planning.

ICT systems also enable investigations not possible by conventional means. A data logger, for example, is the only way of accurately recording the weather continuously over a prolonged period of time, including weekends and holidays. Similarly, pressure pads linked to a computer via a buffer box can monitor pedestrian traffic in or out of a classroom and lead to work on burglar alarms and similar. Many other opportunities present themselves, especially in science and design and technology. The accuracy of measurement possible with a computer is also a significant benefit to investigative and experimental work.

## Students as autonomous learners

ICT can provide ample opportunities for students to take responsibility for their own learning. They can become active learners rather than passive recipients of a body of knowledge pre-packaged for them by adults. After all, knowledge is dynamic and constantly developing, even well-argued scientific facts can be, and are, disproved on a regular basis. The body of knowledge that we require

to function effectively also changes constantly as society and technology moves forward. While we may choose to enforce certain views of history and culture, together with immutable understanding of literacy, numeracy and science, much else need not be set in stone.

Already, students with easy access to online systems, such as the Internet, freely choose what they want to learn, following both interests and need. With information, instructional materials and peer support, a framework already exists for students to begin to select what they wish to learn. Given the relatively short time they spend in school, it is unsurprising that many exploit the possibilities provided by technology. With the digital revolution bringing computers, telecommunications and TV together, we may reach a situation where an information feed into every home is as important as gas and electricity.

When students can actively select what they wish to learn, to take control of their learning, we may need to re-evaluate our concepts of schooling. In the meantime, good teaching needs to take account of the active learning potential of the tools currently available. This means encouraging explorative work; guided, but not narrow and constrained. This involves the teacher giving up some element of control over what is learned; giving direction and guidance as teacher and students work together to reach a common goal.

It may also be useful to explore some theories of learning psychology and to consider the role that ICT can play in supporting the range of learning styles and the needs of the curriculum.

## Theories of learning psychology

Students learn in a variety of ways, yet these all fall within widely accepted theories of learning, particularly those proposed by Vygotsky. These need to be considered in relation to the ways in which ICT is used to support learning.

A key element of Vygotsky's theories concerns the idea of a 'zone of proximal development' (ZPD). This may be considered as the distance between the student's actual level of development in terms of solving problems and the potential level of development, given appropriate guidance by an adult. Put simply, it is the gap between where the student is now and where he and the teacher wish him to be. By the use of careful questioning, the teacher can both support the student in accepting his current level of knowledge and aid movement through more conceptually difficult stages. In Vygotsky's terms, the teacher has provided 'scaffolding'.

ICT, and particularly the computer, is the problem-solving tool *par excellence* and is frequently used for group activities (if only because a limited number are available). The group itself can provide the necessary scaffolding as ideas are discussed, with appropriate intervention by the teacher to ensure progress by one or all members.

Group work also supports Vygotsky's second idea which considers the importance of the cultural and social context within which learning takes place. A group of students, motivated and enthused by interactive applications, will talk freely and exchange ideas, leading to a positive learning situation.

In an integrated learning system, it is the software itself that, if properly designed, provides the scaffolding. The student is moved forward through planned steps in learning, moving to the next stage if questions are answered correctly and receiving reinforcement if there are difficulties.

Gardner has suggested that there are eight areas of intelligence encompassing all areas of human endeavour (Gardner H, 1993, *Frames of Mind: The Theory of Multiple Intelligences*). In each, students demonstrate certain recognisable characteristics. Though all will be present to some extent, one or more will tend to dominate. These areas are:

- **Mathematical–Logical** where students enjoy strategy games together with mathematical and scientific challenges.
- **Linguistic** where students take a great interest in all aspects of language.
- **Visual–Spatial** where the student thinks in images.
- **Musical** where the student listens carefully to music, and enjoys singing and playing musical instruments.
- **Kinaesthetic** where students enjoy activities involving touch and movement.
- **Interpersonal** where students are leaders, with good skills of communication and empathy.
- **Intrapersonal** where students are self-motivated.
- **Naturalistic** where the student is aware of the natural world and is able to recognise, classify and identify pattern.

Too often, schooling concentrates on developing only linguistic and mathematical intelligence. Similarly, the importance of groups working in cooperative and collaborative activities, engaging in practical tasks and communicating ideas takes second place. While the computer itself is not the answer to this conundrum, multimedia materials often support a range of learning styles, while an ILS could be written to suit the preferred style of each intelligence. Where information is presented in different ways, students can select and use whichever approach they find preferable.