

1. WHAT DOES THIS BOOKLET OFFER?

In the current educational climate, there is no shortage of encouragement, and pressure, for teachers to improve their work and raise educational standards. There are plenty of initiatives that suggest ways in which teachers should do a better job. However, all too often the enthusiasm of the proponents of such initiatives is not matched by any evidence that they will be either feasible or effective in practice.

This booklet offers advice to teachers on how to interact more effectively with students to promote their learning. The ideas presented in this book are based on substantial evidence that the initiatives proposed can actually improve students' learning and achievements. This research background to the ideas is explained in Section 2. The specific aim here is the improvement of ICT learning and teaching, and so in Section 3 our ideas are put into the context of the aims and expectations of ICT learning.

The recommendations we make are grounded in the main findings from many decades of research into the principles that govern effective

teaching and learning and the factors that help support the motivation and self-esteem of learners. These foundations for formative work are discussed in Section 4.

Sections 5 to 8 set out in detail four main ways of practising formative assessment, which we have found to be both workable and productive with ICT teachers.

Effective formative assessment does not just happen; it needs to be carefully planned, so the closing section, Section 9, discusses an approach to formulating a plan to develop formative assessment work within an ICT department in a school.

2. BACKGROUND HISTORY

The findings on which this booklet is based have their origin in a review of research, published in 1998 both as a full article and in summary form as a short booklet for teachers (Black and Wiliam 1998 a,b). This work established that there was strong evidence that formative assessment can raise standards of student achievement, but that the assessment practices entailed were not implemented in most classrooms. This led the group at King's College London

to explore the potential for practical improvement by collaborating with groups of teachers willing to take on the risks and extra work involved, with support from their schools and their LEAs. Through collaboration with the Medway and Oxfordshire Local Authorities (LAs) we were able to recruit six secondary schools spanning a range of catchment backgrounds. At the outset, 12 science and 12 mathematics teachers were involved; and 12 teachers of English joined in the work at a later stage.

The first outcomes, which took over two years to achieve, were that almost all of the teachers were positive about the effects of formative assessment on them, and that there were significant gains in test performance for the classes involved.

The evidence from classroom observations, records of visits and meetings of the whole group of teachers, interviews with and writing by the teachers, and discussions with student groups, was summarised in a second short booklet for teachers in 2002 (Black *et al.* 2002). This was followed by a longer report on these findings at length, both in a book (Black *et al.* 2003) and in many papers in professional and research journals.

Following that project, members of the King's team have made

numerous contributions to teachers' conferences and to school and LA INSET training. They have also been helping in developments on a larger scale, notably with the Scottish Education Department and with the State of Jersey. The exploration of opportunities for formative assessment and evaluation of their effects has spread to all curriculum subjects, including ICT. The development of formative assessment has also been made a significant component of the Department for Education and Skills (DfES) initiative for Key Stage 3, work to which the King's team have also made direct contributions.

Throughout this work we have at all times been aware that formative assessment has both *generic* features – that is features that will apply to learning across all stages and across all school subjects – and features that are *specific*, for example to individual subjects. In this booklet, we focus on the needs and opportunities that are relevant to secondary ICT teachers, i.e. those who are teaching ICT as a subject.

3. AIMS OF ICT TEACHING

ICT can be approached in many different ways in schools. It is important to make clear firstly

that this book is written specifically for the ICT curriculum and not for the broader uses of ICT in other curriculum subjects except where it relates to the teaching of ICT 'across the curriculum'. In England, the content of ICT lessons in secondary schools is strongly influenced by the National Curriculum Schemes of Work and examination syllabuses, and the range of types of syllabus has increased to provide a variety of different possibilities at Key Stages 4 and 5. This range of courses reflects the ubiquitous nature of ICT and the diverse needs of learners for ICT knowledge, understanding and skills. The technology continues to develop rapidly and there is a continuing need to educate those who will specialise in researching, designing and enabling this development. The needs of these budding computer scientists are met by A-level Computing courses, but at Key Stages 3 and 4 the focus is on developing the skills, knowledge and understanding that all students need in order to make effective use of ICT in their own learning, their everyday lives and their future work.

Since the introduction of the National Curriculum for ICT more than 15 years ago there has been a steady stream of curriculum materials produced nationally and at LA level, which provide specific advice and resources

for teaching ICT as a subject. Over the same period the computer science and computer studies curricula, though being based on a more established body of knowledge first introduced in 1965, have been usurped in the majority of schools by this 'new' ICT curriculum. Although there have been many published materials developed and available to teachers over this period, unlike other more established subjects the ICT National Curriculum has been changed significantly. As a consequence, there has been no long history and associated foundation of core materials that could have formed a body of resources on which teachers could rely.

The evolution of the ICT curriculum has left many teachers with a confused idea of what should be taught in the ICT curriculum and what the balance should be between theory and practice. As a result of consistently poor reports by Ofsted and complaints by teachers and ICT organisations, the government produced an ICT Strategy that contains schemes of work, lesson plans, teaching materials and advice on teaching and learning strategies, many of which were adopted from the earlier plethora of LA and national materials. Many ICT teachers welcomed this provision of resources and have since developed and adapted the materials to suit their own situations.

The rapidly changing nature of the technology makes it difficult to predict future needs, and opinions differ as to the balance that will be required between skills and knowledge and understanding. Some courses focus on developing basic skills whereas others aim to develop the problem-solving ability that is needed to develop ICT-based solutions to everyday problems. The Key Stage 3 Strategy aims to develop skills, knowledge and understanding and builds towards a situation in Year 9 where students are expected to be able to use a systems approach to develop ICT-based solutions to complex problems. This is achieved through a spiral curriculum in which learners gradually tackle more complex tasks that are scaffolded to develop the ICT skills, knowledge and understanding; problem-solving strategies; and thinking skills that they need.

Despite the changing approaches to ICT, formative assessment practices have an essential role to play, since their purpose is to enable teachers to sift the rich data that arise in class discussion and activity, so that professional judgements can be made about the next steps in learning. Currently, formative assessment of ICT during lessons includes: question-and-answer sessions in whole-class teaching, observations of students working on screen, individually or in pairs, and

providing oral and written feedback on students' computer printouts.

In addition to assessment in lessons, teachers can incorporate formative assessment opportunities into homework tasks that can include investigations and solving specific problems, as well as class, paper-based and ICT tests during the school year. At specific times, learners also have to prepare for examinations so time needs to be set aside near to the end of courses to hone examination techniques. Feedback, peer- and self-assessment all have important roles to play in this process and, utilised properly, formative assessment can result in substantial learning gains (Black and Wiliam 1998 a,b).

A range of hardware and software plays a part in ICT learning and teaching and the use of electronic whiteboards and/or wireless connectivity, in particular, have increased the opportunities for interactive teaching with the whole class as well as with groups. Although e-assessment is in its infancy, national Key Stage 3 ICT on-screen tests are being developed. The pilots for these were designed to assess knowledge and understanding of the content and skills of the ICT national curriculum and students' problem-solving abilities with ICT, but they were purely summative. In future, the intention

is to provide support for their use as formative assessment. It is hoped that e-assessment will be developed to provide diagnostic assessment that supports learners and teachers in deciding the next steps in teaching and learning.

4. PRINCIPLES OF TEACHING

There are four main principles of teaching that relate to effective learning. The first is to start from where the learner is, recognising that students have to be active in reconstructing and formulating their ideas. An approach that merely adds an overlay of new ideas to those existing ideas can lead to poor understanding, if not confusion. An essential part of teaching is to obtain feedback from the individual students to determine what their existing ideas are in order to meet this principle. This includes feedback from the student to the teacher, from the teacher to the student and from student to student. Learning is effected by combining these approaches, in which each contribution responds to another. Thus, for classroom dialogue, the starting point could be a question formulated by the teacher to put ideas ‘on the table’ that initiate responses from the students. These three types

of feedback, which are considered essential to formative assessment, are discussed in more detail later on.

A second principle of teaching is that students must be active. Learning has to be done *by* them, it cannot be done *for* them. Therefore the teacher has to encourage, and to listen carefully to, a range of responses, taking them all seriously, whether they be right or wrong, to the point or zany, and helping students to talk through inconsistencies and to respond to challenges. In such discussions, the teachers are fashioning their interventions to meet the learning needs that have been made evident, but they are also implementing the second principle of teaching.

A third principle is that in order to learn students must understand the learning target, which requires understanding of what would count as good quality work. They must also have an idea of where they stand in relation to that target. Only with these two can they achieve meta-cognition, which is the power to oversee and steer their own learning in the right direction so that they can take responsibility for it. This is no small achievement, and it requires attention in teaching to providing opportunities for students to reflect on their work and helping them to understand the targets of the learning and the criteria of quality, i.e.