

ICT and the key processes

The term 'ICT' as applied to the teaching of mathematics includes a range of hardware (including calculators), and general and subject-specific software. Many mathematics classrooms now have interactive whiteboards which allow daily opportunities for ICT to be used in the classroom, both as a demonstration tool for teachers and as a way of allowing pupils to interact with software. The opportunities that ICT provides mean that teachers can reconsider the most appropriate ways of teaching mathematics. Concepts, structures and processes can be represented in new and revealing ways, often using dynamic images, which permit insights and understandings that were difficult to convey previously.

ICT should be considered an essential tool for both teachers and pupils. It can increase pace in lessons, improve pupil engagement and encourage discussion. Many teachers report that using ICT has led to pupils showing greater confidence in their mathematics, often shown by pupils 'having a go' instead of giving up when they meet a challenge.

The following illustrates just some of the ways that ICT can be used to support learning through each of the key processes.

Representing

ICT offers powerful forms of representation, including on-screen images and computer models in various forms. Examples of using ICT to represent include:

- choosing an appropriate computer representation of a problem, trying out ideas and experimenting
- identifying variables to be considered in the computer model, for example, the parameters in an equation or probabilities in a statistical simulation
- selecting the mathematical data that needs to be entered into the computer.

Analysing – use mathematical reasoning

Computers have a number of features that can be exploited to foster pupils' ability to reason. These include:

- making connections, for example, between an equation, a table and a graph
- visualising and working with dynamic images, for example, using dynamic geometry software to explore the properties of lines, angles and shapes
- making conjectures and generalisations fostered, for example, by use of the 'hide and reveal' facility of a computer
- exploring the effects of varying values, for example, in a spreadsheet or statistical model, posing the question 'what happens if...?'
- taking account of feedback from a computer, particularly exploiting its rapid processing capability.

Analysing – use appropriate mathematical procedures

Calculators and computers are themselves procedural devices, but the user also has to learn appropriate procedures in order to make effective use of them.

Examples include:

- procedures for constructing and manipulating graphs, charts, diagrams and other screen images
- routines for using a basic, scientific or graphical calculator accurately and efficiently, including, where appropriate, trial and improvement methods
- use of correct notation and computer syntax.

Interpreting and evaluating

Setting up a model and using the processing power of the computer necessitates particular skills in interpreting and evaluating the output. Some of the skills required include:

- determining whether the output is in an appropriate and useful form
- interpreting the meaning of the output in terms of the situation being modelled
- looking for patterns and correlations (e.g. in a spreadsheet) and evaluating their significance
- drawing conclusions and constructing convincing general statements
- being aware of the strength or weakness of empirical evidence gathered when using ICT.

Communicating and reflecting

ICT offers ways of communicating in mathematics. For example:

- organising findings and using graphic and dynamic forms of presentation
- discussing computer outputs, for example, the effect of changing an input or the value of a variable
- comparing alternative approaches, for example, an iterative method with an analytical approach.

A range of resources to support ICT in mathematics are included in the 'Ideas for rich tasks' folder within the *Secondary mathematics planning toolkit*.