

# Pedagogy and Practice: Teaching and Learning in Secondary Schools

## Unit 6: Modelling

The Coalition Government took office on 11 May 2010. This publication was published prior to that date and may not reflect current government policy. You may choose to use these materials, however you should also consult the Department for Education website [www.education.gov.uk](http://www.education.gov.uk) for updated policy and resources.



*Pedagogy and Practice:  
Teaching and Learning in  
Secondary Schools*

**Unit 6: Modelling**

**Senior leaders,  
subject leaders  
and teachers in  
secondary schools**

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**Teaching repertoire**



## How to use this study guide

This study unit offers some practical strategies that teachers use to provide effective modelling. The techniques suggested are tried and tested; they draw on both academic research and the experience of practising teachers.

By working through this guide you can build your teaching repertoire step by step, starting with strategies that are easy to implement and moving on to those that will help pupils develop their skills still further. The unit contains 'reflections', to help you reflect on an idea or on your own practice, as well as practical tips and tasks to help you consider advice or try out strategies in your classroom. There are case studies to exemplify particular points, a summary of the research and some suggestions for 'next steps' and further reading. The final page invites you to reflect on the material and to set your personal targets for the future.

You can work through this unit in a number of ways:

- Start small; choose one class to work with. Ask another teacher to help by talking through what you intend to do and to act as a mentor.
- Work with another teacher or group of teachers who teach the same class. Work together on developing your approach to modelling. After three weeks compare notes. Discuss which strategies are the most effective and why.
- Find someone to pair up with and team-teach. Design the tasks together and divide the role of teacher in the lesson between you.
- Work with a small group of teacher-researchers within your school. Use the guide to help you focus your work as a professional learning community.
- Identify sections of the unit that are particularly relevant to you and focus on those.

There is space in this study guide for you to write notes and responses to some of the questions, but you may also find it helpful to keep a notebook handy. For some tasks, you might want to make an audio recording or video of yourself in action so you can review your work more easily. You could add this, along with any other notes and planning that you do as part of your work on this unit, to your CPD portfolio.

The evidence of work you gather in your portfolio could count as points towards accreditation of an MA, or could support your application for membership of a professional body, such as the General Teaching Council of England (GTCE). It could also be used to support an application to reach threshold or Advanced Skills Teacher status.

You will need access to [video sequence 6, Modelling](#), when working through this unit.

# Modelling

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## Introduction

### Effective modelling in lessons

When effective modelling is a regular feature of lessons:

- the work pupils produce is more likely to achieve the standard required by the teacher;
- teachers see work meeting reasonable standards and their expectations of pupils rise accordingly;
- pupils are able to make use of the processes, skills, conventions and procedures that have been developed and consolidated in previous years;
- pupils are generally on-task, engaged and motivated;
- pupils are better able to work independently of the teacher, being clear about the skills they need to use and what a good finished product should look like;
- pupils feel they have the knowledge and skills to accomplish tasks to a good standard;
- pupils feel they have succeeded and this results in improved confidence.

### Common issues

When pupils are asked to produce a piece of work, they often lack:

- an understanding of the strategies required to plan and complete the task;
- the vocabulary needed to communicate the knowledge they have of the subject and to evaluate what they have produced;

- sufficient knowledge of the conventions and language features of the text they are asked to write;
- sufficient knowledge and experience of procedures they need to follow and how to decide the order in which they need to do things.

Many pupils may have the necessary subject knowledge, but lack both the experience of using process skills and the confidence to experiment and take risks when they are learning.

Pupils who are learning English as an additional language do not have sufficient experience in listening, talking, reading and writing in English and would benefit from hearing the appropriate style, tone and vocabulary of oral and written texts. These pupils will also benefit from ‘seeing’ processes and procedures modelled and from the use of more visual forms of communication. Pupils who have special educational needs also require this additional scaffold as it offers them a clear model of the process as well as the finished outcome.

## Resolving the issues

Modelling can be used to address these issues. There are a number of strategies you can use to ensure your modelling is effective.

- **Prepare the lesson well**, particularly if you are demonstrating a new procedure or idea to pupils. For example, if you plan to model a new skill or technique for the first time, you might practise the skill and rehearse what you are going to say. (As you become more confident, you might still plan exactly what you want the pupils to know, but may not need to write out a script or practise the skill again.)
- **Take into account pupils’ prior knowledge and experience.** Make links between what they’ve done before and the current work. When introducing new ideas and experiences allow sufficient time for pupils to become familiar with the conventions or features of the work.
- **Try to maintain a view of the class** while writing notes for them by using an OHP, a laptop or an interactive whiteboard; try to keep turning round to write on a board to a minimum.
- **Maintain the pace of the lesson** by using modelling for short periods only, especially when you are just beginning to employ the technique. Until pupils’ listening skills have developed, model just a small part of the activity, for example the opening sentence of a conclusion in a science experiment, or how to use a soldering iron in D&T.
- **Repeat the modelling** of a particular process whenever necessary. It is important to remember that some skills are acquired only through repeated practice.
- **Establish rules for the session** and emphasise the importance of sticking to them. Explain to pupils that it will help them learn and make the most of the limited time you have together. This can be done quickly with the participation of pupils and the rules can be displayed on a classroom poster. They may include the following:
  - Don’t call out.
  - Concentrate, listen and watch, and make sure you can see clearly.

- Wait until the teacher has finished speaking before you ask a question.
- Don't talk when the teacher or someone else is talking.

## 1 What is modelling and why is it effective?

### What is modelling?

Many people say they have learned the basics of cookery by watching Delia Smith's programmes on television. They learn how to achieve the desired outcome by watching her demonstrate a technique and listening to her simultaneously describe and explain what she is doing.

When we are learning a new skill or preparing to undertake a challenging task, it helps if we can:

- see someone else do it first;
- hear them 'thinking aloud' about the decisions they are making;
- hear them explaining what they are doing at each stage;
- ask questions about the process as it is happening;
- identify problems as they arise and think aloud about how to solve them;
- slow the process down to look in detail at the most difficult part and ask for further clarification;
- see the process demonstrated visually, sometimes repeated more than once if it is difficult to grasp;
- be given time to discuss what has been done and predict next steps.

In other words, it helps if we have a model. Modelling is an effective teaching style used in all sorts of contexts outside the education system. It is used for training medical professionals, hairdressers and train drivers, to give just a few examples.

### Modelling in the classroom

Also known as 'assisted performance' or 'teacher demonstration', modelling is recognised by teachers as an effective strategy for when pupils are attempting new or challenging tasks. Modelling is an active process, not merely the provision of an example. It involves the teacher as the 'expert', demonstrating *how* to do something and making explicit the thinking involved.

Through modelling, the teacher can:

- 'think aloud', making apparent and explicit those skills, decisions, processes and procedures that would otherwise be hidden or unclear;
- expose pupils to the possible pitfalls of the task in hand, showing how to avoid them;
- demonstrate to pupils that they can make alterations and corrections as part of the process;
- warn pupils about possible hazards involved in practical activities, how to avoid them or minimise the effects if they occur.

## The benefits of good modelling

Modelling that involves demonstrating visually is particularly important for pupils who cannot visualise concepts without prompts or follow a set of instructions just by listening to them. It is also helpful for pupils with sensory impairment who may miss some experiences through lack of sight or hearing.

Good modelling:

- illustrates for pupils the standard they are aiming for and establishes high expectations in terms of skill as well as knowledge;
- helps pupils develop the confidence to use the processes for themselves;
- helps pupils accept that making mistakes is part of the learning cycle;
- helps pupils to take risks when learning;
- helps pupils with special educational needs, who benefit from having processes and skills demonstrated in a clear, concrete way;
- helps pupils learning English as an additional language, who benefit from the combination of a visual model and an oral explanation;
- appeals to a significant number of pupils whose preferred learning styles are visual and auditory;
- provides an effective approach for extending the experience of gifted and talented pupils.

Effective modelling ensures that pupils move from dependence on the teacher as the expert, to independence and being more expert themselves. Vygotsky identified the road to independence as one that leads from scaffolded support.

In effective modelling, the teacher:

- is specific about the task and what pupils will learn;
- does not expect pupils to listen or watch for extended periods of time;
- offers challenge but mediates that through providing pupils with the criteria for success;
- explains underlying principles so that pupils understand what is involved;
- shares the thinking so that the mental processes are explicit;
- involves pupils increasingly in the process by encouraging them to think about the task, ask questions, offer contributions and test ideas;
- provides opportunities for pupils to practise the new skill while it is fresh in their memory;
- supports first attempts with prompts, scaffolds and praise;
- enables pupils to become independent;
- enables pupils to see how they can learn from others.

## Task 1

### Modelling to develop analysis

30 minutes

Video sequence 6a shows a Year 9 geography lesson at an inner-city comprehensive. Pupils' attainment on entry to the school is slightly below average overall. This class is a mixed-ability group with a wide range of prior attainment, including those working above the level expected for their age as well as those working below it. They have been studying Brazil and the rainforest.

Watch the video and look carefully at the teacher's use of modelling. Use the following questions to help you with your analysis.

- What skills, processes or procedures were being modelled?
- How did the teacher make the decisions behind the task clear to the pupils?
- After modelling the activity, how did the teacher 'scaffold' the learning in order to move pupils towards independence?
- How did the pupils respond throughout the session?

Compare your notes with the analysis in [appendix 1](#) on page 22.

## Task 2

### Classroom assignment: try the strategies

30 minutes

From your notes for [task 1](#), identify two strategies that were new to you and that you thought worked particularly well.

Choose a class you feel confident with and a lesson where demonstrating a key skill or concept would be useful.

Plan to use either or both of the new strategies in this lesson. Remember to keep the modelling session short and focused.

Look at the pupils' outcomes from the lesson. Have pupils grasped the skill or concept that you modelled during the lesson? Which aspects of the modelling session could you improve next time?

Here are just a few examples of skills, processes and procedures in different subjects where modelling could help:

- writing an account in history;
- making notes in preparation for an essay in religious education;
- identifying key points or evidence from a range of sources in geography;
- reading an examination question in science and deciding what is required;
- constructing a concept map in science;
- considering options when receiving the ball in an invasion game, for example football or netball;
- evaluating a finished product in design and technology;
- presenting a piece of logical reasoning in mathematics;
- analysing an image in art;

- learning and using a rhythm in music;
- improving technique when throwing a javelin in athletics.

### Task 3

#### Identify opportunities for modelling

20 minutes

Make a list of opportunities for modelling in your subject. Think about the range of learning needs in the classes you teach, including those at Key Stage 4.

Some teachers are reluctant to undertake modelling for a number of reasons, even though they realise it is a very important teaching strategy. Identify three reasons why modelling is important in your subject and three areas of possible concern.

#### Why modelling is important

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#### Concerns

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Look back to the list of strategies for effective modelling in [Resolving the issues](#) on page 2. Are your concerns covered by any of the suggestions made there? Look out for further relevant suggestions as you work through the unit.

## 2 Modelling talk

The *Literacy across the curriculum* training materials stress the importance of modelling speaking and listening as well as reading and writing. **All subject specialists** have a vocabulary and ways of expressing themselves that are appropriate, and indeed important, for their subject. When you learn a foreign language, you need plenty of opportunities to hear it spoken. Through modelling talk, the teacher can demonstrate for pupils the particular features of the language of the subject.

By orally rehearsing ideas, teachers provide pupils with a good model for their talk and for their writing. In design and technology, for example, the teacher might model how to describe the taste of certain foods:

‘This piquant sauce has a base of cider vinegar and sugar. If I wanted to alter the taste to make it sweeter, I would have to increase the ratio of sugar to vinegar.’

Similarly, an art teacher might model the evaluation of a painter’s techniques:

‘The first thing I notice about this painting of sunflowers by Van Gogh is the vibrancy of the colours and the strong brushstrokes. To produce this effect Van Gogh would load his brush with paint and create marks on the canvas very quickly. You can see this by the lack of modelling of the paint which achieves this quality of spontaneity.’

### Task 4

#### Identify the features of your subject language 10 minutes

These are some of the features of geographers’ talk. Users of this subject language:

- have specialist vocabulary;
- use semi-formal syntax;
- include factual explanations;
- employ phrases that indicate cause and effect, for example ‘consequently’, ‘this results in’, ‘precipitating’;
- have a committed enthusiasm and respect for knowledge of places and perspectives.

Now identify other features of talk that are required in your subject.

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## Task 5

### What oral skills need to be developed?

15 minutes

Choose a class you teach. Make a list of the subject-specific oral skills these pupils need to develop. Refer back to the list of general features of subject talk in [task 4](#) to help.

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### Reflection

Look at the list you made in [task 5](#). How do you currently make these skills explicit in your lessons?

What strategies are you using to teach pupils how to become effective speakers?

Look at your current scheme of work and planning. Have you made sufficient provision for teaching these skills?

Here is a teaching sequence that covers the main points to be considered in planning an effective modelling session.

### Teaching sequence for modelling talk

- 1 Make the learning objectives explicit to the class.
- 2 Provide an example or model of the oral-language text type.
- 3 Identify the purpose, the outcomes and the 'ground rules'.
- 4 Define the speaking and listening conventions.
- 5 Set an activity or oral task that enables pupils to rehearse and explore language conventions in a supported context.
- 6 Reflect and review, refocusing on the speaking and listening objectives.

## Task 6

### Modelling talk

30 minutes

Video sequence 6b shows a mixed-ability Year 7 class. The class is doing a short unit of work based on the following objectives from the English framework:

- promote, justify or defend a point of view using supporting evidence, example and illustration which are linked back to the main argument;
- acknowledge other people's views, justifying or modifying their own views in the light of what others say.

The pupils had spent the previous lesson considering a series of 'outrageous' arguments. They then worked on defending or opposing them, using evidence to justify their views.

Watch the video sequence and use the following questions to help you identify the ways in which the teacher and the teaching assistant modelled the appropriate language to use when constructing a spoken argument.

- What role does the modelling sequence play in teaching pupils about how to construct an argument? What evidence is there in the video that pupils have understood the principles of constructing an argument?
- How has this approach helped pupils with EAL and special needs?

## Task 7

### Classroom assignment: modelling talk

1 hour

Identify an opportunity to model subject-specific talk in a lesson that you will teach soon. Plan a talk for that lesson, using the teaching sequence as a guide. Consider also the following questions.

- What are the objectives for the lesson?
- What are the subject-specific key words and phrases you want pupils to learn?
- How will you group pupils for the teacher demonstration?
- What resources will you need for this lesson that will support modelling?
- Who will help you in the lesson?

It is useful to make an audio recording of your lesson or have another teacher observe to help you reflect on it later. You could ask pupils how the modelling session helped them.

### Practical tip

In preparing to use modelling as a technique, some teachers have found it useful to make an audio recording of their talks before delivering the lesson. They used the questions below to help analyse their work.

- Did you use your voice in a way that would engage pupils, varying it to maintain their interest?
- Did you make the learning objectives clear?
- Did you explain that, by listening to you, they would be able to produce good-quality work, and work safely where appropriate?
- Did you include subject-specific vocabulary and explain meanings?
- Was the talk long enough to provide pupils with the knowledge they needed for the task?
- Was the talk too long? Does it need modifying?

Remember, it is difficult for people to listen if they are uncomfortable or if the talk goes on for too long. Make sure that pupils are facing you and can see and hear you in comfort. Aim to talk for no more than **5 minutes** to begin with.

## Task 8

### Evaluation

15 minutes

Use some of the following questions to focus your evaluation of the lesson from [task 7](#).

- What worked well? How effective were your modelling strategies?
- How did you help the pupils to apply the strategies you modelled?
- Which examples of subject-specific language and vocabulary that you modelled did you hear the pupils use?
- How well did the pupils' work match the expected outcomes?
- Were there any problems? If so, what could you do to overcome them next time?
- If you asked them, what did your pupils say?

### 3 Modelling writing

The knowledge and understanding pupils have acquired in **all subjects** over the key stages is assessed at some point through writing. Even reading skills are assessed through a written response. GCSE coursework makes particular demands on pupils, and subjects that previously did not require writing skills, such as drama, dance and PE, now involve a written examination.

However, pupils experience more problems with writing than they do with speaking or reading. Attainment measures at the end of all the key stages show that writing lags behind the other two language modes. The 2002 National Curriculum tests for English showed a 20 per cent differential between reading and writing for all pupils; the gap is wider for boys, who experience greater difficulty in mastering writing than do girls. The differential increases over Key Stage 3 and Key Stage 4.

Modelling is one of the most effective ways of helping both girls and boys to become confident writers, and it works especially well for boys. Modelling how to write an answer to an examination question is an excellent strategy to use in all year groups, but has particular relevance for Key Stage 4 pupils.

Below is a list of the main text types that pupils are expected to write across the curriculum and in examinations.

Text type	Examples
Instructions	Recipes, directions, plans for making
Recount	Stories, science experiment write-up
Explanation	The rain cycle, mathematical conclusions
Information	Food in Roman Britain, the properties of mercury, nutritional analysis
Persuasion	Advertisements, manifestos
Discursive writing	Magazine articles, discursive essays
Analysis	Literary criticism, analytical essays, data tables or charts
Evaluation	Critical reviews, reflection on outcomes

#### Task 9

#### Identify text types in your subject

10 minutes

From the list above, identify which text types pupils are asked to write in your subject.

Think about how you introduce writing tasks. What do you tell pupils about what is required when writing a specific text?

## Reflection

The Key Stage 3 *Literacy across the curriculum* training materials give analyses of different text types to help you improve the quality of pupils' writing in your subject. See [appendix 2](#) for the one on evaluation. This is a text type that pupils are asked to write in a number of subjects, particularly at GCSE.

How familiar are you with the language features of the texts that are written in your subject?

Each of these text types has a set of conventions at word, sentence and text level. If pupils are to become proficient at writing these texts, they need to have explicit teaching for each type. As writing is a skill that develops through continual practice and reinforcement, pupils will need repeated opportunities to learn about these features. Traditionally, teachers have set writing tasks and relied on marking to correct the errors, both factual and secretarial, expecting English teachers to teach the necessary writing skills. However, the programmes of study for all subjects emphasise the need for all teachers to be aware of the literacy demands of their subject and to make provision in their schemes of work for teaching pupils the skills they need to express their understanding and knowledge.

Explicit modelling of the features of the texts, showing pupils how to select and manipulate content, is a proven strategy for improving the outcome of writing tasks. It helps pupils to avoid many common errors and substantially reduces marking. It also raises pupils' confidence in their ability to undertake the task because they have a good model in their heads of what they need to produce. This is particularly important when pupils are preparing coursework assignments for GCSE.

Here is a set of generic conventions that can be applied to all texts.

### Purpose

- What is the purpose?
- Who is it for?
- How will it be used?
- What kind of writing is appropriate?

### Text level

- Layout
- Structure/organisation
- Sequence

### **Sentence level**

- Viewpoint (first person, third person etc.)
- Prevailing tense
- Active/passive voice
- Typical sentence structure and length
- Typical cohesion devices

### **Word level**

- Stock words and phrases
- Specialised or typical vocabulary
- Elaborate or plain vocabulary

### **Reflection**

When you set writing tasks, do you make all these features clear to the pupils? How do you show them how to plan the content? How do you demonstrate how to write the opening paragraph or other sections of the text? Do you explain your selection of connectives, words and phrases as you write?

Here is a teaching sequence that covers the main points to be considered in planning an effective modelling session. This sequence could take place in one modelling session, or through modelling sessions over a series of lessons.

### **Teaching sequence for modelling writing**

- 1 Establish clear aims.
- 2 Provide examples.
- 3 Explore the features of the text.
- 4 Define the conventions.
- 5 Demonstrate how it is written.
- 6 Compose together.
- 7 Scaffold pupils' first attempts.
- 8 Move pupils on to independent writing.
- 9 Draw out the key learning.
- 10 Use praise to motivate and encourage.

**Task 10****Modelling writing****30 minutes**

Video sequence 6c shows a history lesson with a Year 7 group. The teacher models and then demonstrates writing an explanation.

Watch the video and look at how the teacher's use of modelling compares to the first part of the teaching sequence. Make notes in the grid below on how the different elements are covered.

Establish clear aims

Provide examples

Explore the features of the text

Define the conventions

Demonstrate how it is written

## Task 11

### Classroom assignment: modelling

1 hour

Identify an opportunity to model writing in a unit of work that you will teach soon.

Collect some good examples of the text type (including some written by pupils).

Plan how you will model the writing in the lessons, using the teaching sequence as a guide. For example, you may want to try modelling just the opening paragraph in the first lesson and build up to the whole text over a number of lessons. Write out your script for the first lesson and keep it short.

Decide whether you are going to use a whiteboard or an OHP.

If you can, make an audio recording of your lesson or have another teacher observe to help you reflect on it later.

### Practical tip

Write out the script or some key points that you are going to use in the lesson and refer to it while you are modelling the text.

You can observe pupils' reactions and answer any questions most effectively if you can model this when facing the class.

## Task 12

### Evaluation

15 minutes

Use the following questions to evaluate the lesson from [task 11](#).

- What worked well?
- Were there any problems? If so, what could you do to resolve them for next time?

Analyse the written outcomes from a previous lesson and from the modelled session. What are the differences between the two samples? Do these tell you anything you can act on next time?

## 4 Practical modelling

### Successful practical modelling

Effective teachers of practical subjects are adept at using demonstration and modelling as strategies for introducing pupils to new or complex processes, skills or tasks.

Demonstration is an accepted strategy that is often used successfully in the teaching of practical subjects. Modelling should be seen as an extension of demonstration by not only showing how to do something but also thinking through the process aloud and making this thinking explicit to pupils. By thinking aloud the teacher shows and reinforces the importance of making decisions regarding:

- how to begin;
- how to select information or data which is relevant to the task or audience;
- how to organise information, data or ideas;
- the use of protocols relating to the presentation of information, data or ideas;
- how to end.

For example, in design and technology the approach of many pupils to designing is mechanistic, lacking any true understanding of the skills required for the process or the confidence to develop their own ideas fully. Modelling the unpacking of a design brief, and the thinking that takes place when designing, can help pupils to develop their skill and confidence in exploring, generating and developing their design ideas.

In mathematics, exercises on solving problems are widely used. Modelling the stages is important in short problems as well as in substantial or extended problems. Pupils often rush through the stages, hoping the teacher will confirm the correctness of their answer! Effective problem-solving habits need to be modelled and taught, not left to chance. A teaching strategy to develop these good habits is to take a small set of problems, and model working each through just the first two stages, then pausing to compare approaches. This may seem unnatural to the class at first, but once they can see the benefits, pupils begin to give more conscious attention to how they plan the solution.

In science pupils regularly engage in scientific enquiries and these comprise a wide range of processes and procedures that pupils have to learn. For example, they plan, obtain and present evidence, consider the evidence and evaluate their work. They also need to consider ideas and evidence, including how scientists worked in the past and how scientific ideas are presented. An effective way of teaching these processes and procedures is to model them for pupils. A teacher might, for example, use a scientific enquiry planning poster to model the process of controlling variables. The difference between talking it through and modelling it is that the teacher does it, talking it through while making decisions about which variable to control and why. The teacher shares the decision-making process with the pupils. This is just as effective for any aspect of scientific enquiry.

## Task 13

### Modelling a design brief

30 minutes

Video sequence 6d shows a D&T teacher modelling the unpacking of a design brief to a Year 9 class.

Learning new skills is often difficult for pupils in any subject. The teacher in this case is modelling their thinking about how to go about the process.

Watch the video sequence and use the questions in the grid below to make notes and reflect on what you observe.

Questions	D&T lesson
How did the teacher focus the pupils on the skills, processes or procedures being modelled?	
How did the teacher's modelling keep the pupils' attention and make explicit the thinking and decisions needed during the task?	
How did the lesson organisation and the task allow pupils the opportunity to try out the new skill, process or procedure and develop independence?	

### Reflection

The teacher in video sequence 6d shows how practical modelling helps their pupils' achievement and confidence, specifically in those aspects of their subject that pupils find most challenging.

Appendix 3 shows the reflections of some teachers who have used the questions in the table as a focus for watching this video sequence; they might be a useful starting point to compare your ideas against.

Remember, a key issue is to be clear about the differences between demonstrating and modelling – put simply, demonstrating is often just showing or telling *how* to do something, while modelling engages pupils in *thinking* as well as doing and allows them to develop the confidence and independence needed to progress.

## Summary of research

In terms of research, modelling spans a number of different topics because it encompasses a variety of quite different approaches, from physical demonstration to unpacking complex mental procedures. What unifies this diversity is the fact that the pupils are offered an approach that supports their understanding.

### Wider research

One of the reasons why modelling is important is that it can contribute to pupils developing a 'mental model' of a topic. Mental models are regarded as a cornerstone of understanding. Most psychologists view understanding as much more than bundles of unconnected facts. As Johnson-Laird (1985) described it:

*The psychological core of understanding ... consists of having a 'working model' of the phenomenon in your mind. If you understand inflation, a mathematical proof, the way a computer works, DNA or a divorce, then you have a mental representation that serves as a model of an entity.*

Extract from 'Mental models' by P. N. Johnson-Laird, in Aitkenhead and Slack (eds) (1985) *Issues in cognitive modelling*. Psychology Press. © Taylor & Francis Group plc. Used with permission of the publisher.

A mental model has components and relationships between those components. Thus you can have a mental model of a concept, a task or phenomenon. The vital characteristic of a mental model is that it allows you to predict and respond to unknown situations – it confers flexibility and the ability to transfer. This is illustrated by a number of experiments undertaken in Japan (Hatano and Inagaki 1992). For example, young children who had experience of looking after goldfish were found to have better understanding of how to look after other small animals. It is likely that they understood features such as feeding and cleaning, the health of the goldfish and the relationship between them. So when faced by an unknown situation of looking after another animal they were able to use the 'model' and transfer their knowledge from looking after goldfish. Thus they knew the importance of feeding the right amount of food, at regular intervals, and keeping the animal's living environment clean.

Stevens and Rosenshine (1981) synthesised 20 studies related to disadvantaged students and found that effective instruction was characterised by teacher demonstration of particular skills, student practice of the component parts with the teacher providing prompts and corrections, leading to independent practice. This is a very close parallel to guided work in the national strategies. Further work by Rosenshine (1983) indicates that, particularly with younger or low-achieving students, certain features will be important in modelling and demonstrating, such as teaching being well structured into small and sequential steps. Practice is again emphasised so that the skill or response becomes automatic.

### Writing

There is some work in geography, done by a partnership between practising teachers and a university researcher, that shows the potential for teachers modelling processes for pupils. The university researcher analysed pupils' writing in the genres of describing and explaining, and developed a model to show the levels of performance. Through teacher modelling and peer and self-assessment, pupils' writing improved compared to comparison groups.

## Metacognition

Modelling is likely to encourage pupils to use metacognitive thinking. It is recognised as a different type of thinking concerned with planning, monitoring and regulating actions in complex tasks. This is particularly the case where teachers ‘think aloud’, slow down to look at difficult parts of a process and encourage pupils to do the same. In a review of learning skills interventions, Hattie, Biggs and Purdie (1996) report that best results are obtained when strategy training was used metacognitively. Further, Wang, Haertel and Walberg (1993) conducted a review to identify the factors that explained successful learning, and metacognition was rated second out of 28 factors.

One of the best-known and well-researched programmes that uses metacognition as one of its central tenets, is reciprocal teaching (Palincsar and Brown 1984). Students working in groups are taught four behaviours that are characteristic of good problem solvers and they use them in, for example, understanding demanding texts and tackling science and mathematical problems. The four behaviours are summarising, questioning, clarifying and predicting. Students take it in turns to lead the group. This is a case, therefore, where very explicit modelling leads to students internalising a process, and which is then modelled in the group to the point where it becomes automatic.

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## Next steps

This unit has explored an aspect of teaching and learning. You may wish to develop your ideas further, to consolidate, apply ideas in different contexts or explore an aspect in more depth and innovate.

### Reflect

What have been the key learning points for you?

What has been the impact on pupils?

Here are some suggestions as to how you may develop practice further:

- Identify a particular subject skill, process or procedure that you feel a particular class or group of pupils do not do well. Plan how to model it well; do this repeatedly over a period, perhaps of three lessons in different contexts, and then evaluate the impact on your pupils' performance. Does repetition make a difference? Is there an optimum number of times you need to model?
- Investigate the difference in pupils' understanding when modelling is used as opposed to demonstration with clear explanations.
- Involve pupils in modelling by inviting them to plan teaching others how to perform a particular process or procedure. Evaluate the impact of asking them to teach from their own understanding.
- If you have a teaching assistant or technician working with you, ask them to help you plan and deliver a modelling session. Does working with another improve your planning procedures?

For further reading, the following publications are recommended:

- Bransford, J. D., Brown, A. L. and Cocking, R. R. (eds) (1999) *How people learn: brain, mind, experience and school*. National Academy Press. ISBN: 0309070368.
- Davies, F. and Greene, T. (1984) *Reading for learning in the sciences*. Oliver and Boyd. ISBN: 0050037684.
- DfEE (2001) *Literacy across the curriculum*. Ref. DfEE 0235/2001.
- DfES (2002) *Training materials for the foundation subjects*. Ref. DfES 0350/2002.

## Setting future targets

Having considered your next steps, you may wish to set yourself some personal targets to support your own continuing professional development. You could use these ideas to inform your performance management discussion.

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### Task 14

#### Setting your targets

40 minutes

When setting targets for the future you may want to discuss the possibilities with a colleague or your line manager.

Whatever you decide to do, you will need to consider the following.

- What are your objectives for the next year?
- What are the expected outcomes in terms of pupils' achievements?
- What strategies will you employ to achieve these outcomes?
- How will you track progress over the year?
- How will you know whether you have been successful or not?

## Appendix 1

### Analysis of video sequence 6a

What skills, processes or procedures were being modelled?	Using questions in planning Analysing a picture
How did the teacher make the decisions behind the task clear to the pupils?	The teacher: explained how questions could be used in planning; slowed the process down by creating steps; involved pupils in the decision making; thought aloud about what he was doing at each stage; stressed the importance of using prior knowledge when undertaking a new task; was explicit about analysing and not describing the image; allowed pupils to practise the first stage before moving on to the second; increased pupil involvement once he was sure they were secure in what they had to do.
After modelling the activity, how did the teacher 'scaffold' the learning in order to move pupils towards independence?	The teacher: used pair work; differentiated the support to meet the needs of the pupils, e.g. provided prompts to help with writing questions for some pupils and sentence starters for others; split the task to allow for increased complexity; asked questions, offered guidance and gave feedback during the task; displayed pupils' work as an example.
How did the pupils respond throughout the session?	The pupils: listened attentively; participated in the activities; answered teacher's questions; demonstrated clear understanding of what they had to do.

## Appendix 2

<b>Analysing text types: Evaluation, including self-evaluation</b>	
<p><b>Purpose</b></p> <ul style="list-style-type: none"> <li>• What is its purpose?</li> <li>• Who is it for?</li> <li>• How will it be used?</li> <li>• What kind of writing is therefore appropriate?</li> </ul>	<ul style="list-style-type: none"> <li>• To record the strengths and weaknesses of a performance/product</li> <li>• Part of the plan-do-review cycle, which might have an effect on future task setting / performance / target setting</li> <li>• Often used as part of assessment process, linked to objective-based teaching – i.e. <i>Did you meet your objectives for this particular piece of work?</i></li> <li>• Sometimes more long term – e.g. evaluation of performance over module of work / term</li> </ul>
<p><b>Text level</b></p> <ul style="list-style-type: none"> <li>• Layout</li> <li>• Structure/organisation</li> <li>• Sequence</li> </ul>	<ul style="list-style-type: none"> <li>• Title contains value judgement – e.g. <i>How well did your construction work? How well are you progressing in this subject?</i></li> <li>• Sometimes in list form, including strengths and weaknesses, followed by a summary, followed by targets for the future</li> <li>• Bullet points, numbered or lettered items</li> <li>• Subheadings used to focus attention of writer – e.g. <i>How much did the materials cost? How long did it take you to make it? How successful was the testing period?</i></li> </ul>
<p><b>Sentence level</b></p> <ul style="list-style-type: none"> <li>• Viewpoint</li> <li>• Prevailing tense</li> <li>• Active/passive voice</li> <li>• Typical sentence structure and length</li> <li>• Typical cohesion devices</li> </ul>	<ul style="list-style-type: none"> <li>• First person; singular for individual evaluation; plural (first/third person, etc.) for group evaluation</li> <li>• Past tense to reflect on performance; present to reflect on personal/group characteristics; future for target setting</li> <li>• Active voice</li> <li>• Connectives used to balance strengths and weaknesses – e.g. <i>although, however, still, on the other hand</i></li> <li>• Connectives used to indicate the use of evidence – e.g. <i>as in ..., I know this because ..., this shows that ...</i></li> <li>• Connectives used to establish cause and effect – e.g. <i>because, since, therefore, so, as a result</i></li> <li>• Avoidance of meaningless evaluations and targets – e.g. <i>It didn't work very well; I will try harder with my spelling</i></li> </ul>
<p><b>Word level</b></p> <ul style="list-style-type: none"> <li>• Stock words and phrases</li> <li>• Specialised or typical vocabulary</li> <li>• Elaborate/plain vocabulary choices</li> </ul>	<ul style="list-style-type: none"> <li>• Technical vocabulary related to subject under review – e.g. in English, the spelling of unstressed vowels in polysyllabic words; in maths, the solving of simple quadratic equations</li> <li>• Vocabulary of comment – e.g. <i>We all felt that ..., Some people in the group thought that ...</i></li> <li>• Vocabulary of constructive criticism – e.g. <i>John's suggestions, though inventive, were not generally accepted ..., Perhaps at this point, I could have ...</i></li> </ul>

Taken from *Literacy across the curriculum*, handout 2.4, page 8

## Appendix 3

### Analysis of video sequence 6d.

Questions	D&T lesson
How did the teacher focus the pupils on the skills, processes or procedures being modelled?	<p>Used the OHP</p> <p>Identified key word and phrases with coloured pen</p> <p>Links to previous learning</p> <p>As well as 'what' to do, he went on to explain 'how' - list of steps to go through</p>
How did the teacher's modelling keep the pupils' attention and make explicit the thinking and decisions needed during the task?	<p>Used the whiteboard to model and record thinking and ideas - made links with arrows and colours</p> <p>Made it clear the thought processes he was going through and how this affected the decisions he was making</p> <p>Didn't really question pupils much during the modelling session, saved this for after the pupils had completed the task</p>
How did the lesson organisation and the task allow pupils the opportunity to try out the new skill, process or procedure and develop independence?	<p>The task was organised so that discussion and interaction within pairs is inevitable</p> <p>Pupils were asked to go through the same process as the one that was modelled</p> <p>Pupils had access to large paper, space to work and discussion time in which to explore and develop their ideas</p>

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