



Guidance

Curriculum and  
Standards

### Teachers

Status: Recommended

Date of issue: 01-2005

Ref: 0035-2005 G

# Key Stage 3

## *National Strategy*

### Leading in Learning: developing thinking skills at Key Stage 3

Handbook for teachers



department for

**education and skills**

creating opportunity, releasing potential, achieving excellence

# **Key Stage 3**

*National Strategy*

## Leading in Learning

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## Acknowledgements

We are grateful to North Tyneside, Nottinghamshire, Redbridge and Richmond-upon-Thames LEAs who piloted the Leading in Learning materials.

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# Foreword

The Leading in Learning programme has been developed as part of the Key Stage 3 Strategy's support for whole-school improvement. It is a systematic, research-based programme, focused on improving pupils' thinking skills in curriculum subjects. This initiative is a key element in the government's commitment to personalised learning that seeks to build every aspect of education to meet the needs and aspirations of individual learners, to maximise their achievement and create independent, lifelong learners.

Personalised learning is an approach to teaching and learning that stresses deep learning as an active, social process and which is explicit about learning skills, processes and strategies. It builds independence through interaction, intervention, stimulation and collaboration. Leading in Learning is at the heart of personalised learning because it involves the systematic and explicit development of thinking and learning skills and strategies across the curriculum. It enables pupils to understand themselves better as learners and to apply a widening repertoire of learning approaches in different subjects. Giving explicit attention to thinking and learning equips pupils to transfer their learning to different contexts and helps them to process, construct and deploy subject knowledge and understanding more actively and effectively.

A key sign for the achievement of personalised learning is the extent to which schools can create a continuing dialogue with pupils about their learning, so that they are engaged and motivated, enjoy their schooling, know their learning goals and can work and reflect together on what and how they learn. Leading in Learning is of major importance in establishing this dialogue, so that each pupil develops the self-esteem and confidence for active participation in learning within and beyond school.

Leading in Learning challenges the notion held by many pupils that learning is dependent on luck and that ability is fixed. Instead it teaches pupils that learning can be improved through the application of a range of approaches and strategies. It should help to move some pupils from a feeling of helplessness to one in which they feel they have some control over their achievement and learning trajectory.

The initiative is based on three 'cornerstones':

- 1 A strong research base into learning and cognition.
- 2 Collaborative learning by groups of teachers.
- 3 Systematic support across a whole school, backed by materials and consultancy from the Key Stage 3 National Strategy.

For the initiative to succeed, all three elements need to be firmly in place.

- Teachers wishing to go further into the history and research will find a short summary with key references in Appendix 3 of this handbook, entitled 'The evolution of teaching thinking skills'. This appendix outlines different perspectives on the subject, reviews developments over the past 25 years and concludes with an outline of how the Leading in Learning programme presents an effective model for developing a thinking skills programme.
- The *Handbook for teachers* is designed to support the establishment of collaborative networks of teachers to promote the explicit teaching and

learning of thinking skills within and across subjects. Teachers focus on a particular thinking skill and then collaborate to connect lessons across three chosen subjects using a common strategy. This collaboration greatly increases the chances that pupils will build cognitive structures and acquire a disposition that encourages transfer of learning.

- The full set of materials includes a detailed *Guide for school leaders* and a *School training manual* that promote the systematic involvement of teachers in all subjects to ensure a full pupil entitlement to the development of thinking skills.



# Introduction

## Leading in Learning: the approach

Leading in Learning is a whole-school programme for teaching thinking skills at Key Stage 3. The programme takes a cross-curricular approach, rather than separately timetabled lessons or programmes confined to a particular subject. The main reason for this is the desire to maximise transfer of learning – to help pupils develop and use their thinking skills in all subjects and in other aspects of their lives. The model is innovative in requiring planning across departments, using cycles of **three lessons**, one in each of **three subjects**. For the occasional lesson teachers are invited, without abandoning their subject, to set subject content in a context where the objective is to develop a selected thinking skill and explore how it might be used in other subjects or in real life.

The model was piloted in four LEAs, and it both stimulated teachers and excited the interest of pupils. Based on a set of ten teaching strategies, it allows a phased approach that includes these features:

- trios of 'leading thinkers' from different departments develop 3-lesson cycles with chosen classes, usually starting in Year 7;
- other teachers gain experience of teaching lessons with a thinking skills focus in preparation for making a contribution to 3-lesson cycles.

Over a period of time, the approach is scaled up to involve most departments and all year groups, ensuring systematic coverage and progression in developing thinking skills by embedding plans in departmental schemes of work.

## Supporting resources

This handbook includes:

- guidance on the 3-lesson cycle, improving thinking skills lessons and developing progression;
- notes on each of ten teaching strategies, which you will need to refer to selectively over time;
- some planning and observation templates.

To supplement this handbook, the DfES website ([www.standards.dfes.gov.uk/keystage3](http://www.standards.dfes.gov.uk/keystage3)) provides subject exemplification of the ten teaching strategies.

The programme is supported by staff training, coaching and collaborative planning sessions.

## National Curriculum thinking skills

The National Curriculum defines five thinking skills.

### Information-processing skills

These enable pupils to locate and collect relevant information, to sort, classify, sequence, compare and contrast and to analyse part/whole relationships.



### **Reasoning skills**

These enable pupils to give reasons for opinions and actions, to draw inferences and make deductions, to use precise language to explain what they think and to make judgements and decisions informed by reason or evidence.

### **Enquiry skills**

These enable pupils to ask relevant questions, to pose and define problems, to plan what to do and how to research, to predict outcomes and anticipate consequences and to test conclusions and improve ideas.

### **Creative-thinking skills**

These enable pupils to generate and extend ideas, to suggest hypotheses, to apply imagination and to look for alternative innovative outcomes.

### **Evaluation skills**

These enable pupils to evaluate information, to judge the value of what they read, hear and do, to develop criteria for judging the value of their own and others' work or ideas and to have confidence in their judgements.

It makes these points about teaching thinking skills:

*'Pupils can be encouraged to reflect on what and how they learn, and how these skills can be applied to different subjects, different problems and real-life situations.'*

*'By using thinking skills pupils focus on "knowing how" as well as "knowing what" – learning how to learn.'*

*The National Curriculum: Handbook for secondary teachers in England 1999, 'Promoting skills across the National Curriculum' (pages 22 and 23).*

## **Transferring skills**

One of the weaknesses of education in general and teaching thinking in particular has been the transfer of learning. Often it seems that what has been taught in one subject does not influence learning in other subjects or contexts. It is quite deliberate, therefore, that the Leading in Learning initiative is structured so that both teachers and pupils begin to look beyond subject confines to learning more broadly.

Curriculum subjects differ in how they are specified, but all can be broadly considered in terms of content ('knowing what') and process ('knowing how'). It is to the process aspects of subjects that thinking skills most directly relate, for example, mathematical reasoning, scientific enquiry and historical evaluation. When the overarching nature of thinking skills and their broad applicability is highlighted in lessons across the curriculum, the process aspects of subjects are better served. This is what the Leading in Learning approach seeks to do.

Teachers and pupils in the pilot noticed other benefits too. Teachers often commented that, although the focus for their lesson was a thinking skill, the teaching strategies they used helped pupils to achieve a more secure grasp of subject content. Pupils also frequently said that what they learned was 'sticking better' or was 'more memorable'.

*'When the teacher asked us about the picture we had drawn in our groups in RE last week I could still remember it.'*

In summary, a cross-curricular approach to developing thinking skills can assist pupils in developing the process skills of subjects and help to make their knowledge and understanding of particular subject content more secure. Above all, it can raise pupils' awareness of themselves as thinkers and enhance their appreciation of the broader purposes of education.

## Getting involved

The next section of the handbook describes the 3-lesson cycle and how it operates. Teachers who are not involved in the initial 3-lesson cycles with other departments will have an opportunity to consider the National Curriculum thinking skills and to try out one or two of the suggested teaching strategies in lessons with a thinking skills focus. **However, it is important to understand the 3-lesson cycle from the outset, so that you can see where preparatory work in your department is heading.** In this and subsequent sections of the handbook it should be clear which points are applicable to you, so that you can easily dip into the pages as appropriate.

# The 3-lesson cycle

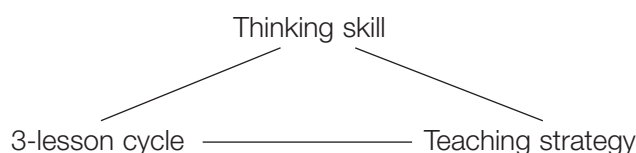
## The model

To achieve greater transfer of learning, it is essential that the teachers in any school collaborate so that deliberate efforts are made to connect lessons across subjects. For effective teaching of thinking skills at Key Stage 3, a model that is manageable within the context of a subject-focused curriculum is required.

The model that was successfully tested in the Leading in Learning pilot involves cycles of **three lessons**, one in each of three **different subjects**. One teacher made this comment:

*'We are unanimous in our view that the cycles helped us to develop challenging and interesting lessons which really made pupils think. Towards the end of three cycles we saw real progression in many pupils and natural links being made with uses for the various thinking skills.'*

In the 3-lesson cycle connections are made by focusing on a particular *thinking skill* through the use of a common *strategy* in each of the *three subjects*:



After agreeing on a common group of pupils, the process is: identify a thinking skill to be developed, review strategies that can be used to address the chosen thinking skill and then choose one strategy that all three teachers will be able to use in a forthcoming topic or unit of work. A range of ten different teaching strategies is offered and detailed notes are provided later in the handbook (see note below).

*Examples:*

*In one pilot school, a history, RE and mathematics team chose to focus on Reasoning using first the strategy of 'Classifying' and in the next cycle 'Reading images'.*

*In another school with an English, science and RE team, the focus for the first cycle was Reasoning and 'Audience and purpose' was the chosen strategy. The second cycle focused on Creative-thinking skills and used the 'Reading images' strategy. For the third cycle, the 'Mysteries' strategy was used to reinforce Reasoning and Creative-thinking skills from the previous cycles.*

The value of using a common strategy is twofold:

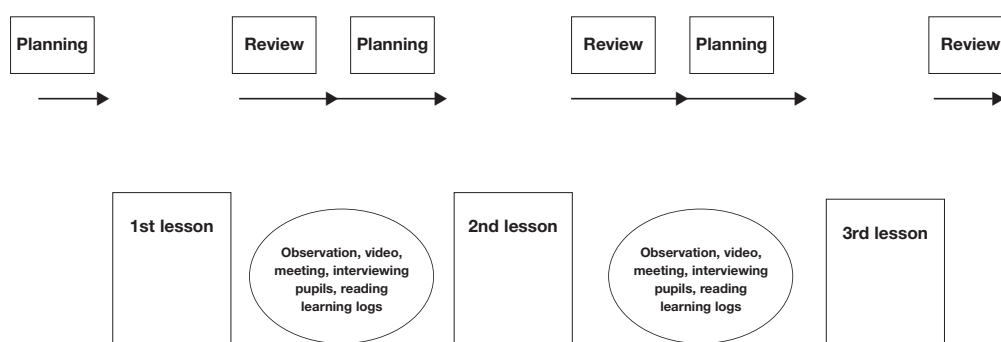
- 1 Pupils find it easier to recognise the connections between lessons because the shape of the lesson is familiar. This encourages them to transfer learning.
- 2 Pupils and teachers have the opportunity to see how important processes, such as classifying, summarising or making analogies, can develop pupils' thinking skills and are common to broad areas of teaching and learning. Learning in different subjects has more in common than we sometimes realise. Such an approach can highlight some of the most important similarities and differences between subjects.

The strategies are introduced in the section entitled **Ten strategies to make links**, starting on page 28. It includes a chart which matches the strategies to the five National Curriculum thinking skills. Subsequent pages address each of the strategies in turn. These notes provide a starting point for planning lessons using your chosen strategy.

## The cycle

In one cycle a lead lesson is taught in one subject with follow-up lessons in two other subjects. The lessons should be taught within a relatively short period of time of a week or two. There is benefit in the lessons being closely situated in that pupils' learning is quickly consolidated. However, time does need to be allowed for teachers to plan and review together between the lessons. Here is the process in diagrammatic form.

*The 3-lesson model*



Further cycles can then be developed, possibly with different thinking skills as the focus. Schools might plan for one cycle every half-term, giving up to six cycles in the year to cover a range of thinking skills.

## The planning process

At the outset a number of decisions need to be made by staff leading the initiative. The most likely order of events would be to begin the programme in Year 7, starting with three departments, following a phased programme, and extending into Year 8 and then Year 9 and involving all or most departments.

School leaders – preliminary tasks	
Task	Notes
Select three teachers.	<ul style="list-style-type: none"> <li>■ For initial cycles, three ‘leading thinkers’, each in a different department.</li> <li>■ Scale up to involve all staff in the three departments teaching a particular year group.</li> </ul>
Select a teaching group.	<ul style="list-style-type: none"> <li>■ Initially one class or, where not feasible, teaching groups where the maximum number of pupils appear in all three lessons.</li> <li>■ Scale up to all classes in a year group.</li> </ul>
Select one or possibly two thinking skills to teach.	<ul style="list-style-type: none"> <li>■ Initially a thinking skill suitable for development in all three departments.</li> <li>■ Scale up to ensure systematic coverage of all thinking skills across the key stage, and embed in departments’ schemes of work.</li> </ul>

Once these decisions have been made, the teachers involved can plan cycles of three lessons. Working collaboratively had a powerful impact on the development of teachers in the pilot:

*‘We strongly valued the melting pot of ideas which stimulated an inspirational approach to lesson building. Bouncing new concepts off the class made for more complete lessons and allowed pupils to access the most fundamentally difficult ideas.’*

The greatest benefits were felt in schools which made the investment needed for teachers to: plan and review lessons together; watch each other teach; be coached by a more experienced teacher of thinking skills. In these schools, the development of the initial trios of teachers was seen as a vital investment on which to draw when scaling up to involve whole departments. It also provided a model that could be spread, over a period of time, to involve other trios.

As a support to collaborative working a number of templates are provided in Appendix 1 (see page 111):

**Collaborative lesson planning template** – matches the structure of a thinking skills lesson.

**Lesson observation schedule** – for use when observing a colleague participating in the 3-lesson cycle, or for coaching by a more expert colleague. It provides prompts for key features of an effective thinking skills lesson.

**Collaborative cycle review template** – can be used to provide a record of the joint review.

**Pupil information sheet** – can help to gain pupils’ interest and make them feel a valued part of the initiative. It needs to be adapted to audience and purpose.

**Pupil review sheet** – could be supplemented by some sample pupil interviews. This is valuable in circumstances where time can be found to discuss and complete

it. Possibilities include:

- Where lessons are long and pupils write easily, review sheets could be completed at the end of the lesson.
- The template could be used at some other time, such as tutor time, or adapted for one teacher to use as a summary, perhaps in the first lesson they have with the class after the end of the cycle.
- The template could be used to focus on the progress of a small group of pupils, perhaps with questioning and support from a teaching assistant.

The following table sets out the planning process for a 3-lesson cycle.

Staff teaching the 3-lesson cycle	
Task	Notes
<p>Select a common strategy to use in all three lessons for the thinking skill you will address. The strategy should:</p> <ul style="list-style-type: none"> <li>■ be appropriate for teaching the selected thinking skill;</li> <li>■ provide a suitable context for each subject.</li> </ul>	<ul style="list-style-type: none"> <li>■ Use the table on page 31 as an initial guide. Perhaps select from a shortlist of three or four strategies.</li> <li>■ When scaling up, the school should plan for the whole range of strategies to be used.</li> </ul>
<p>Decide on the order of the lessons.</p>	<p>Consider where you place the most experienced and confident teacher:</p> <ul style="list-style-type: none"> <li>■ They might start the first cycle, in order to model the lesson for colleagues and ensure a lively beginning.</li> <li>■ Subsequently they might go last, in order to secure transfer and progression.</li> </ul>
<p>Plan the first 'lead' lesson and broadly map out how the second and third lessons will follow to ensure progression in the chosen thinking skill. Complete copies of the lesson planning template.</p>	<p>Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:</p> <ul style="list-style-type: none"> <li>■ an objective explicitly related to the chosen thinking skill that is common to all lessons in the cycle and is revisited in each of the plenaries, using planned questions to draw out pupils' thinking;</li> <li>■ an objective related to the subject or context of the lesson that is not the focus of the plenary but can be picked up in a subsequent lesson in that subject.</li> </ul>

Plan how the first lesson will be 'captured' so that subsequent teachers can pick up the learning outcomes.	<ul style="list-style-type: none"> <li>■ The most important way in which this can be done is through lesson observation. Ideally each of the three lessons should be observed by the other two teachers.</li> <li>■ Video can be used in addition to enable subsequent unpicking of the lesson.</li> <li>■ Make use of pupil review sheets or sample interviews, where feasible.</li> </ul>
Teach the lead lesson and pass on outcomes to subsequent teacher who adjusts second lesson.	<ul style="list-style-type: none"> <li>■ Teachers should meet to evaluate first lesson using observation notes and/or video. Discuss aspects of managing the strategy and ways of developing metacognition (e.g. identifying thinking words that pupils need).</li> <li>■ Second teacher may need to adjust aspects of the planned lesson.</li> </ul>
Teach second lesson to build on first lesson in terms of pupil learning.	<ul style="list-style-type: none"> <li>■ Second teacher should make explicit reference to lesson of first teacher in both the launch and the plenary.</li> <li>■ Pupils may have targets for improvement set in the first lesson, which should be revisited.</li> </ul>
Pass on learning to third (and possibly first) teacher who adjusts third lesson.	<ul style="list-style-type: none"> <li>■ Teachers should meet to evaluate second lesson. Check for progression in chosen thinking skill by increased emphasis on metacognition in the plenary.</li> <li>■ Plan and refine detail of third lesson.</li> </ul>
Teach third lesson to build on first two and capture accumulated pupil learning outcomes.	<ul style="list-style-type: none"> <li>■ Third teacher should refer explicitly to first two lessons in the cycle.</li> <li>■ In the plenary, push pupils to be more explicit in describing the thinking skill, saying where else it might be used and why.</li> </ul>
Review process and outcomes and complete cycle review template.	<ul style="list-style-type: none"> <li>■ Teachers should meet to review learning evident in third lesson.</li> <li>■ Consider evidence for transfer of thinking skill across the cycle.</li> </ul>

Further cycles will provide an opportunity for teachers to develop their planning, improve lessons and foster progression in the development of pupils' thinking skills. The next three chapters provide guidance on these issues:

- **Improving thinking skills lessons** sets out a model of the stages of a thinking skills lesson, with particular emphasis on the plenary and on the language of thinking.
- **Troubleshooting** deals with some common issues related to matching strategies to subjects, managing group work and developing metacognition (thinking about thinking).



- **Developing progression in thinking skills** indicates ways of building progression into the teaching of 3-lesson cycles and gives some tentative suggestions for progression in pupils' responses.

The second part of the handbook is devoted to the ten strategies and begins on page 28 with the chapter, **Ten strategies to make links**. It is supplemented by subject exemplification on the DfES Key Stage 3 website ([www.standards.dfes.gov.uk/keystage3](http://www.standards.dfes.gov.uk/keystage3)).

Appendix 1 incorporates the templates referred to earlier. Appendix 2 develops suggestions for identifying progression in pupils' thinking skills, based on the SOLO taxonomy. Appendix 3 traces the evolution of teaching thinking skills, sets Leading in Learning in its historical context and gives some pointers to theoretical ideas which can help you understand and develop your practice.

It is recommended that you refer to this handbook when planning and discussing thinking skills lessons with colleagues. Appropriate sections will also be referenced in the training and support programme provided by the school (see Leading in Learning *School training manual* and *Guide for school leaders*).

# Improving thinking skills lessons

It is important that you develop a clear model of stages in thinking skills lessons as a basis for developing and improving practice. Such a model is set out in this chapter. It is supported by a later section of the handbook which includes notes on each of the ten strategies.

## Planning to objectives and outcomes

At the heart of the 3-lesson cycles is a focus on the same thinking skills objective in each lesson. Each lesson will have different subject-related objectives. However, for this one lesson the thinking skill objective should be given the main emphasis, particularly in the plenary. When specifying objectives for a thinking skills lesson, the following points need to be considered.

### ■ Thinking skills objective:

- The National Curriculum descriptions for each thinking skill set out the components of that skill and provide vocabulary to use with pupils (see pages 7, 8 and 21).
- Process descriptions in your subject scheme of work will also help, but bear in mind the need for shared vocabulary across subjects.
- Although there is some uncertainty about progression in thinking skills it should be possible to indicate how the emphasis on metacognition increases over the cycle (see example below).
- It is essential to address the thinking skill explicitly with pupils in both the launch and plenary phases of the lesson.

### ■ Subject objectives:

- It is preferable to have one, or at most two, subject objectives.
- Be prepared to leave discussion of subject outcomes until a subsequent lesson, so that the plenary of each lesson in the cycle can focus on the thinking skill.

*Example:*

*Sequence 4 on the Leading in Learning DVD shows extracts from Adele's RE lesson. She states her prime objective as 'To develop the skill of reasoning and to reflect on its importance and use'. Note the emphasis on reflection (metacognition) in what was the third lesson of a cycle.*

Learning outcomes will focus on how pupils have applied their thinking to the task set. For example, some pupils will be able to present a summary of reasons for alternative solutions to the task. They will reflect on why they would choose one rather than another.

Learning outcomes might also focus on pupils' awareness of their thought processes (metacognition). For example, they might be able to:

- explain how they used their reasoning when summarising;
- give an example where reasoning is important in everyday life.

Although it is very important to the planning process to specify objectives, teachers with much experience of teaching thinking skills develop the ability to recognise and value unanticipated learning outcomes during the course of the lesson. On some occasions they decide to capitalise on these in the plenary, which reflects skilful 'during lesson' planning.

## The launch

The notion of a launch is an analogy. Consider a space travel vehicle. It needs a rocket to launch it so that it can overcome gravity, get through the earth's atmosphere and get headed on the right course. So it is with pupils on some occasions. They need the boost of the rocket to get them off the ground – thinking! They need some help to get through the first hard dangerous bit where they are dealing with the atmosphere and gravity. Once in space they can travel under their own power. But before they do they need bearings, so:

- help pupils see the relevance or interest in the forthcoming task;
- outline what one is looking for in terms of learning behaviour;
- get pupils tuned to the type of thinking and effort that is required, which may require modelling;
- clarify any terms, concepts or procedures that may be required.

There will be some **distinctive features** to the launch of a thinking skills lesson:

- Objectives will focus on the thinking and learning that pupils will be engaged in.

*'Your challenge today, as we continue to work on ratio and proportion, is to think about how we can classify ideas.'* (mathematics)

- There is a strong emphasis on collaborative working, sharing ideas and talking together – you might suggest to pupils that they are pooling their brains to produce better ideas and thinking.

*'Can you think back to what you learned about working in teams in the earlier lesson in the cycle?'*

- Connections to other subjects or contexts inside and outside of school are stressed – 'bridging scenarios'. You might ask pupils to consider what they already know that will help them with the task that they have been set. It is essential to make links to previous lessons in the cycle.

*'You have been working on classifying skills in mathematics and geography. Think about how this might help you outside of school. For example, imagine that your mum wants you to buy a Frank Sinatra CD for your Dad's birthday. Where would you look for this in a music megastore?'*

**Practical tip:** If pupils fail to see the point of focusing on a thinking skill, offer them a real-life application and perhaps ask them if they can think of another. Some bridging scenarios are suggested in section 9 of each strategy.

## The middle or group work phase

In the middle phase of the lesson, pupils should be working in groups on the challenging open task that has been set. Their thinking is expressed in the talk that takes place. This talk helps stimulate further 'higher order' thinking. Part of the purpose of the plenary is to review and rehearse learning and therefore the middle phase of the lesson is an opportunity to eavesdrop on pupils' thinking and talking. If you do this you can ensure that this thinking is shared more widely in the plenary and greater learning is possible.

- A part of your role during the group work phase is to monitor and move the task on when appropriate. Depending on the strategy this might involve managing timing, handing out blank cards, etc.
- Watch and listen to groups as much as possible. Reflect on your questions for the plenary, making notes on anything that may be useful.
- If you need to intervene in a group which is really stuck:
  - encourage the group to discuss their own difficulties to see if they can be more self-reliant and move on without your help;
  - encourage evaluation and reflection on progress and methods, so that ideas are refined and improved.
- On occasions, you may want to draw the class together in order to move their collective thinking on a stage. However, do not allow this to disturb the flow of group discussion or leave you short of time for the final plenary.

From a teaching perspective, **distinctive features** of the group work phase are:

- eavesdropping on discussion in the groups in order to capture pupils' thinking to inform the plenary;
- keeping interventions minimal, because it is important to allow pupils to learn from struggling (collaboratively) with the task or problem.

**Practical tip:** If a group is obviously stuck or asks for your help, get them to identify specifically what they are finding difficult, then tell them that you will leave them to talk it through for 2 minutes. They should come up with one or two ways of overcoming the problem and you will return to help them to choose the best way or to offer another suggestion. You are encouraging them to be more self-reliant.

## The plenary

The plenary is a vital part of every thinking skills lesson but is usually reported to be the most difficult phase. Pupils have to develop the ability to think and talk about learning so that they are aware not only of what they have learned but also how they have learned it – this is 'metacognition'. It requires you to ask the right kinds of question and to provide the language structures that pupils need to talk about their thinking. Plan key questions in advance but be prepared to develop them on the basis of the notes you make during group work. Types of question to ask are described in the next section and exemplified in the notes for each teaching strategy.

- **Ensure extended answers.** Ask a fair proportion of open questions and use supplementary prompts such as *'Go on'*, *'Tell me more about that'* and *'Explain why you think that'*, so that you get extended answers.
- **Encourage a build-up of joint thinking.** Encourage pupils to listen to each other and respond to, critically assess, evaluate or disagree with each other – *'Does anybody have a different idea/approach/method?'*, *'Do you all agree?'*, *'I know that some other groups were thinking differently'*. At this point the notes you made from your earlier listening and watching can pay real dividends as you can invite other groups or individuals to contribute.
- **Summarise thinking** and act as a broker for ideas and reasoning, so that good thinking is offered to all.
- **Focus on the 'how'.** On some occasions focus on how a task has been done and expose the main patterns and little idiosyncrasies, both in terms of how individuals thought and groups operated.
- **Make connections.** If at all possible make a connection between the solutions or the methods and other contexts, so pupils can see the wider purpose and application of the emerging learning. The examples in the 'Bridging scenarios' for the appropriate strategy should provide some stimulus. (Note: This is well illustrated in the RE lesson on the DVD referred to earlier.)
- **Establish generalisations** that relate to the five National Curriculum thinking skills so that they become more visible and transferable in other lessons and contexts. This is partly achieved through stories, examples and analogies, as suggested in the bridging section of guidance on each strategy.

The singular **distinctive feature** of a thinking skills plenary is that it is not about subject content, the 'what' of the lesson. It is exclusively focused on the thinking skill, the 'how' of the lesson.

**Practical tip:** Plenaries can founder because pupils are not used to this process. They need some 'think time' to rehearse their thoughts. Put two or three questions on the board and tell groups that they have a few minutes to ponder these. Make it clear that anyone might be expected to make a contribution.

## Metacognitive plenary questions

Useful questions for metacognition can be scripted as part of collaborative planning before a lesson. However, the need for, and relevance of, some questions only emerges during a lesson. It is extremely valuable to get into the habit of writing down possible questions as a lesson unfolds. As pupils answer questions at length they are *reasoning*, and depending on the question asked, other thinking skills can be practised and strengthened. The types of questions outlined below do not all have to be asked in one lesson.

### *Reasoning questions*

Many of these questions will start with *'Why...?'* prompting pupils to 'unpack' why they have reached a conclusion or hold a particular opinion. These questions should encourage pupils to give extended explanations or justifications which might last 30 seconds or more.



### *Reflective questions*

Many of these will start with 'How...?' .You are prompting pupils to reflect on:



How?

- how general approaches and broad strategies were used to tackle problems and tasks;
- how specific parts of the thinking process, for example sequencing, were used;
- how individuals and groups contributed to the task;
- how moments of insight or inspiration, such as getting a visual image flash in the mind, helped.

*Reasoning* and *reflective* questions might predominate in the first two lessons of a cycle or indeed over several cycles.

### *Challenge questions*

Some of these questions might start with:



Ah, but...

- 'But...?'
- 'Have you thought of...?'
- 'What do you think about...?'

You are prompting pupils to reconsider, reflect on consistency, hear an alternative viewpoint or even doubt their first thoughts. With time pupils can be prompted to ask some of these questions of their peers as they begin to assess critically each other's thinking.

### *Application questions*

These are the 'So what?' questions which might start with:



So what?

- 'Why is...important?'
- 'Where else might you...?'
- 'Imagine you were...?'

You are prompting pupils to consider how the thinking they have employed in this lesson might serve them in another context. It often helps if you can offer pupils stories, contexts or analogies which help them see the wider elements of their thinking. Offering bridging scenarios can help pupils to transfer their thinking and learning to other contexts.

*Bridging scenarios* are important. There is evidence that teachers whose pupils do well are able to encourage pupils to make connections and see a bigger picture. Initially you might offer a bridging context within the subject, but it is the more general bridging cues which have the greatest potential for opening pupils' eyes and minds and promoting transfer.

*Challenge* and *application* questions can be more difficult to employ, as both teachers and pupils may be less familiar with them. Therefore, it is worth noting that asking these types of questions is one approach to progression in teaching thinking.

## Language and thinking

Pupils may find it helpful to be alerted to ‘thinking words and phrases’ that they can use both in group discussion and in plenary sessions. Conscious use of thinking words and phrases helps to make thought processes more explicit, and opens them up to scrutiny, reflection and regulation. You may find it helpful to refer to the *Training materials for the foundation subjects* (DfES 0350/2002), Module 12: Thinking together, which focuses on exploratory talk. The following list of thinking words is from Module 13: Reflection (handout 13.7).

### Thinking words

adapt	evidence	predict
analogy	examine	prioritise
apply	experience	realisation
assess	experiment	recall
assumption	explain	recognise
attitude	extrapolate	reconstruct
belief	formulate	refine
clarify	hypothesise	reflect
classify	identify	reorganise
combine	image	response
compare	imagine	scan
compose	implement	sequence
consider	interpret	short-term memory
context	interrelate	skim
contradict(ion)	judge	specification
contrast	justify	stereotype
convert	juxtapose	stimulus/stimulate
decide	link	structure
decipher	long-term memory	summarise
decode	meaning	symbol
define	metaphor	synthesise
design	model	transform
develop	negotiate	translate
differentiate	organise	trigger
distinguish	paraphrase	visualise
evaluate	plan	

### Thinking phrases

You might consider identifying some key phrases to introduce to pupils, perhaps displaying them for pupils’ reference as a way of encouraging them to extend the range of language structures they use to discuss the thinking they have been doing. Here are some examples:

*‘I think this...because...’*

*‘We could use this strategy in...’*

*‘Another reason for this is...’*

*‘As I did this, I was thinking about...’*



*'If...then...'*

*'What I have learned is...'*

*'The most difficult part was...because...'*

*'The most challenging part was...'*

*'I found the strategy helpful because...'*

*'At first we thought...but later decided...'*

*'Although I thought...Sam made the point that...'*

*'We couldn't agree about...but eventually decided...'*

*'We found...puzzling because...'*

*'We had to change our ideas because...'*

*'It didn't make sense until we...'*

*'What made the difference was when...'*

*'There were three components to the task...'*

*'We tried three different ways of...before...'*

*'When we compared our ideas with...'*

## Troubleshooting

When developing thinking skills lessons certain issues arise quite frequently. Key sections of guidance in this handbook are:

- Improving thinking skills lessons (pages 16 to 22)
- Notes on the particular teaching strategy you are using (pages 33 to 110)

These sections provide a basis for discussions with colleagues in school or with the LEA consultant to help guide you to a resolution of the issue or difficulty. There follow some hints on resolving three of the more common issues.

*I struggled to match our chosen teaching strategy to the subject content of a particular topic or unit of work.*

- Planning 3-lesson cycles with teachers from two other departments involves choosing a strategy that all of you can use with a class over a short span of time. Be prepared for some negotiation over selecting the strategy or changing the topic in which the lesson is embedded. It is often possible to disrupt the 'content flow' of your subject temporarily. This is balanced by the gain in pupils' thinking skills and how they approach the subject.
- The website gives exemplification in most subjects for a range of strategies. You may be able to adapt an idea you find there. Often teachers have seen an example, not necessarily in their subject, that inspires them to develop ideas of their own.
- Sometimes a little more effort is required to prepare a suitable task. Consider whether you could produce something jointly with a colleague to use with several classes, or ask a technician to help prepare the resources.

*We selected a suitable strategy, but I found the group activity difficult to manage or did not get the response from the class that I wanted.*

- In the notes on each strategy there is a 'troubleshooting' section. Some more general points are addressed below.
- Did another colleague have more success using the same strategy with the class? If so, what can you learn from them? Perhaps the class is not used to group work, or maybe the dynamics of the groups are not working well? Try changing the composition of the groups, set tight requirements and persevere – response will usually improve.
- Managing group work requires particular skills and techniques that teachers need to practise. If your experience is limited you may find it helpful to refer to the following National Strategy materials:
  - Unit 10: Group work, in the suite of study guides that are part of the *Teaching and learning in secondary schools* National Strategy materials (DfES 0423–2004).
- Sometimes the task may have a degree of openness or ambiguity which causes difficulty. Or it may be pitched beyond the experience and capabilities of pupils. You might adjust the task, but remember that challenge is essential to developing pupils' thinking skills, so beware of

oversimplification. Teachers have often been surprised at how pupils have responded and it is wise not to jump too quickly to the conclusion that it is the difficulty of the task that is the problem.

*The activity went well, but I struggled to focus discussion on thinking skills.*

- This is a most important issue to resolve. In planning you should start by selecting a thinking skill to develop, then a teaching strategy that can be used in the context of your subject. There are two possibilities:
  - You are focusing too much on subject content. This is natural – it is what you normally do! It requires a conscious effort to overcome this tendency. Teachers have found that successful lessons develop subject understanding, even when the focus of discussion is on thinking skills. You can always return to the subject matter in a subsequent lesson. If a colleague is observing your lesson consider asking them to add input to the plenary.
  - You are focusing too much on the teaching strategy. It is all to the good if teachers and pupils find the strategies stimulating! Many of them are important transferable skills in their own right. The way to handle this in the plenary is usually to debrief first on the strategy and then take a conscious step to focus on the thinking skill.
- Metacognition (thinking about thinking) does not come easily to pupils and will take time.
  - It needs to become a *habit* – pupils need repetition and practice.
  - They need to be given the *language and vocabulary* to talk about their thinking. Consider using a set of ‘talking frames’ to help pupils use effective language structures. (See section on language, page 21.)
  - Through bridging scenarios, they need opportunities to make a conscious *transfer* to other subjects, lessons and real-life contexts.
- Key parts of the lesson are the launch and the plenary.
  - Consider whether in the introduction to the lesson you are making it sufficiently explicit to pupils what thinking skill you are developing and encouraging some bridging to other lessons or contexts.
  - It is essential to allow sufficient time for the plenary in order to develop metacognition. This part of the lesson requires a high degree of skill to teach well: questioning, dealing with responses and feeding in observations from the group work phase. The guidance on plenaries (see pages 18 to 20) should help, as should observation of a skilled colleague. In the end, there is no substitute for perseverance and practice!
  - For further guidance on developing effective plenaries, see Unit 7: Questioning and Unit 5: Starters and plenaries in the suite of study guides that are part of the *Teaching and learning in secondary schools* National Strategy materials (DfES 0423–2004).

# Developing progression in thinking skills

## Thinking skills over Key Stage 3

There is intended to be considerable flexibility in the way that thinking skills are addressed in Key Stage 3. The following principles are offered to inform decisions rather than dictate a curriculum:

- Four of the thinking skills (Information processing, Reasoning, Creative thinking and Evaluation) might be addressed in 3-lesson cycles over the course of Year 7 and Year 8. Earlier cycles should establish clarity in that skill area and, as pupils gain in confidence, later cycles should develop their competence.
- In Year 9 in particular one would expect pupils to be able to employ these skills with increasing independence and to develop more substantially the skill of Enquiry. Particular departments might plan and conduct enquiries or investigations which explicitly expect pupils to deploy these skills. Pupils should peer- and self-assess their use of thinking skills.

Progression needs to be considered on different timescales: across the three lessons in a cycle, over a sequence of cycles, over the key stage. Teachers who have infused thinking skills within their own subject or planned to coordinate teaching across several subjects have found planning progression a challenge. Approaches considered in the Leading in Learning pilot can be thought of in two ways: level of task challenge and level of response. Raising the level of task challenge is a way of achieving progression in the teaching. Expecting a higher level of response on a similar task is a way of seeking progression in the learning.

## Level of task challenge

In the pilot, teachers planned in a variety of thoughtful ways for successive lessons within a cycle both to follow from the one before and to provide further challenge for pupils. This can be done in several ways.

- 1 Increase the difficulty of the task.** This might be done by providing more complex information, introducing conflicting information halfway through an activity or asking pupils to evaluate as well as create ideas. Guidance on the level of task challenge is provided in the notes for each of the ten strategies.
- 2 Reduce the amount of support for the task** in the form of questioning, modelling, explaining or scaffolding generally. Thus pupils are expected to work more independently. For example, ask them before they start an activity to consider what they already know that might be useful, and to generate a rough plan for tackling it.
- 3 Increase the complexity of the group work** by, for example, asking pupils to work with those that they don't normally work with, perhaps in mixed-gender groupings. The richness of the group work and talk can also be extended by asking pupils to use cue cards. Cue cards are reminders to pupils, printed on card and available on the desk, to try particular behaviours in talk or thinking –

such as *Has everyone been asked for their ideas and been listened to?*.

- 4 Increase the level of challenge in the plenary** so that pupils are asked to reflect more on how tasks have been done and what significance this has. In other words the plenary is more metacognitive. In the first lesson of a cycle, for example, the plenary might emphasise debriefing on the strategy used. By the third lesson, pupils are familiar with the strategy and the plenary can focus more on the thinking skill and its application or transfer to other subjects and contexts.

The main concern of teachers in the pilot was to ensure that the lessons contained 'visible' progression, so that pupils could see or feel how their skills were developing. This 'teaching progression' is aimed at developing three characteristics:

- Clarity – pupils grasp what the skill is through developing a language to both describe it and understand its wider application.
- Confidence – pupils are encouraged by understanding that a skill developed in, for example, art has relevance and application in geography and science.
- Competence – practice brings a degree of automatic performance.

Thus after three lessons with the same focus and deliberate connections, pupils were giving feedback via their evaluations that they had learned something valuable. It was clear too that pupils benefited from working (where this was possible) as an unchanged class who acted as a community of learners, both developing norms and habits, and helping one another in some very deliberate ways. They pooled their brains.

## Level of response

In the pilot, less attention was given to individual learning progression in the early stages of implementing the programme. There are a number of reasons for this. Firstly, teachers need to concentrate on making the cycle lessons coherent and challenging. Secondly, it does take a number of lessons when one is innovating for a class to become comfortable and competent before individual performance becomes significant. Yet it was clear from the evidence collected that some pupils performed better than others. As a first step, the section **Identifying successful thinking** in the notes on each of the ten strategies gives some guidance on judging pupils' response to the task and ways of planning to improve their capability. (These sections draw on the SOLO taxonomy referred to in more detail in Appendix 2.)

In summary, aim for either an improved individual outcome or an improved group outcome. The significance of the latter is that what the members of a group may be able to do together this week, an individual from that group may be able to do next week, on their own. The process or skill has been internalised. This corresponds with the idea of the Zone of Proximal or Potential Development, or ZPD, proposed by influential Soviet educational researcher Vygotsky.

## Future developments

As experience of using 3-lesson cycles grows and schools begin to scale up the process across the key stage, the Strategy intends to publish further guidance in the form of case studies and other materials. Areas for further development and exemplification include:

- ways of ensuring systematic coverage and progression in teaching thinking skills at Key Stage 3;
- illustrations of progression, such as that based on the SOLO model referred to in Appendix 2.

Your LEA Leading in Learning consultant will contribute to and keep you in touch with these developments as they evolve.

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## Ten strategies to make links

Ten teaching strategies have been selected to:

- address the National Curriculum thinking skills, each strategy being suitable for developing one or more thinking skills (see matching chart on page 31);
- provide a variety of learning opportunities for pupils, with particular emphasis on collaborative group talk as a way of developing their thinking;
- give scope for teachers of different subjects to agree a common choice for 3-lesson cycles.

These teaching strategies have all been tried and tested in the classroom:

- 1 Advance organisers
- 2 Analogies
- 3 Audience and purpose
- 4 Classifying
- 5 Collective memory
- 6 Living graphs and fortune lines
- 7 Mysteries
- 8 Reading images
- 9 Relational diagrams
- 10 Summarising

Notes on the strategies are provided in the next section of the handbook. For each there is first a brief description, then some notes under these headings:

- 1 **Rationale** explains the wider relevance of the strategy to pupils' learning and gives some indication of how it helps span subjects and encourage transfer.
- 2 **National Curriculum thinking skills addressed** highlights components of the five thinking skills that the strategy is strong for developing and other components which can be addressed if the teacher creates opportunities.
- 3 **Planning to use the strategy** sets out factors to consider when planning to teach using the strategy, illustrated with brief subject examples to convey the idea (see below for further details on subject exemplification).
- 4 **An example from a 3-lesson cycle** uses a particular subject example to show how the objectives might prioritise a particular thinking skill and to illustrate how the strategy might be used during the group work phase of the lesson.
- 5 **Creating the right level of challenge** which explains, in general terms, how you can adapt the approach to meet different demands depending on ability or age of the group. It provides some basis, therefore, for planning progression.
- 6 **Identifying successful thinking** sets out, for one thinking skill considered, some tentative levels of response to help identify what pupils can and cannot



do and to inform planning to improve their capability and performance. Note that level of response is one component of pupil progression. (See pages 25 to 27 and Appendix 2, pages 117 to 120 for a more extensive discussion of progression.)

- 7 **Troubleshooting** describes common teaching difficulties encountered and gives suggestions for dealing with them.
- 8 **Metacognitive plenaries** gives examples of questions to ask and lines to pursue in getting pupils to 'unpack' what and how they have learned and what they might do with this learning. They provide a stimulus to help planning of questions appropriate to the context of the lesson. (For further details, including how the questions are classified, see pages 18 to 20.)
- 9 **Bridging scenarios** are stories, prompts, analogies and scenarios to encourage pupils to make connections, generalise and see a bigger picture. They are usually used at the beginning and the end of lessons.

To supplement the notes provided here, exemplification for particular subjects can be found on the DfES Key Stage 3 website

([www.standards.dfes.gov.uk/keystage3](http://www.standards.dfes.gov.uk/keystage3)). For each subject it includes:

- notes on National Curriculum thinking skills and the subject;
- subject examples for particular strategies;
- references to other sources of ideas.

As the Leading in Learning initiative gathers pace, LEA and other networks will be a further source of help and ideas.

## Identifying strategies suitable for teaching your chosen thinking skill

As schools embed 3-lesson cycles in schemes of work and the five thinking skills are addressed in a systematic way, use of the ten strategies will also become more systematic. This ensures that the strategy used is appropriate to the thinking skill being developed, that it can be matched to the context of each subject in the cycle and that, over time, pupils experience a wide range of different strategies. For all schools this is a developmental process and, in the earlier stages of implementing the Leading in Learning programme, there will be scope to try out different strategies. This section of the handbook provides guidance to assist that process.

On page 31 you will find a chart which sets out, for each of the five thinking skills, which of the ten teaching strategies are particularly suited. Two levels of suitability are indicated:

- thinking skills which the strategy is strong for developing (darker shading);
- thinking skills which can be developed if the teacher creates the opportunity (lighter shading).

The chart provides a useful way of narrowing down the range of strategies to consider when teaching a particular thinking skill. Teachers in the pilot found the chart to be a helpful starting point, but it should not become a strait-jacket. In

practice, there is considerable flexibility in what thinking skill a given strategy can be used to address. The way that you choose to manage the strategy and the plenary discussion has a significant influence on this.

Reference to the chart might indicate three or four strategies from which to choose. If you are at the stage of trying out one or two strategies within your own subject or department then the exemplification materials on the website provide guidance and suggest tasks related to particular teaching strategies. If you are involved in a 3-lesson cycle, the process of choosing a strategy is a collaborative enterprise with other departments and the following principles are offered to guide your decision making.

- Teachers of humanities subjects and English might allow colleagues in other subjects to steer the choice initially as they will probably find that they can use nearly all the strategies.
- If in doubt go with one of the simpler strategies in the first instance – ‘Classifying’ or ‘Summarising’.
- If one of your colleagues is more experienced in teaching thinking skills, then be guided by their experience and suggestions as to how the strategies might be adapted into other subjects.
- Accept that there will need to be some compromise and adjustment in planning to accommodate the use of one strategy in three departments – a bit of content might have to be taught out of sequence or adjusted slightly.

Remember that the Leading in Learning initiative is aimed at developing pupils’ insights into learning, which is sometimes not achieved if the focus is exclusively on subjects.

Strategies		National Curriculum thinking skills									
		Advance organisers	Analogies	Audience and purpose	Classifying	Collective memory	Living graphs and fortune lines	Mysteries	Reading images	Relational diagrams	Summarising
Information processing	locate and collect relevant information										
	sort and classify										
	sequence										
	compare and contrast										
	analyse part/whole relationships										
Reasoning	give reasons for opinions and actions										
	draw inferences and make deductions										
	explain what they think										
	make informed judgements and decisions										
Enquiry	ask relevant questions										
	pose and define problems										
	plan what to do and how to research										
	predict outcomes and anticipate consequences										
	test conclusions and improve ideas										
Creative thinking	generate and extend ideas										
	suggest hypotheses										
	apply imagination										
	look for alternative innovative outcomes										
Evaluation	evaluate information										
	judge the value of what they read, hear and do										
	develop criteria for judging the value of work or ideas										



# Advance organisers

*Advance organisers are devices used to enable pupils to orient themselves to a topic through what they already know. They are organisational frameworks that teachers present to pupils before teaching a topic to prepare them for what they are about to learn. It could be: a handout outlining what will be covered in the topic; concept map; spider diagram; flow chart; story or anecdote; or study guide. The chosen advance organiser should help pupils access what they already know about a topic and focus them on the new information.*

## 1. Rationale

In any new situation, the danger is that we are overwhelmed by new information and cannot see the wood for the trees. Research has shown that teachers can influence what pupils learn by helping them make connections between what they already know and what they need to know.

Advance organisers are one way to help pupils construct an appropriate mental representation by making the conceptual organisation and causal links more obvious. It is as if you are going somewhere new and you find out something about the place to help you orientate yourself when you arrive. In addition, advance organisers can provide a summary prior to starting a topic, help pupils plan how to approach a task and take the anxiety out of what is to come, especially for more holistic thinkers.

Advance organisers can be tools to help pupils become more independent learners but require careful construction and need to be coupled with the use of good questioning skills and cues to draw pupils' attention to the essential details and away from distractions.

## 2. National Curriculum thinking skills addressed

Advance organisers are strong for developing **Information processing**. The important aspects of this skill are comparing and contrasting, and analysing part/whole relationships.

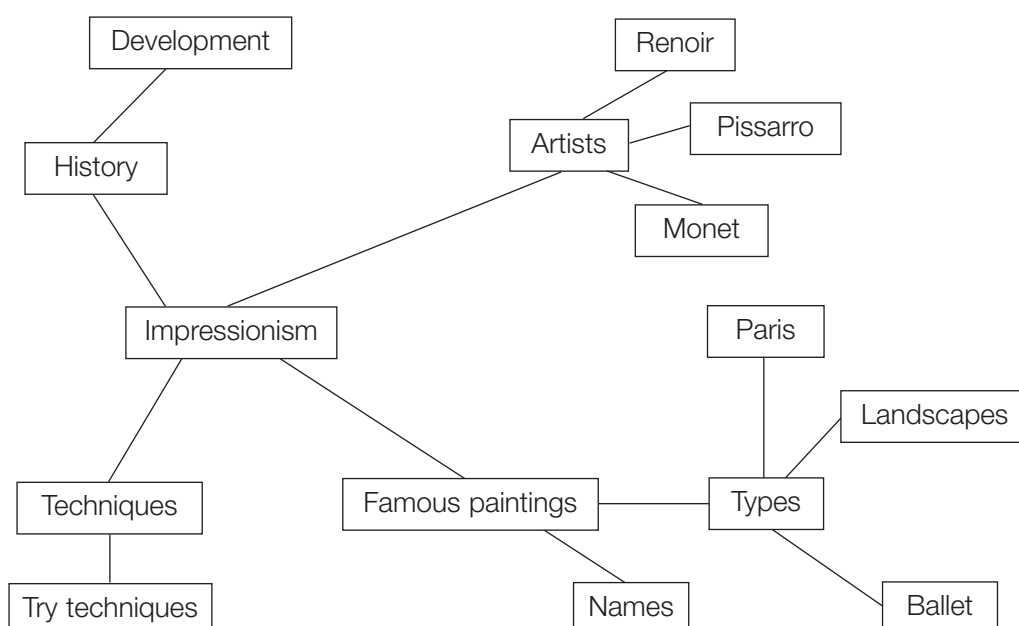
Other thinking skills which can be significantly addressed, where the teacher creates opportunities, include:

- **Reasoning**, where pupils are making inferences, deductions and informed decisions;
- **Enquiry**, where pupils are asking relevant questions and then planning what to do and research.

### 3. Planning to use the strategy

From the perspective of your subject you will need to consider:

- The knowledge or process(es) the pupils need to learn or understand based on an assessment of their present level of understanding.
- A clear rationale for the information you will include in the organiser and how you will help pupils link this to prior knowledge.
- The most appropriate format for the organiser, possibilities being:
  - **Summary** – consisting of descriptions of the new knowledge or process that pupils will be learning. It could be in the form of pictures, diagrams, notes or artefacts. *For example, a PE teacher plans to teach pupils to play baseball and wants to show an instructional video. However, she knows that many pupils have not seen a game and are not aware of the strategies and rules of the game. She provides them with an advance organiser consisting of a layout of the playing area and the basic rules.*
  - **Narrative** – a story or personal account to help pupils make personal or real connections with new content. *For example, a history teacher reads a passage from 'The Diary of Anne Frank' as an advance organiser for a topic on Persecution.*
  - **Skimming** – allows pupils to preview important information by focusing on headings, subheadings, highlighted information or other clues. *For example, an RE teacher gives pupils a photocopy of a magazine article on Eid and asks them to use a highlighter pen to pick out important headings, words or captions to gain a quick overview of the festival.*
  - **Graphic organisers** – a visual representation of what the pupils are going to learn, such as a table, chart, flow diagram, spider diagram. This format is useful if the information is unfamiliar to pupils or the relationships between the pieces of information are complex. *For example, a series of art lessons is going to make pupils familiar with Impressionism. The teacher presents pupils with the following graphic organiser.*



## 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Information processing**, an 'Advance organiser' is a suitable strategy to choose. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Information processing that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **MFL example** is for the second lesson in the cycle. In the first lesson pupils would have experienced using a skimming exercise to preview a new topic.

This lesson is based on the QCA Year 9 scheme of work Unit 15 'Une Visite' and MFL Framework objectives 9W2, '*Pupils should be taught to extend the range of connectives to support the understanding and composition of complex sentences and text*', and 9S6, '*Pupils should be taught how to understand and build extended sentences with clauses of different types*'. For this lesson the objectives are for pupils to:

- improve their information-processing skills by comparing and contrasting information and analysing whole and part relationships;
- explain, using examples, that the use of different connectives and adjectives can add to the interest and complexity of sentences and text.

The teacher would begin by asking pupils to recall the previous lesson where they had been developing their information-processing skills using the strategy of an advance organiser.

The pupils would begin the lesson by constructing a spider diagram to help them recall the work they had previously done on the use of simple connectives and adjectives. They would then be asked to discuss in pairs how these could make a piece of text more interesting.

The teacher would then remind the pupils that they were working towards a piece of writing about how French people spend their holidays. As an advance organiser for this the pupils would be presented with two pieces of information about the French and their preferred holidays – one written in very simple sentences with few adjectives and connectives and the other with more complex sentences. Pupils would be asked to compare and contrast the texts, identify the differences and discuss how they could make a text more interesting. Each group would record each main point on a sticky note. These notes would be collated and kept as the advance organiser for the remainder of the topic. Pupils could be reminded that a Venn (relational) diagram is a useful way of recording similarities and differences. Finally, the teacher would ask the pupils to annotate and extend their spider diagrams.



## 5. Creating the right level of challenge

To support lower-achieving pupils you might consider the following, for each of these types of organiser:


- Summary – give them an easy description and/or pictures or diagrams; ask them to highlight words or concepts that are not clear.
- Narrative – use a simple text.
- Skimming – model the procedure, making the selection explicit or use a scaffold, e.g. give the main headings and let pupils find key words.
- Graphic organiser – present a completed organiser to talk through, or highlight on it those areas that are less familiar than others.

To challenge higher-achieving pupils you can:

- Summary – ask them to annotate the advance organiser while watching a video or during discussion; invite them to devise questions for clarification or questions that they expect to be answered during the topic.
- Narrative – use more challenging texts in terms of vocabulary and use of metaphor; present different groups in the class with texts describing the same event but from different perspectives, e.g. *in a war* – each group produces an advance organiser and the two are compared and discussed.
- Skimming – put groups together to compare their skimming results and discuss why they picked the information they did.
- Graphic organiser – give pupils a partially completed or a blank organiser to complete.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Information processing**. They might also be used as part of assessment for learning to help pupils improve their own skills of information processing through peer- and self-assessment.

- 
- Pupils use the advance organiser ineffectively, e.g. skim the text but pull out irrelevant information.
  - Pupils can identify some parts of the organiser that are familiar but cannot make links between new and current knowledge.
  - Pupils can use the advance organiser to give an overview with some understanding of the detail – might ask questions for clarification.
  - Pupils are able to transform, rather than just transfer, information in the organiser and ask questions as they identify gaps in their understanding (reasoning skills coming into their own).
  - Pupils adapt the advance organiser to increase the effectiveness and usefulness of it as a thinking tool (creative thinking being used).

In progressing through these levels pupils are holistically improving their comparing and contrasting skills, analysing parts and wholes, making inferences and deductions, and improving their enquiry skills.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils come to this 'cold'.	Model the process and explain the thinking and usefulness of an advance organiser.
Pupils are not finding that the advance organiser is helping them to learn new content, i.e. they see the point of it but it doesn't help them.	Ensure that the purpose of the advance organiser is appropriate. Check that pupils are clear about how the advance organiser can support learning. Ask pupils to personalise the organiser with questions, annotations, etc., adding more detail linked to their preferred learning style.
Pupils do not understand the big ideas about the topic.	Assess the present level of knowledge in terms of specific language and conceptual understanding. Review topic content and how it will be taught. Prepare a preliminary teaching sequence.
Pupils have misconceptions about the big ideas of the topic.	Identify misconceptions and how they might have arisen. Present pupils with activities or information to challenge the misconception. Remember that some misconceptions may arise because they require a level of abstract thinking that some pupils have not yet reached.
Pupils do not see the point of an advance organiser.	Model the process and make explicit to pupils how this will help their learning. Make pupils aware of the differences between holistic and serialist thinkers.

## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to 'unpack' what and how they have learned and what they might do with this learning.

The following sequence of generic questions can be used to encourage pupils to be metacognitive about information processing. The pupil responses relate to the MFL example given above.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	'How did the advance organiser improve your learning in this topic?'	'I could see what I needed to do and what the differences were.'
<b>Reflective – specific</b>	'Do you think there is anything missing from the advance organiser?' 'What techniques did you use to help you skim a piece of writing?'	'Maybe we should have put other things in, not just connectives and adjectives.' 'We underlined some words like we did in the last lesson.'
<b>Reasoning</b>	'Why do you think an advance organiser is useful to have at the start of a topic?'	'It reminds you when you have done something similar in another topic and you feel more confident.'
<b>Challenge</b>	'Do you think we could have used a different advance organiser? Explain your answer.'	'Maybe – but this was a good way to make us look at what we are going to do instead of just being told.' 'We could see what was simple and how to make it more interesting.'
<b>Application</b>	'Advance organisers link what we already know with what we are going to learn. Do you think it is important to do this?' 'Which subjects or topics would you find advance organisers useful for?'	'Yes, it makes French writing more interesting and I could see that I already knew some things.' 'I think these would work for any topic really. But they would have to be different ones because subjects don't do the same thing.'

## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to process information and use advance organisers. They can be used either at the beginning or the end of lessons. Further examples in school could be:

- a school or examination timetable or a syllabus;
- an equipment list and diagram of a layout;
- glossaries that show the vocabulary to be used in a topic and which can provide an overview for pupils about what they are going to learn.

In everyday life, advance organisers could be found in:

- magazines that compare a number of similar appliances or objects against certain criteria in order to judge which is the best;
- self-assembly furniture packs where the diagram is a graphic organiser to enable you to put it together;
- a guide-book or map which you look at before going on holiday so that you know the layout of a place and/or some of the things you might expect to see, visit or experience;
- a very thick, new computer manual to give a useful overview of the main sections covered;
- a personal account by a refugee to help you understand more factual reporting of events in a war-torn country.



# Analogies

*An analogy, in this context, is being used to describe a teaching device that helps pupils understand an unfamiliar concept or process by comparing it with familiar objects or processes.*

*Analogies can be:*

- *Structural, e.g. the structure of the atom is like a solar system. These analogies support the way that something is described or explained so that pupils can understand it better.*
- *Functional, e.g. creating a piece of writing is like pegging washing on a washing line. These analogies help pupils to understand a process that they have to use.*

## 1. Rationale

Thinking and communicating through parallels is a natural process of human thought. It is so natural that if you eavesdrop on everyday conversations you will hear people saying 'It's like ...' or 'You know when ...'. They are using analogous situations to explain something, although there are often only superficial parallels with the actual concept.

An analogy is a teaching device that uses everyday, familiar contexts to bridge between the known and the unknown. If used well, analogies can support the process of reasoning by using parallel situations and giving pupils a mental framework in which to think.

Asking pupils to assess the usefulness of the analogy by explaining how it represents an unfamiliar context and where it falls down can further develop the thinking process. Different analogies may be needed to help clarify different aspects of a concept and pupils should be encouraged to look for their own analogies.

Metaphors are not explored here but they too can be used in a similar way to develop pupils' thinking. Creating and analysing them can help pupils explore ideas at a deeper level by making relationships and connections explicit. The key point is that we can help pupils to become better learners if they know what analogies and metaphors are, and that they are available to help one understand something or explain it to others.

## 2. National Curriculum thinking skills addressed

Analogies are very strong for developing a range of **Information-processing** skills. The important aspects of this skill are comparing and contrasting and analysing part/whole relationships.

Analogies are also strong for **Reasoning** skills where pupils are asked to explain why and how the analogy is useful.

Other thinking skills which can be significantly addressed, where the teacher creates opportunities, include:

- **Evaluation** where pupils are judging the appropriateness of their analogies using criteria developed by the pupils;
- **Creative thinking** where pupils are asked to generate and extend analogies by applying their imagination.

### 3. Planning to use the strategy

From a subject perspective, this strategy in particular may benefit from members of a department discussing how they explain difficult concepts or procedures and whether, without realising it, they already use analogies that can be shared. This process may throw up subject matter that would benefit from being approached through analogy. You will also want to consider:

- whether you are presenting one or more analogies to pupils in a lesson;
- pupils' present level of understanding of the concept they are using the analogy to explain.

A starting point for teaching through analogies is to give pupils some simple analogies, e.g. *the heart is like a pump*; *a telephone exchange is like the road system*, and to list, very deliberately, the features/structure and/or function of the known part of the analogy, which we will term the **source**. You can then point out those aspects that directly relate to the unknown, or **target**, part of the analogy.

The next step could be to consider whether the everyday context might need refining, e.g. *do we need to specify the type of pump (balloon, foot, electric, submersible)? Or find out more?*

Pupils can then think about the aspects that make it a good analogy, e.g. *a pump demonstrates pushing and compression*, and where it fails as a good analogy, or could indeed encourage misconceptions, e.g. *pump needs something/someone to work it but heart beats on its own; pump cannot work continuously as the heart does*.

Pupils can then decide if it is a 'good enough' analogy for the aspect of the concept that is being explored, e.g. *the analogy is acceptable if looking at simple heart function, however it is not helpful in terms of heart structure*.

Some very difficult subject matter can be explained through analogies and where it is thought that pupils do not even have a 'source' knowledge that can be used, there are two possible avenues to explore. The first is popular culture, especially television, where in *Neighbours*, *EastEnders*, *Emmerdale* and *Coronation Street* most human scenarios are played out. The second is to use simulations, where you get pupils to do or see something that acts as the source.

Finally, it is worth noting that many cartoons are generally analogous, and as such are a wonderful source in the humanities, English, science and drama and to a lesser extent in other subjects. The essential task is to get pupils to explain what the cartoon means in terms of the subject domain. Concept cartoons are a well-established procedure for supporting understanding in science.

## 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Reasoning** then the 'Analogies' strategy is a suitable choice. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Reasoning that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **science example** is for the second lesson in the cycle. In the first lesson pupils would have been introduced to the idea of an analogy and discussed ways in which the analogy did and didn't work.

This lesson is based on the Year 9 scheme of work objective, '*Pupils should learn a simple model of energy transfer from batteries to components in circuits*'. For this lesson the objectives are for pupils to:

- develop their Reasoning skills by using precise language to explain how and why an analogy helps their understanding;
- be able to explain how energy is transferred from the battery to the components in a circuit.

The teacher might begin by saying, '*In the geography lesson with Mr Smith you looked at how analogies can help you understand something that you can't actually see – the inside of the Earth. And then you considered where the analogy was really good at helping your understanding and where it didn't help very much*'.

In previous science lessons pupils have learned how current behaves in electrical circuits and how to measure voltage. For this lesson, pupils would be presented with different analogies used to associate energy transfer with voltage. For example:

- The 'almost Monopoly' or 'pocket money' analogy where pupils are given money that has to be spent around the circuit before they can return.
- The 'up and down' ski lift.
- The central heating system.
- The bicycle chain.
- Carrier model, e.g. lorries collecting and delivering gravel.
- A circle of string that is moved through pupils' hands.

Working in small groups, pupils would be asked to decide what each part of the analogy represents and then to discuss the advantages and limitations of the model in representing a physical circuit, current and energy. Pupils can significantly develop their reasoning skills by discussing the similarities and differences between the analogy and their understanding of what happens in a circuit.

Each group would be asked to decide which analogy they think is the best for explaining energy transfer and justify this to the rest of the class. Some groups may decide they can think of a better analogy which they can add to the list.



During the discussion, the teacher may become aware of misconceptions held by pupils that will need to be picked up in subsequent science lessons.

## 5. Creating the right level of challenge

To support lower-achieving pupils you might:


- check their existing knowledge of the everyday aspect before using the analogy and/or prepare a preliminary teaching sequence;
- describe some analogies used in different subjects in a simple context;
- model the process of identifying the limitations and usefulness of the analogy;
- ask them to state the links or relationship in a general way.

To challenge higher-achieving pupils you can:

- require them to assess the strengths and weaknesses of a number of analogies or their own analogy;
- ask them to create their own analogy and explain the thinking behind it;
- snowball groups together to discuss how the analogy is 'good enough' for the concept it is trying to make clearer;
- ask them to explain how the analogy could lead to some misunderstandings.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Reasoning**. They might also be used as part of assessment for learning to help pupils improve their own skills of reasoning through peer- and self-assessment.

- 
- Pupils identify features and functions in the source but cannot link them to the target so do not explain the analogy.
  - Pupils can identify one or two appropriate features or functions that simply explain the analogy.
  - Pupils can identify most of the appropriate features or functions in the source that explain the analogy and link them to the target but there is no overall linkage between them.
  - Pupils can explain the general pattern or relationship between the two parts of the analogy, e.g. a ski lift is like an electric current because....
  - Pupils can explain the analogy with detailed understanding and evaluate the strength, or value, of the analogy. They may offer their own analogy.

In progressing through these levels pupils are holistically improving their comparing and contrasting skills, developing their ability to explain how and why and using their imagination to generate and extend ideas.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils are not familiar with the analogy.	Check pupils' existing knowledge of the everyday aspect before using the analogy and/or prepare a preliminary teaching sequence.
Pupils are more confused by the use of an analogy.	It may be that the analogy is superfluous and does not add anything to the understanding. This can happen if the topic is fairly easy or it might be that the topic needs to be considered differently, the analogy is poor or it needs better planning for the lesson. Model the process of identifying the limitations and usefulness of the analogy.
Pupils focus on unhelpful aspects of the analogy.	Use an organiser to help structure the identification and comparison of aspects of the analogy. Model the thinking process of identifying and comparing features and functions.
Pupils cannot see the links between the analogy and the unfamiliar concept or process.	Firstly check that pupils are familiar with the everyday example being used – both features and functions. Use peers to explain the analogy to each other or why it is/is not a 'good enough' model.

## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to 'unpack' what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about reasoning. The pupil responses relate to the science example given above.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	'How did you identify the features and/or functions? Did you start with the features or functions or both together? Did you use a list or other way of organised working?'	'First we looked at which bit of the circuit was meant by each part of the analogy, like the bicycle chain representing the current. Then we discussed energy transfer and how well this analogy showed transfer.'
<b>Reflective – specific</b>	'Can you picture the familiar thing in your mind? Can you picture the unfamiliar thing any better? What can you see? Does this help you?'	'We weren't too sure about how a central heating system works so that wasn't helpful. It's hard to picture electricity because we can't see it. No-one knows what it looks like but the analogies sort of help you to understand it better.'

<b>Reasoning</b>	<p>'Which aspects of the analogy work the best and can you explain why?'</p> <p>'Which aspects of the analogy work least well or not at all and can you explain why?'</p> <p>'Could the analogy be developed or amended or is a new one needed?'</p> <p>'Did you go through each point in turn and decide whether it was applicable?'</p>	<p>'We thought the bicycle chain was best because there was no "stuff" moving as electricity isn't a real thing.'</p> <p>'The string model was good for resistance but it looked as though the wire was moving. If we used clear hose pipe with water running through it then the wire wouldn't need to move but it wouldn't show resistance and the water makes electricity look like stuff.'</p>
<b>Challenge</b>	<p>'Can you think of any audiences that the analogy will not be suitable for?'</p>	<p>'The carrier model would be really good for Year 7 but they wouldn't understand about central heating. I bet someone in Africa wouldn't know anything about ski lifts!'</p>
<b>Application</b>	<p>'Why do we need analogies? How do they help anybody?'</p>	<p>'Analogies put a picture in your mind and make unusual things more understandable.'</p>

## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to reason and use analogies. They can be used either at the beginning or the end of lessons.

Analogies are by definition bridging activities but you might like to:

- make the point that analogies are a common device in literature (books and stories). Ask someone to tell you the rough outline of the story of the hare and the tortoise and then ask someone what this is meant to tell people – so, along with other parables, it is a form of analogy;
- ask pupils to think about the analogies that have been used in different subjects during the last week or where they use or could use analogy to explain things in everyday life;
- encourage pupils to skim newspaper articles or magazines for written or picture analogies – point out that most cartoons are analogies. Clever people are often shown as 'eggheads' to communicate the power of their brains.

# Audience and purpose

*In life, we spend a lot of time either making things or constructing messages (communicating with people) – both can be regarded as products. These products are usually designed for a particular audience with a particular purpose, although these are not always clearly defined. This strategy enables pupils to give consideration to audience and purpose. The audience could be people of a particular age, from a particular region or with a common interest. The purpose could be to entertain, inform, explain, persuade, serve a practical need or a decorative function.*

## 1. Rationale

The success of a product is significantly determined by whether suitable components have been put together well to suit the purpose or need. This is equally true for a joiner building a bedroom cupboard, a young man doing his Christmas cards or a composer writing music for a film.

Many curriculum subjects aim to develop pupils' awareness of, and skill in addressing, what they are doing and why – the purpose of their efforts in school work. We assume that pupils develop this either automatically or pick it up from formal sessions on design or genres in writing. Very often they don't, nor do they see the connections between different subjects in this respect; for example, the connection between developing tactics in team games in PE, defining audience and purpose in writing and doing a piece of sculpture for a public space in art. Audience and purpose encourages pupils to think hard about why things are done and takes them into the realms of meeting a need or a demand rather than just doing or supplying something.

## 2. National Curriculum thinking skills addressed

Audience and purpose is strong for addressing the skill of **Evaluation**, where pupils can judge the value of information against criteria developed by them. It is also strong for all the **Reasoning** skills.

This strategy can address the full range of thinking skills. It is for the teacher to create opportunities within the planned development of pupils' thinking skills, including:

- **Enquiry** skills, where pupils are asking questions, posing problems, predicting outcomes, testing conclusions and improving ideas;
- **Creative thinking**, especially applying imagination and looking for alternative innovative outcomes;
- **Information processing**, when comparing and contrasting and analysing part/whole relationships.

### 3. Planning to use the strategy

An approach suitable for different subjects is to provide pupils with four to six 'products' or descriptions of products (the term 'product' is being used very broadly here). It is best illustrated with a detailed example, as follows.

In design and technology, pupils could be given a number of descriptions of 'meals to go' and a number of 'eating scenarios' and they are asked to match the meals with the scenarios.

Meal 1: Two jam sandwiches, a packet of crisps, a chocolate biscuit and piece of fruit in a 'Telly Tubby' lunch box.

Meal 2: A flask, a bottle of water, a plastic box with six ham sandwiches, two bars of chocolate and a packet of dried fruit in a rucksack.

Meal 3: A hamper with cold chicken, pasta salad, wholemeal rolls, butter, strawberries, cream, chocolate mints, champagne with two glasses, a knife, fork and spoon and a flask of coffee.

Meal 4: A box filled with chapatti and naan bread, samosas, dhal and chicken tikka.

Meal 5: Sunflower seeds in a clear plastic feeder to hang on a garden bush.

Meal 6: A cardboard cup of latte coffee and a chocolate croissant in a small paper carrier.

Meal scenarios:

*A: A mother and toddler joining a nursery group to celebrate Eid*

*B: A well-paid rail commuter going to work*

*C: A greenfinch looking for morning food*

*D: A 5-year-old child in Year 1 at school*

*E: A hill walker out for the day*

*F: A couple on a summer day out for their 25th wedding anniversary*

The task is not necessarily the main thinking episode although this part can be fairly demanding.

Following feedback, ask pupils how they decided which meal went with which scenario. They need to be given at least 10 minutes to do this well – it is a critical episode. Take feedback as a whole-class discussion and emphasise to pupils that it is important that they listen carefully to what is said as they will need this information for the next stage.

Based on the whole-class discussion each group should now identify those things (factors) which can be considered as criteria (explain this if necessary) for judging the success or failure of a particular meal for a particular purpose. Their list should contain some of the following, although they may be expressed in different terms:

- What the person likes or is likely to eat/like.
- A meal that meets the nutritional needs of the circumstances, in terms of amount of food, variety, whether or not the items complement each other, etc.

- A meal that is appropriate to the occasion (especially the anniversary).
- The immediate container (e.g. the plastic box for sandwiches, the foil containers).
- The overall packaging (e.g. the rucksack, the paper carrier, the seed feeder).

Other possibilities could be to ask pupils to rank the suitability of the meals for a chosen scenario, or to adapt the meals to suit a slightly different purpose.

As a variation, in a history example (commonly known as Making Wagons) the context is the American West, taking a wagon from Missouri to Oregon in the 1850s. The choices are a range of 50+ items that could be taken, from seed potatoes to a large dog, a spare water barrel and a block and tackle. The constraint is that each item is priced and there is a set budget.

## 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Evaluation** then 'Audience and purpose' is a suitable choice of strategy. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Evaluation that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **English example** is for the third lesson in the cycle. In the first two lessons pupils would have experienced similar but simpler activities.

This lesson is based on the Year 7 Framework objective, '*Pupils should identify how media texts are tailored to suit their audience*', where the following objectives might apply.

For pupils to:

- improve their skills of evaluation and develop criteria for evaluating a product;
- be able to deconstruct a text in order to identify how it is suited to its audience.

The teacher might begin by asking pupils to turn to their partner and discuss what they understand about writing and making products for an audience and a purpose. They impress on pupils that this lesson should use learning from the two previous lessons of the cycle.

Each group, of about three pupils, would be given four examples of texts from various magazines and other sources, chosen so that they had different audiences and different purposes. It might be appropriate that in one example either the audience or purpose is ambiguous in order to promote speculation. It might be valuable to include some 'poor' writing such as instructions or small print for a credit card. They would then be asked to match the text to cards bearing words which indicated a possible purpose of the text such as to inform, persuade or instruct. Since this is the third lesson in the cycle pupils would not be given cards

bearing matching audiences, but rather have to work these out for themselves. They would be asked to write on blank audience cards, the age, sex and interests of the audience that the text would suit.

Brief feedback would then be taken so that pupils could establish that they were thinking along the right lines.

Pupils would then deconstruct each text in detail. Each group would be given a sheet on which they would make notes of features of the text, such as the use of language, images and font. On the same sheet they would be expected to explain how these features suggested a particular audience and purpose.

Finally, the groups are asked to identify criteria for deciding whether the writing is successful, i.e. best suited to its purpose. Using ideas from the whole-class discussion they would now identify those factors which could be considered as criteria for judging the success, or failure, of their text. Some examples of criteria might be:

- reading level, e.g. vocabulary, sentence length
- appeal of content
- clarity of instructions
- human interest
- free gifts
- colour.

## 5. Creating the right level of challenge

To support lower-achieving pupils you might:


- model, by talking aloud, how you would write for a particular audience;
- give them examples of the same materials used for different audiences and ask them to compare the two and name the particular differences;
- make the audience and purpose very familiar;
- use prompts to encourage them to explain their thinking.

To challenge higher-achieving pupils you can:

- ask them to deduce the audience and purpose from a sample of text, diagram, picture or artefact (in the design and technology example give them the meals only and not the scenarios);
- show them television advertisements, which may be from other countries, with no sound, and ask them to suggest, and justify, the audience and purpose;
- make the audience and purpose less familiar;
- introduce constraints when making a choice or designing something.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Evaluation**. They might also be used as part of assessment for learning to help pupils improve their own skills of evaluation through peer- and self-assessment.

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- Pupils can suggest one or two criteria for evaluating how well a product or message suits its audience or purpose but cannot apply them appropriately.
  - Pupils can suggest one or two criteria and apply them to the products.
  - Pupils can suggest a variety of criteria and can apply them individually to the products. They struggle to reach a conclusion about the 'best' solution as they cannot reconcile conflicting criteria.
  - Pupils use a variety of criteria and can use them independently to come to a defensible position on which is the best or appropriate product or message.
  - Pupils can generate 'insightful' criteria that go beyond the obvious, can generate several 'best' solutions based on variations in purpose and can imagine contrasting scenarios.

Audience and purpose

In progressing through these levels pupils are holistically improving their skills of analysing part/whole relationships through asking questions, testing conclusions and improving ideas. As the tasks become more challenging they are required to apply imagination to creating products to suit audiences, looking for alternative solutions and evaluating.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils are too terse in their answers and don't give enough detail.	Use small prompts to encourage them to explain their reasoning fully, e.g. 'Why did you decide to include that and why is it suitable?'
Pupils cannot picture or comprehend some contexts and so cannot generate detailed reasons.	Try asking them to close their eyes and picture a scene related to the context or use photographs or other media.
Pupils do not think of the coherence of the individual items in making a 'whole'.	Prompt groups by asking 'If you take or include X do you really need Y?' or 'If you include A, how will that help your audience?'.
Pupils do not know enough about the context to make good choices.	If they know virtually nothing then do some ground work with them, e.g. using photographs. If they know a bit, don't worry as their thinking will reveal misconceptions which you or others can correct. The process can also be the start of a small enquiry – 'What is this place/context like?'.



## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to ‘unpack’ what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about evaluation. The pupil responses relate to the English example given above.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	‘How did you decide what to include for this audience?’	‘I thought about what my brother would like because he is a footballer.’
<b>Reasoning</b>	‘Why do we use different criteria at different times?’	‘If it’s a different audience you need different criteria.’
<b>Challenge</b>	‘What is a criterion? Why do we need criteria?’	‘It is like a standard you have to meet – like you have to be above a certain height to go on a fairground ride.’ ‘If you didn’t have criteria, you would not be able to say whether a book was good or bad.’
<b>Application</b>	‘Do you always need to think about criteria when writing, making or designing?’ ‘Are some criteria more important than others?’	‘It’s no good if you don’t think about what the readers like. They won’t read it. Or in technology they won’t buy what you’ve made.’ ‘Sometimes I write just to please myself!’

## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to being able to judge the value of information and consider audience and purpose. They can be used either at the beginning or the end of lessons. Further examples in school could be:

- making a presentation;
- asking teachers who the audience is for a piece of writing, diagram or text;
- inventing or designing something for a particular purpose, e.g. a ball game for disabled pupils.

Audience and purpose in everyday life:

- Ask who sends Christmas cards or cards for other festivals or events. If you send cards to, for example, friends, boy/girl friends, grandparents, uncles and aunts, pen friends/cousins, do you write the same thing in each card?

- Ask what stories/books pupils liked when they were little. Do they still read them? What do they read now? What do their parents read? (All different audiences/markets.)
- Ask what television programmes are on early in the morning (cartoons and news), late morning/afternoon (old films, magazine programmes, audience participation, speciality programmes), evening (soaps, reality TV, popular drama, comedy, news and current affairs) and late at night (films, documentaries, imports, adult programmes) and then ask why. You might also ask about what type of programmes appear on different channels – so it is all about audience and purpose.
- Ask about the advertisements which are screened in between such programmes – these show that the companies who are advertising think that the audience of this programme is also the audience for their product.
- Show a few job advertisements and highlight the criteria for applicants. Draw attention to ‘essential’ and ‘desirable’ terms and compare to the pupils’ discussion about relative importance of different criteria.
- Consider setting up a website. Should you have a particular audience and purpose in mind? What would happen if you tried to be all things to all people?
- You are going abroad for a month to a hot country with primitive resources. Your baggage allowance is only 15 kg, so how will you decide what to take?



# Classifying

*Classifying is a thinking skill we use naturally to organise information and ideas. It is a vital skill for processing information and for the ability to use and apply information in new ways. A common way of setting up a classification task is by means of a card sort, although it can also be carried out using objects rather than cards. Pupils work together to sort these into groups that have shared characteristics, which establish criteria for a classification group. Having to consider and justify their criteria helps them to develop their skills and understanding.*

## 1. Rationale

Classifying develops pupils' ability to identify common features, improves their ability to handle and interpret information and enables them to retrieve information from their long-term memories more easily. Consider the way we might store food and equipment in our kitchen cupboards. For many this will be achieved using a system of categories and subcategories. This enables the well-organised to quickly retrieve what they need because they know where things should be.

Human thought processes are fundamentally inductive, that is, working from specific observations to broader generalisations and theories. In an inductive approach to learning, pupils collect and sift information, then examine it critically. They construct categories and test them. Through this process they have the opportunity to develop their own concepts. When pupils develop concepts and ideas for themselves they are likely to be more meaningful and therefore understood and remembered, because they have mentally 'constructed' them.

In the classroom, the aim of the classification strategy is not that pupils should rediscover everything for themselves. Rather, it is that teachers should tap the inductive thought processes, as a means of helping their pupils to gain insight into the principles and structures of the subject for themselves.

## 2. National Curriculum thinking skills addressed

Classification, as presented here, is strong for developing the full range of **Information-processing** skills, namely sorting, classifying and sequencing, comparing and contrasting and analysing part/whole relationships.

Other thinking skills which can be significantly addressed, where the teacher creates opportunities, include:

- **Reasoning** skills, where pupils are required to justify their categories, thus explaining their decisions based on inferences and deductions;
- **Evaluation**, where pupils are encouraged to judge the quality of their classification criteria when compared to those of other groups of pupils;
- **Enquiry** skills, especially asking questions, may be developed if the classifying process is used as the starting point for testing the ideas and categories produced.

### 3. Planning to use the strategy

If you are using a set of cards then, depending on the subject and the topic, they may contain words, short pieces of text, pictures or diagrams. Pupils work together to sort these into groups that have shared characteristics. In group work and in subsequent whole-class discussion, it is important that pupils should:

- justify their decisions;
- explain their thinking to others.

The lesson is likely to begin with pupils making a free choice of characteristics and may develop, through teacher intervention, towards reclassification addressing more challenging subject-specific criteria.

From a subject perspective, you need to consider:

- thinking carefully about what categories make good sense and are challenging, but you have to be **very careful** that you do not just impose your categories on pupils. A small number of categories works best, perhaps between three and six;
- devising a set of cards, some of which will provoke debate. Keep the number manageable, say between 15 and 25;
- initially allowing pupils to group cards according to their own criteria;
- composing questions that will prompt pupils to think hard about their categories, listen to others and share good ideas or, when appropriate, move towards the criteria you want them to consider.

Examples of classification tasks are:

- In English, categorising a set of non-fiction texts under different text types.
- In PE, putting different games into categories, e.g. football is an invasion game, badminton is a net/wall game, cricket is a striking game, etc.

### 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Information processing** then the 'Classifying' strategy is a suitable choice. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Information processing that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **geography example** is for the third lesson in the cycle. In the first two lessons pupils would have experienced simpler classification activities.

The lesson is based on an objective from the Year 7 QCA scheme of work Unit 4 'Flood disaster – how do people cope?', which states that '*Pupils should learn how different individuals and organisations in the UK respond to a flooding hazard over different timescales*'. For this lesson the objectives are for pupils to:

- improve their information-processing skills, particularly in classifying and sequencing;
- understand how individuals and organisations might play different roles during a flooding event.

The teacher might begin by saying, *'Remember the classifications you did before in the first two lessons of the cycle. Today we're going to look at another one which is slightly more complicated, so our geography objective today is for you to understand how different individuals and organisations might play a role during a flooding event. Who can tell me what our thinking skills objective is?'*

Police forces	Universities	Borough Council
Decorators	Defra and the Welsh Office	County Council
Ambulance service	Army and air force	Environment Agency
Hire companies	Insurance companies	House owners
The Meteorological Office	Electricians	Fire and rescue service
St John Ambulance	Samaritans	Building companies
Citizens Advice Bureau	Regional Water Board	Electricity suppliers
Plumbers	Plasterers	Neighbours
Local radio and newspapers	Women's Royal Voluntary Service	National television, radio and newspapers

Classifying

Pupils would be asked to read the cards and then ask questions to clarify their understanding of the roles and responsibilities of the individuals and organisations with regard to flooding events in the UK. Pupils would then begin to form their own groups of cards. Whole-class discussion can be used to help challenge ideas and share good thinking. In this example the following criteria are very powerful in helping pupils understand the human response to floods:

- the type of role the organisation might play, for example warning, prevention, planning or support;
- when they might respond to flood hazards, i.e. before, during or after.

If pupils readily recognise the sequence in which organisations might respond, but fail to acknowledge their different types of role, then possible interventions would include teacher questioning, whole-class interactive plenaries, pupils visiting other groups, or the introduction of a matrix or grid onto which cards can be placed.

## 5. Creating the right level of challenge

To support lower-achieving pupils you might:


- play 'Odd One Out' with a small set of cards before the classifying activity, to enable pupils to begin to formulate criteria;
- give some or all of the criteria;
- start with a small number of cards or artefacts;
- model how to classify for pupils in the introduction to the lesson, perhaps with photographs or props to support understanding.

To challenge higher-achieving pupils you can:

- require them to identify different ways to classify, for example:
  - cause, effect, solution;
  - advantages, disadvantages or neither;
- snowball groups together to explain their categories to each other, so that there is an opportunity for cross-fertilisation of ideas;
- ask groups to create headings for their categories – a phrase or just a word. (This is often a neglected aspect of classifying and is important in developing new concepts.);
- develop a two-way classification, for example using a grid;
- use the Wise Words activity described in the mathematics materials *Securing progression in handling data*, DfES 0658-2003 G. In this game, pairs of pupils describe one of a set of given cards using two or three characteristics; another pair must determine which card is being described. They can ask one yes/no question;
- ask pupils to design a set of cards of their own.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Information processing**. They might also be used as part of assessment for learning to help pupils improve their own skills through peer- and self-assessment.

- 
- Pupils can put some cards together without being able to identify clearly the shared characteristic.
  - Pupils can form one or two categories based on more concrete or surface characteristics.
  - Pupils can classify most cards into groups based on concrete or visible characteristics.
  - Pupils can classify most cards into groups and can see overlap or alternative categories. They begin to use more abstract or less visible characteristics.
  - Pupils use abstract concepts or develop abstract concepts to inform a classification/categories, which are reflected in their headings. They can critically assess and improve classification headings.

In progressing through these levels, pupils are holistically improving their sequencing, sorting and classifying skills, analysing parts and wholes, making inferences and deductions, improving their explaining and evaluation skills. If the data is suitable pupils may also develop categories based on causal links – their explanations may take the form of ‘this leads to this leads to this’.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Allowing pupils a completely free choice of criteria results in outcomes you cannot always predict. This means it is difficult to plan the flow of the lesson.	Do not worry. Keep the ethos of the task open and encourage pupils to support their creative solutions with full explanations. The rest of the class help provide a reality check for ‘whacky’ thinking.
Predetermined criteria are tempting as they lead to an end point in terms of subject content. This could mean that pupils do not get the chance to think about the nature of characteristics and their importance in classification.	This is a valid concern. It is important that pupils have some experience of executing, discussing and explaining at least one ‘sort’ of their own. This could take place in the first episode of the lesson.
Pupils are able to perform a sort but are unable to explain it.	When pupils are on the edge of their understanding they can often do things but not explain them. Allow pupils to demonstrate their categories and encourage other pupils to ask simple questions which will illuminate the process.
Pupils are inconsistent decision makers and do not execute the sort accurately.	Slow them down and suggest that they justify each step to their partners, checking for agreement before positioning. Emphasise that the group is responsible for the final sort and each member should be able to explain the position of an item.
Pupils’ sorting shows some really important misunderstandings in the way they interpret the cards.	In terms of subject content this can be one of the most important outcomes of this strategy. If possible, discuss these as they arise and encourage pupils to support one another with explanations. It may be necessary to note down some points to be reviewed in another lesson.
Pupils cannot see the point of the exercise and want to get on with some ‘real work’.	Pupils should be made aware of the way their learning is being developed and need to understand that this happens in a variety of ways. The world of work needs flexible thinkers. It might be helpful to call on the notes for bridging if this emerges as a strong point during the lesson.



## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to ‘unpack’ what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about classification. Pupil responses relate to the geography example given above.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	‘How did you choose your criteria for sorting?’	‘First we spotted that some of the organisations and people would help out during the flood and others, like the decorators, would be important afterwards. So then we thought maybe some would be important before the flood happened.’
<b>Reflective – specific</b>	‘Which card was particularly difficult to place? What tip would you give to someone who was struggling to classify that card?’	‘We found the “Environment Agency” tricky because we couldn’t agree which group to put it in – sometimes you don’t know enough about something so you need to know more. If you can’t classify a card you can try writing headings for the groups then test the card against each heading.’
<b>Reasoning</b>	‘Can you show me a set of three linked cards where you can easily explain the connection... and why?’	‘We grouped “Ambulance”, “Army and air force” and “Fire and rescue” quickly because they’re all emergency services who would help during the flood.’
<b>Reasoning</b>	‘Which set of cards do you think are linked but the connection is hard to explain... and why?’	‘We thought “Borough council”, “County council” and “Defra” probably went together but we weren’t sure what they do, so couldn’t come up with a heading for the group.’
<b>Challenge question</b>	‘Do you think this group of cards has a connection? “Women’s Royal Voluntary Service”, “Samaritans”, “St John Ambulance”. What is the connection and why?’	‘Is it that they all help people afterwards...? (teacher prompts for further information) ... and they’re all voluntary?’

<b>Application question</b>	<p>'Why is classifying important?'</p> <p>'When does classifying become stereotyping?' (might need defining)</p>	<p>First pupil – 'We couldn't use the Yellow Pages if we couldn't classify...'</p> <p>Second pupil – 'Yes, and we couldn't write in paragraphs if we couldn't group similar ideas together, could we?'</p>
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## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to classify information. They can be used at either the beginning or the end of lessons. The ability to classify is essential in:

- setting up files on the computer;
- understanding the school library classification system or the classification in a music store;
- breaking down revision under headings;
- using an index.

In everyday life we need to be able to classify, for example:

- You are in a supermarket. You look up at the notices suspended from the ceiling that label the aisles. What kind of thing do they say? What would you find in an aisle marked 'Household'? Where would you find cling film?
- You decide that you would like to study medicine. Your careers adviser asks you which area you might like to specialise in – what could you choose from? Why is there a category called 'general medicine'?
- You are planning a surprise celebration for your brother's 18th birthday. There will be a small party at home in the afternoon and a meal later in a good restaurant followed by a private disco booked in the local nightclub. You begin to list people and decide that you need to classify them so that you know which event to invite them to. How would you do this?
- Classification is about headings and categories – without them we would be lost in a sea of individual things, facts and perceptions....



# Collective memory

*In this strategy pupils work in small teams to recreate a map, picture, diagram, photograph, advertisement, poem, sheet of music or other item that has some obvious physical structure. Each team sends one member at a time to look at the image for 10 seconds. They return to their group and start to reproduce the original. After a short period of time, the next representative from the group looks at the map for 10 seconds. After each turn, groups reflect and plan the next visit. After a few turns each, pupils are asked to compare their versions with the original.*

## 1. Rationale

Some people will know this strategy as 'Maps from memory' as it was first developed in the context of geography, but it has much wider significance. This strategy helps pupils to process and 'decode' visual information from representations that are important to subject learning. It is a lively way of encouraging them to look carefully at the component parts of images and to devise strategies to help commit them to memory. As a result they make connections with knowledge they already have about the subject matter and ultimately develop an understanding of the image as a whole. This brings out the difference between looking and really seeing. Like the 'Reading images' strategy it promotes visual literacy.

Above all, this strategy requires pupils of whatever ability to do a task that is complex, and unless they plan and do it together they will fail. In this collaborative process they have to be metacognitive, that is, they have to talk about their thinking.

## 2. National Curriculum thinking skills addressed

A key thinking skill supported and developed using this strategy is **Information processing**, specifically where the information to be transferred is visual in nature. It focuses sharply on locating and collecting relevant information and this requires the analysis of part/whole relationships. This strategy is equally strong for **Evaluation** skills as pupils judge the value of their own and others' work or ideas in order to improve the strategies they use to process the information and hence recreate the image. Other thinking skills, which can be significantly addressed where the teacher creates opportunities, include:

- **Reasoning** skills, as pupils need to make informed judgements and decisions and can be required to give reasons for their actions and explain what they think;
- **Enquiry** skills, notably planning and testing ideas to improve them.

## 3. Planning to use the strategy

Pupils usually really enjoy this strategy because of the competitive element, but it requires planning, thought and debriefing skills from teachers to maximise the learning outcomes. If you are concerned about pupils becoming overexcited then the image can be shown on an OHT or interactive whiteboard.

Choose an A4 sheet that presents information in a way that has some obvious physical structure and has some importance to the topic: a diagram, poem or other text with obvious structure, a piece of sheet music, an advertisement or annotated photograph, or a map. If you are making up a sheet of your own, the judicious use of colour can often help pupils to link information and talk about its location on the page. There are suitable examples in many subjects: a website map (ICT), a control flow chart (design and technology), the digestive system or the rock cycle (science), a set of interconnected mathematical statements such as an equation, a table and a graph (mathematics).

Arrange pupils in groups of three or four and tell them that they are going to have to reproduce, as accurately as possible, something that you have covered up at the front of the classroom. Taking individual turns they are only going to see it three times each and for 10 seconds each time. They can have 2 minutes before the first go to plan their general strategy and what the first person will do. After each turn give pupils time (1 or 2 minutes – a timer is useful) to record their findings and plan the next visit. Encourage them to cooperate and support one another. It is a good idea to have a recording sheet where pupils can note their general strategy, what each person is meant to do and perhaps what they do manage to achieve. Such a sheet also provides valuable diagnostic assessment information.

#### 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Information processing** then 'Collective memory' is a suitable strategy to choose. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Information processing that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **design and technology example** is for the second lesson in the cycle. In the first lesson, French, pupils experienced a collective memory activity to help them work out the meaning of French words. The lesson described below could be a starting point for the delivery of the 'LEGO® production line' lesson contained in Module 4 of the Foundation subjects: *design and technology, Framework and training materials* (DfES 0971-2004 G).

This lesson is based on the QCA Year 7 scheme of work Unit 7B (ii) 'Designing and making for yourself, focus: resistant materials' and focuses on the design and technology Framework planning objectives, '*Pupils should be taught to predict and manage the time needed to complete a short task*' and '*Pupils should be taught to prepare an ordered sequence for managing the task*'. For this lesson the objectives are for pupils to:

- evaluate group and individual processes used in recreating the instructions for using a construction kit;
- analyse how the components of a LEGO® construction kit fit together to make a completed model.

The teacher might begin the lesson by saying, *'Remember the collective memory activity you did in French last week? Turn to your partner and discuss the strategies you used in that activity that were helpful... Today you're going to develop those strategies by analysing how the components of a construction kit fit together. You will be developing your evaluation skills further when we discuss our strategies and consider which ones are effective'.*

Pupils would be arranged in groups of three, seated so that they are able to work collaboratively. Each group would have a sheet of A3 plain paper, pencils and coloured pencils. The two images showing the sequence of construction for the LEGO® aeroplane (see pages 69 and 70) would be on a table, covered up, at the front of the class. The teacher invites someone to remind the class how the task should be done. Once the groups have completed their turns they should display their reproduced image so that all pupils can see the outcomes of the activity before moving into the plenary.

## 5. Creating the right level of challenge

To support lower-achieving pupils you might:


- choose an image that has a very simple structure and limited detail;
- provide a sheet that scaffolds their first visits by instructing them to find the main lines and get an idea about the overall nature of the image;
- create groups so that pupils with strong visual memories (if you know) are distributed between groups.

To challenge higher-achieving pupils you can:

- speed up the 'rounds' after a few visits so they get no 'planning pause' and have to plan three or four visits in advance. This puts them under real pressure and leads to interesting learning outcomes. It tends to emphasise the value of checking and monitoring work continually.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Evaluation**. They might also be used as part of assessment for learning to help pupils improve their own skills of evaluation through peer- and self-assessment.

- 
- Pupils can identify one or two strategies that they used, but cannot judge whether or how well they worked. They have no sense of criteria for evaluating their performance.
  - Pupils can identify one or two strategies and make valid comments on how well they worked or how they could improve. They evaluate and use criteria.
  - Pupils can identify several strategies that they used and make comments on their worth or effectiveness. However, the strategies are not connected and don't constitute a plan. They might mention changing strategies.
  - Pupils can link their strategies together to present it as a plan – 'First we did this, then....'. They have a rationale for their plan. They are aware of



how they might have changed their plan and can give reasons. They use some prior knowledge.

- Pupils link their strategies in a plan that may have evolved and which they can explain. They are more aware of how they worked as a group. They use prior knowledge to help interpret the image and to predict features of the image. They may also predict how the strategy might have to change in other circumstances.

In progressing through these levels pupils are holistically improving a range of thinking skills. For example, in developing better strategies they will be showing greater creativity, and in explaining what strategies they have used and whether they worked they are developing reasoning.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils don't cooperate. This might happen with some low-achieving pupils who are inclined to bicker or, occasionally, high-achieving pupils who like to work alone.	Stress the importance of being able to cooperate in groups for work or play – two (or three) heads are better than one. Emphasise the importance of the time available to plan and review between visits and perhaps showcase the efforts of a group who have used this well.
Older able pupils, perhaps, not taking it seriously as it does not look like 'work'.	Launch the strategy in such a way as to convey its value – making sense of tables, diagrams and maps in exams without spending too long on them or driving in an unfamiliar place by absorbing a map without having to stop every 30 seconds. The strategy is very much about the ability to develop strategies to make sense of visual representations quickly.
Pupils begin to lose concentration.	Can be caused by the visits being slow. Always try to maintain a brisk pace and keep pupils under pressure.
The classroom looks chaotic.	Learning is not always achieved in ordered conditions and although there is some hubbub pupils are usually very 'on-task'.
There is a lack of certainty about what has been learned.	Clarifying learning is dependent on a good plenary, which is absolutely essential with this strategy. Watch the Knottingley section of the Plenaries module in the <i>Training materials for the foundation subjects</i> (DfES 0351/2002), a lesson where this strategy has been used.

## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to ‘unpack’ what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about evaluation. The pupil responses relate to the design and technology example given above.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	‘How did you do the task?’ (The most important question. Give pupils a few minutes to discuss in groups before reporting back.)	‘We decided to split up the picture into three, so that we had a bit each.’  ‘Because you told us the image was very challenging we sent our best drawer first. He gave us an idea of what the whole thing looked like.’
<b>Reflective – group work</b>	‘How did you work together?’	‘We didn’t really know what to do at first and were worried about the short amount of time. Then someone took charge and gave us instructions.’
<b>Reflective – specific</b>	‘What did the first person do – was this different from the second two people?’	‘We asked our first person to have a really good look at all the image, so we knew what we were up against.’  ‘Once we knew what it looked like we gave people things to look at. I was in charge of getting the colours right.’
<b>Reflective – general</b>	‘Did your original plan work or did you have to change it?’	‘We didn’t expect the picture to be as hard as it was, so splitting it up didn’t work. The others had lots of detail in their bits and I had hardly any.’
<b>Reflective – specific</b>	‘What was hard about the 10 seconds?’	‘I felt really nervous and under pressure from my team. I can’t remember a lot in my head, so I looked really hard at just three things and kept repeating them in my head so I wouldn’t forget.’
<b>Application</b>	‘Think about other things we’ve done in (subject). Where else might this have helped you to learn better?’	‘I’d have been able to plan my pizza production line a lot better if we’d used this strategy first. I didn’t review my plan and ran out of time.’

Collective memory



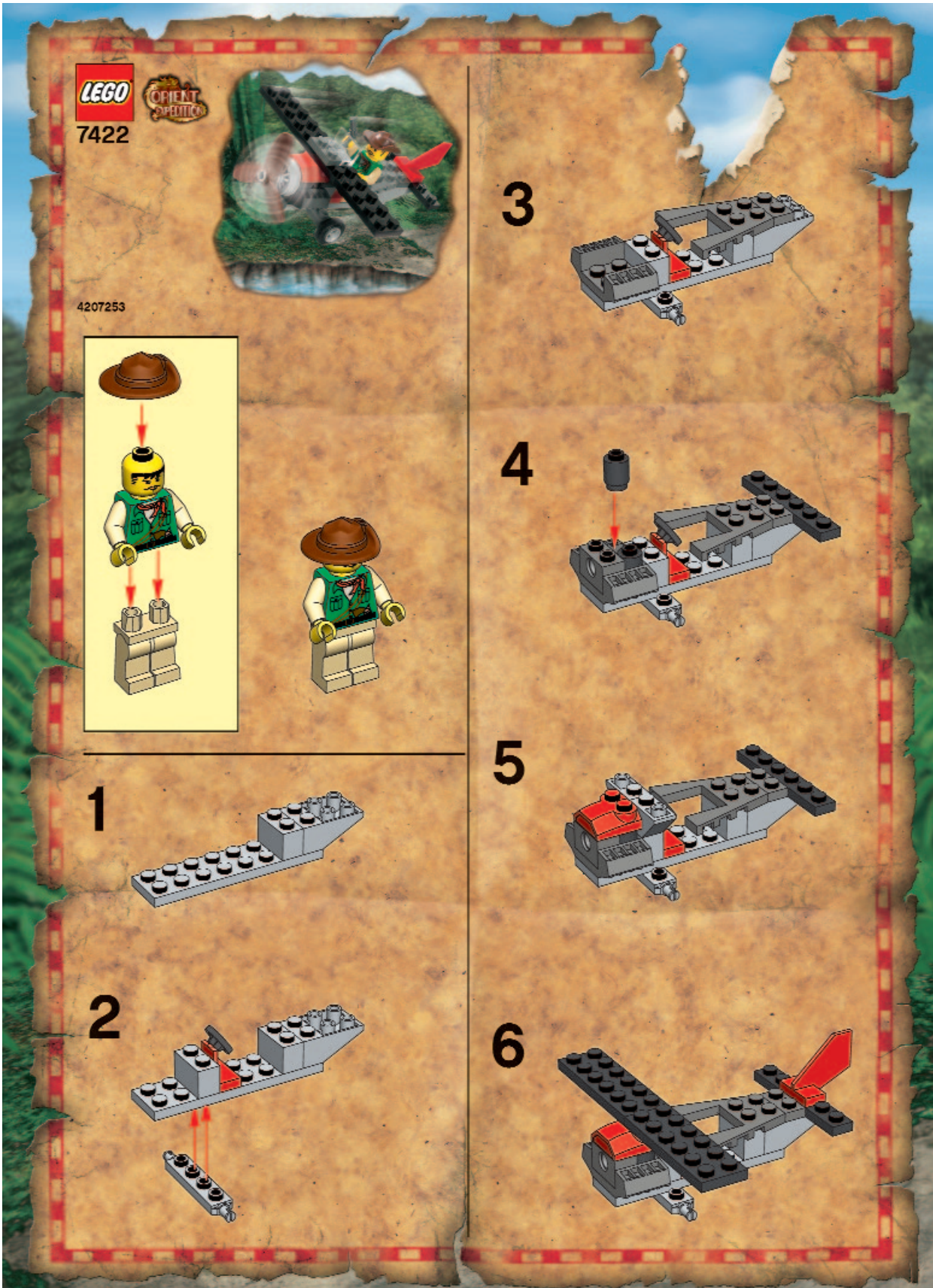
## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to evaluate different strategies and to use the strategies developed in collective memory tasks. They can be used either at the beginning or the end of lessons. Further examples in school could be where you have to analyse and learn visual representations.

- You can do better in examinations (in geography, history, science, RE or PE, for example) if you can remember and reproduce diagrams, sketches and maps.
- In mathematics it could help you sort out how the conventions for marking up parts of a diagram in geometry help to establish a shared understanding of the properties described, or how the graphs of a number of functions are related by transformations.
- It is often useful to get the general shape of something before you worry about the detail. (Have some examples of images to flash up or go through to practise this skill very rapidly.)

Some everyday life examples are:

- Getting a quick overview of a map when you are moving around, so that you do not have to keep going back to it.
- A good analogy is any substantial task which, done well, requires attention to the whole (big picture – what I am trying to do) and the detail (how this is achieved in stages or parts) and to constantly move between the overview and the detail. One helps inform the other. The main lines help locate the detail and the detail helps build up a richer understanding of what the whole is about, which helps overall interpretation. Can pupils suggest some examples?
- Another good analogy is a jigsaw. Doing a jigsaw requires that you have an idea of what the whole picture looks like, so you look at the box top, and that you look at the minute detail of each piece to see where it might fit in. Further you tend to start in the places that are easiest and have the most clues to guide you. The more you do the easier the task becomes but you need to keep checking that you have done it right and what the whole picture looks like.



Collective  
memory

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# Living graphs and fortune lines

*Living graphs and fortune lines are strategies that relate to graphical representation. Both strategies require pupils to consider how one variable relates to another, such as the heart rate of a football player over the period of a match or the mood of Hamlet during different episodes of the play.*

*In ‘Living graphs’ a line graph is presented, together with a set of related statements. Pupils have to position the statements on the graph and give reasons to justify their decisions.*

*In ‘Fortune lines’ pupils are asked to suggest a scale and then to plot the fortunes or emotions of one or more individuals over a sequence of episodes in time, and then to justify their decisions.*

## 1. Rationale

These strategies move pupils beyond the world of plotting points and reading off values. ‘Living graphs’ support the active construction of real-world meaning from line graphs. Pupils are encouraged to suggest hypotheses and to give reasons for opinions or deductions based on what they think the graphs indicate. The strategy makes pupils think, talk and ask questions. It raises their awareness that a variety of answers is sometimes possible. It reinforces the importance of explanation and reasoning and encourages pupils to think beyond what appears on the page.

‘Fortune lines’ start with a narrative and use the plotting of points as a route to exploration of meaning. Gradations of phenomena such as emotion or power are easier to explore through a graph than by words, which really facilitates discussion over differences in interpretation – pupils engage with the heady mix that is the events and emotions of real or fictional lives.

The key difference between the strategies is the point at which the thinking or interpretation takes place. With living graphs, interpretation occurs primarily when the pupils track back the representation of the two variables plotted on the graph to their wider context. With fortune lines, pupils interpret what it means to experience certain events and this interpretation then shapes the fortune line as they record how an individual feels on a time axis.

## 2. National Curriculum thinking skills addressed

Living graphs and fortune lines develop **Information-processing** skills such as sequencing and are excellent for developing all aspects of **Reasoning**, because pupils’ ideas have to be articulated.

Teacher questioning can also encourage:

- **Creative thinking.** Pupils have to apply imagination to generate ideas and suggest hypotheses to link ideas together – they really encourage pupils to think laterally.
- **Evaluation** skills. Pupils judge their own and others’ ideas.

Both sets of skills are mutually supportive and underpin effective practice.

### 3. Planning to use the strategy

**Living graphs** – Pupils are given a pre-printed graph or draw one of their own. In previous lessons they should have studied relevant subject content – there are many examples in the curriculum, and not only in mathematics and science. They are then asked to place a number of statements (printed on card or strips of paper) relating to events or things people might have said, related to the context of the graph. Statements can be generated by thinking about the causes and effects of the phenomena plotted on the graph.

Model the process with one of the statement cards to convey that a variety of positions on the graph are possible and to give pupils confidence. Ensure that the justification for positioning is clear. Pupils have to decide where the statement would be best positioned from the information they have been given and justify their reasoning to the group.

**Fortune lines** – Pupils are invited to chart an individual's (real or fictitious) fortune or emotions over a period of time. The strategy encourages pupils to consider how people really feel during the unfolding of events and interactions. This strategy can be applied equally to a scene in Hamlet or to the story of Little Red Riding Hood. Ask the class to suggest a scale of emotions appropriate to the context (e.g. happy–sad, but numbers are not needed). The extremes or gradations are then written on the vertical axis. The events or numbers for episodes are then written along the horizontal axis.

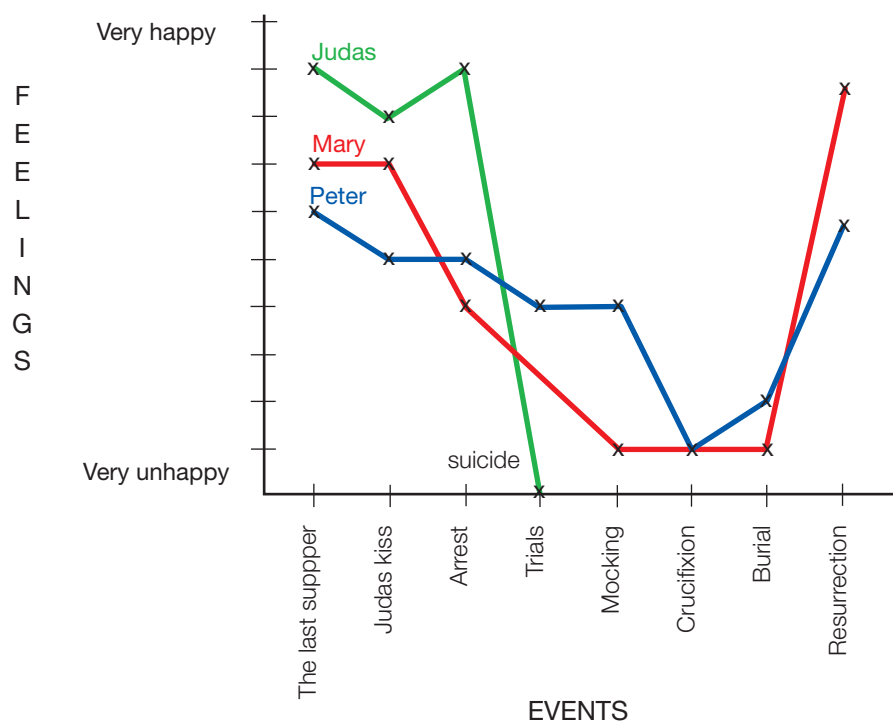
Pupils then proceed in pairs to plot the emotions or fortune of the individual as they empathise for each of the episodes. This might be done individually at first, but pairs work well for this strategy. Whatever the grouping, pupils must get together to compare and justify their choices.

For either strategy, 10 to 12 statements or episodes is enough to work with – more is overkill. Include some ambiguous statements to ensure that discussion focuses on interpretation.

Here is an example of the use of a fortune line in RE.

The events leading up to the resurrection of Jesus are provided on card for pupils to sequence and, when agreed, are written along the horizontal axis. These could include:

the last supper	arrest	mocking	crucifixion
Judas kiss	trials	resurrection	burial



Pupils then proceed in pairs to plot the emotions of different people, as they empathise with Jesus's followers for each of the events. After completion, pupils work in groups to justify their choices.

#### 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Reasoning** then a 'Living graph' is a suitable strategy to choose. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Reasoning that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **PE example** is for the first lesson in the cycle. The lesson is based on an objective for a Year 9 unit on 'Invasion Games' – '*Pupils to understand how the changing demands during the course of an invasion game can affect heart rate so that training can be tailored to meet these demands*'. For this lesson the objectives are for pupils to:

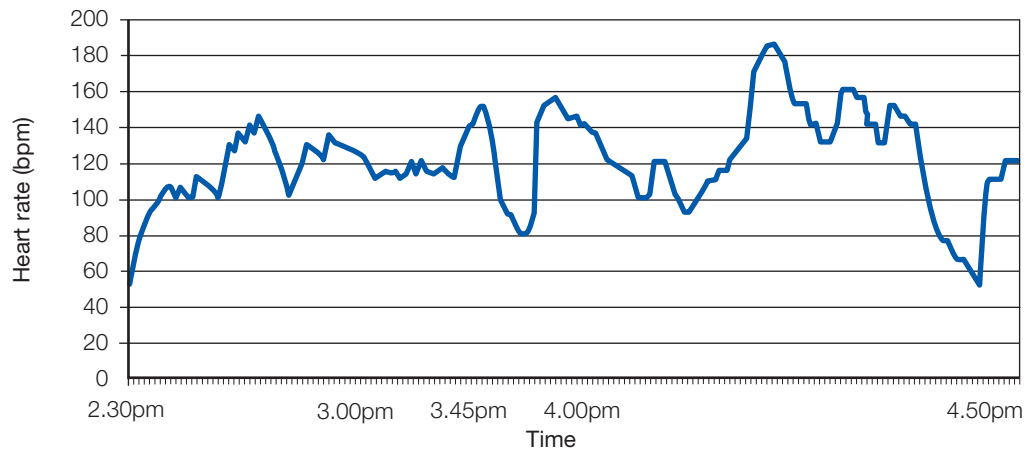
- improve the way they give reasons by using precise language and evidence to explain what they think and how they make a judgement;
- consolidate understanding of the effect of exercise and emotion on heart rate.

The teacher might begin by saying, '*Today we are starting a new 3-lesson cycle to develop our reasoning skills, using what is called a "living graph" to consider reasons why a footballer's heart rate will vary during a match. You will use the same strategy to develop the skills in science and history*'.



Pupils are given a line graph showing the changes in a professional premieriership football player's heart rate during an important away match. In previous lessons they have been studying health-related fitness. They are told that the footballer's resting heart rate is 50 beats per minute (bpm) and kick-off is at 3:00pm.

**Heart rate changes in a professional football player during a premieriership match**



They are also given a set of 12 or so statements relating to particular episodes during the afternoon. Examples of suitable statements might be:

- The opposition take main possession of the ball and have a sustained period of attack.
- The player settles into the game with most play within the centre area of the pitch.
- The player does some light stretching with his team mates.
- The opposition are awarded a penalty and miss.

The teacher models the placement of one statement for the class, talking aloud as they consider different possibilities and discuss reasons for the final choice of position. Pupils are then asked to place the remaining statements on the graph by thinking about the sequence and effects of events in the match. In pairs, they have to decide where each statement would be best positioned. The pairs then move into fours and are asked to justify their reasoning to each other.

## 5. Creating the right level of challenge

To support lower-achieving pupils in creating or understanding living graphs or fortune lines you might:

- model the process on a big version of the graph, for example using an OHT or whiteboard;
- introduce fortune lines with a simple everyday example, such as how the teacher's mood will change over the course of a lesson in response to the behaviour of the class.

To challenge higher-achieving pupils you can:

For living graphs


- ask pupils to devise statements of their own and swap them with another pair or group;
- having completed placing the statements, ask pupils to decide whether each one is likely to be a cause or a consequence/effect of the overall chain of events. Colours or letters can be used. Allow pupils to say that a statement is equally a cause and an effect, and how and why the placement of the statement would differ;
- provide a graph with two different sets of variables displayed on it, for example, a climate graph which includes a line graph for temperature and a bar chart for rainfall.

For fortune lines

- plot the interrelated emotions or fortunes of two characters for the same events. This can lead to useful discussions as to how the two characters are interacting – is one influencing the other and how is this happening (direct speech, letters, visually, physically, via a third party), which can be annotated onto the lines;
- ask ‘*What if...?*’ to encourage pupils to challenge each other to re-assess the original representation/statement placement by either suggesting an additional event or removal of an event.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Reasoning** in the context of ‘living graphs’. They might also be used as part of assessment for learning to help pupils improve their own skills of reasoning through peer- and self-assessment.

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- Pupils understand what they have to do and may be able to place a statement but the answer is not defensible and reveals misunderstandings.
  - Pupils produce one or two defensible answers – they have a reason, usually expressed in one sentence.
  - Pupils place the majority of statements, each of which is defensible, but there is no linkage between the reasoning for any of the placements. Evidence to back reasons will be sparse.
  - Pupils place the majority of statements and there is linkage between their explanations. There is a thread of logic connecting the statements. They may use their own knowledge or give evidence to aid interpretation. They are likely to be using mental pictures to aid their thinking.
  - Pupils can advance alternative positions for the statements which hinge on different assumptions. They have used substantial amounts of their own knowledge to aid interpretation. Their mental pictures will have considerable relation to reality.



In progressing through these levels pupils are holistically improving other thinking skills. For example, considerable creative thinking is involved in linking all the statements together into a narrative of the match and these 'hypotheses' can be evaluated as they are checked against what pupils know about heart rate.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils experience difficulty in empathising with the fortune line character/individual.	Use an analogy that would encourage pupils to remember an event with the same or similar emotions. You may prefer to model this for them if you are dealing with negative emotions.
Pupils experience difficulty in recalling the required background information.	Spend a short time at the beginning of the lesson ensuring that the class has the working knowledge and understanding to successfully complete the task.
Pupils do not seem able to provide reasons for their choices.	It may be that pupils struggle with the language of explanation. It may be useful to provide sentence stems on a prompt sheet, e.g. 'She would be (very) happy/sad at this point because she ...'.  If this occurs unexpectedly during the strategy, encourage pupils to provide a fuller explanation through responsive questioning which gently probes their reasoning.
Pupils seem lost and cannot get started.	Reinforce that there is no correct answer, although there might be better ones; encourage pupils to explore ideas and interpretations.

## 8. Metacognitive plenary

Questioning for metacognition helps pupils to 'unpack' what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about reasoning. The pupil responses in this first table relate to the physical education example given above (living graph).

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reasoning</b>	'Why have you put that statement there?' (Points to 'Player is substituted due to serious injury'.)	'Because his heart rate has gone down to resting so he must have stopped exercising.'
<b>Challenge / Reasoning</b>	'Could the statements be placed in more than one position?'	'We thought "the goalie being injured" could go in any place where the player's heart rate drops quite low.'

<b>Reflective – general/ specific</b>	<p>‘How did you decide where the statements would go?’</p> <p>‘Which ones did you start with, which ones came later, which ones were the most difficult?’</p>	<p>‘We started by sequencing those we could...like warm-ups at the start. Then we put the time-specific ones, like the half-time talk, on the graph.’</p> <p>‘The one about him being nervous was hard because we didn’t know if it would make his heart rate high or low.’</p>
<b>Reflective – moments of insight</b>	<p>‘Did you get any visual images in your head? Where are they from?’</p>	<p>‘I found bits of matches I’d played for the school popping into my head...like how I felt and what my heart rate was like.’</p>
<b>Reflective – general</b>	<p>‘What have you learned about decision making?’</p>	<p>‘It can really help to work with others...they have different ideas...sometimes they made me change my mind.’</p> <p>‘It’s not easy to know if you’re making the right decision when it’s about someone else’s feelings.’</p>
<b>Application</b>	<p>‘Imagine you were doing this in another subject. How might you use what you’ve learned today?’</p>	<p>‘I’d start quicker by sequencing the cards along the x-axis.’</p> <p>‘I wouldn’t worry so much if we didn’t agree...it’s not that important to get the right answer...it’s more about the thinking and giving your reasons.’</p>

Pupil responses in this second table relate to the RE example (fortune line).

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reasoning</b>	<p>‘Why have you put the character (<i>Judas</i>) at that level on the graph (<i>excited</i>) and at that point in time?’</p>	<p>‘I think Judas was excited at first because he thought Jesus would fight back and get rid of the Romans...but when he saw Jesus not answering he got depressed.’</p>

<b>Challenge / Reasoning</b>	<p>'How does <i>Peter's</i> line compare with <i>Judas</i>? Where is it the same and where is it different? Why?'</p>	<p>'Peter and Judas were both really unhappy at the same time but for different reasons – Peter lost a friend and Judas's plan hadn't worked. Judas was excited before the arrest and Peter was too after he'd seen Jesus alive.'</p>
<b>Reflective – general</b>	<p>'How did you tackle sequencing events?'</p> <p>'What was easy and what was hard?'</p> <p>'What other words could you add to the vertical axis? Why?'</p>	<p>'I put the ones I knew in the right place and then added the others when my partner helped.'</p> <p>'...I thought what it'd be like to be a friend of Jesus and see him die. I could imagine I was Judas easily but it was hard pretending to be Mary...'</p> <p>'...We wanted to add "despair" to the vertical axis...because Judas and Peter felt "despair".'</p>
<b>Challenge / Reflective</b>	<p>'Why have other people got different answers? ... Go on...'</p>	<p>'Ali thought Judas was unhappy before he betrayed Jesus because he was Jesus's friend but I don't think he was because he wanted to be in a fight for freedom... It's because we have different points of view...different interpretations of what really happened.'</p>
<b>Reasoning</b>	<p>'Has anyone got an answer or idea that you like and why?'</p>	<p>'I like the idea of Mary being scared after the resurrection and not just excited.'</p>
<b>Application</b>	<p>'Where else in (<i>subject</i>) could you use a fortune line to understand the feelings of the people involved?'</p>	<p>'I could use it for the parables like the lost son – I could do a line for the father, the younger son and his brother to compare their feelings.'</p> <p>'You could draw one for characters in "Lord of the Flies"...we're doing it in English.'</p>

## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to reason and use living graphs or fortune lines. They can be used either at the beginning or the end of lessons. Some examples are:

For living graphs

- In maths or science at school it is often useful to be able to explain the main trends of a graph – where it goes up or down, or the peaks and the troughs, rather than worrying about the exact values that are plotted. All graphs are a summary or simplification of numbers – living graphs can help you remember that the numbers do stand for events or things in the real world, often with people involved.
- On the television news they sometimes show a graph like the number of people being caught drink-driving at Christmas, or infected with HIV, and they do a short explanation of ‘why’, perhaps followed by a particular story. In effect, like a living graph – the real lives behind the line and the figures.

For fortune lines

- When you see a good film, how you feel at certain points is like a fortune line as it is an interpretation of the characters and plot – scared at certain points in a horror film, a bit embarrassed when a kiss is coming, weepy when someone dies or makes a sacrifice. Film directors and writers exploit our emotions.
- You read a book such as *Lord of the Rings* and consider how the fortunes of the characters, for example Frodo, Saruman, Gollum and Gandalf, change through time and how they relate to each other.
- Are there different types of film or book that have particular types of fortune line – happy endings, sad endings, shock beginners, building tension? Are your interactions with friends and family like this at all – where certain interactions trigger off certain emotions?



# Mysteries

*In a mystery pupils are presented with between 15 and 20 items of data on slips of paper about a situation where there is a single open question or problem for them to resolve. The statements can be general or background information, specific details and sometimes 'red herrings' or irrelevant information, but always there is an element of uncertainty or ambiguity. Pupils work in groups to read and sort the statements, link information on different cards and come up with a solution to the mystery question. Later they are asked to explain their answer.*

## 1. Rationale

'Mysteries' are designed to encourage pupils to deal with ambiguity, to make links between disparate, apparently unconnected pieces of information, fit them together to make sense of disorder, read between the lines, come up with a variety of ideas and evaluate them. They do this through addressing a central question which has no single correct answer and where they are not even sure what information is relevant...rather like real life in fact.

Pupils' thinking is physically evident as they move the slips of paper around the table-top. That way, they can change their minds as they share their thinking – the moving actually helps them think. The teacher can see the progression in their thinking in the way the data items are grouped and structured and by listening to pupils talking. These stages have been termed 'brains on the table' and they do allow teachers a unique opportunity for diagnostic assessment.

## 2. National Curriculum thinking skills addressed

'Mysteries' stand out as a strategy in that they are good for all of the National Curriculum thinking skills, indicating both their flexibility and power as a teaching tool. In the early stages of carrying out a 'Mystery', **Information-processing** skills are likely to predominate. As pupils make progress in processing the information **Reasoning** and **Evaluation** skills will become more dominant.

Eventually, if allowed sufficient time or with teacher intervention, pupils will begin to use:

- **Enquiry** skills, such as predicting outcomes and anticipating consequences and improving their ideas;
- **Creative-thinking** skills, including extending ideas, suggesting hypotheses and looking for innovative outcomes.

## 3. Planning to use the strategy

The first step in planning a mystery is to identify a topic where there is opportunity for uncertainty and ambiguity and where one wants pupils to think hard about causes behind events. One needs 15 to 30 data items. To design the mystery, think in the following terms:

- A story line or narrative – there need to be some slips which describe characters and what happens to them in a particular scenario.

- A place/time context which usually provides the subject knowledge background for the mystery.
- Data items which open up the possibility of different interpretations.
- Perhaps even some deliberate red herrings that can lead pupils down the wrong path if they are not prepared to reason and evaluate.

The data needs to be cut up and placed in envelopes for groups of three or four pupils. The mystery needs a single open question for pupils to answer that allows different interpretations of the data. For example, the Leading in Learning DVD includes extracts from two lessons in a cycle using 'Mysteries' at Manor School in Nottinghamshire.

- In the second lesson Russ, the science teacher, poses the question: 'Why hasn't Tim got any tea?'
- In the third lesson Mari, the geography teacher, poses the question: 'Why did Tom and Rebecca go to Newquay for their holidays?'

When pupils have had 15–30 minutes working in groups to come up with an answer they need to be primed to be able to explain their answer, so it is valuable to give them a few minutes to rehearse their explanation. It is worth telling them that they should be able to use the physical structure of the data items to help give their answer.

A variation on the approach is to get one pupil from a group to swap with one from another, so that ideas and explanations can be put under scrutiny – it is important to set ground rules and give clear instructions for this. This can really help to develop pupils' reasoning skills.

#### 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Reasoning** then the 'Mysteries' strategy is a suitable choice. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Reasoning that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **history example** is for the first lesson in the cycle. The lesson is from a Year 8 unit on 'Religious conflict in the 16th and 17th centuries and relates to the 'Britain 1500–1750' section of the National Curriculum programme of study. The overarching objective for this unit is for *'Pupils to analyse and explain the reasons for religious persecution in the 16th and 17th centuries'*. For this lesson the objectives are for pupils to:

- develop their reasoning skills by explaining why some causes of events might be more important than others;
- suggest different explanations for the witch hunt in 17th century Britain.

The cards for this mystery could include the following:

King James I became King of England in 1603.	King James I was scared that somebody was trying to kill him.
King James I always wore extra padding under his shirt.	King James I wrote a book to warn people about witchcraft.
Early in 1612, rumours reached London that people in Pendle were plotting to kill King James I.	In 1605, the Gunpowder Plot was discovered. Catholics were blamed for trying to blow up the king.
Roger Nowell was a magistrate, who was educated and well-read.	King James I sent Roger Nowell to Pendle in March 1612.
The Catholic faith was very strong in Lancashire.	Alison Device was the grand-daughter of Demdike and lived in Pendle.
Pendle is about 200 miles from London.	Alison Device said that Chattox had cursed the local beer and turned it sour.
Two old widows, Chattox and Demdike, lived in Pendle.	Local people believed that Chattox and Demdike had special powers.
King James I was a Protestant.	Alison Device was a teenager in 1612.
In March 1612, Alison Device told Roger Nowell that she had used special powers to paralyse a travelling salesman.	Nobody in the 17th century, even doctors, was sure about the causes of illness and disease.
Alison Device told Roger Nowell that Demdike had cursed a man called Richard Baldwin after an argument. Baldwin's daughter fell ill the next day and died a year later.	Most people in the 17th century believed that you had a better chance of going to Heaven if you confessed your sins before you died.
Alison Device said that Demdike and Chattox tried to heal a sick cow, but it died.	Roger Nowell was keen to please King James I.
Lancaster was the biggest and most important town in Lancashire.	Poor people in England did not go to school in the early 17th century.
After 1660, many educated people in England became excited by scientific discoveries.	Roger Nowell came from a powerful Protestant family.
Demdike confessed she had met the Devil.	The death rate was high in the 17th century, with many people dying young.
Demdike died in prison.	Pendle was a remote area of Lancashire.



The open question might be:

*Alison Device and Chattox lived in Pendle, Lancashire in 1612. They were both hanged at Lancaster Castle. Why?*

An important learning point with 'Mysteries' is that pupils should be encouraged to 'unpack' the thinking involved for themselves. Typically then, the lesson would not begin with the teacher sharing the learning objectives. In launching 'Mysteries' within the 3-lesson cycle the teacher might start by saying: *'We're going to try out a new and exciting strategy which will help you to suggest different explanations for the witch hunt in 17th century Britain. This will make you think really hard. An important part of today's lesson will be for you to explain and give reasons for your solution to the mystery question because you're going to do two more "Mysteries" in mathematics and science over the next two weeks.'*

When pupils have spread out the cards they might be allowed to ask questions about specific terminology if this is likely to create a barrier to engagement with the task. The teacher would then display the mystery question and ask the pupils to work collaboratively to solve it.

## 5. Creating the right level of challenge

To support lower-achieving pupils you might:

- simplify the mystery – begin with fewer cards and more concrete data;
- suggest headings for the groups of cards;
- encourage pupils to explain their ideas to you and/or build in interim plenaries where groups with more advanced or refined thinking are asked to share their ideas with the rest of the class;
- building on the physical structuring opportunities, use the layout of the cards as the basis for planning extended writing, perhaps in a subsequent lesson in the subject. Pupils can be asked to group their statements so that each group will become a paragraph. They can develop a heading for each group that they turn into a topic sentence. They can identify which 'facts' in the group can become supporting evidence for the sentence and how the paragraphs build to become a piece of discursive or explanatory writing. This is a powerful approach to improving extended writing.


To challenge higher-achieving pupils you can:

- make the mystery more complex by including data items that are not easy to classify, more 'red herrings', or more abstract information about which they need to hypothesise and infer and generally think more creatively;
- require them to suggest headings for the different categories of information as they group them;
- ask pupils to identify assumptions that they have made in developing their explanation. The term 'assumption' will need some explaining itself, and it is important that assumptions are not represented in a negative light (we all make them), but the point to be made is that one needs to be aware of them so that they can be checked when appropriate;

- Use the physical structuring of the cards as an opportunity to introduce some insight into reasoning. The terms 'background' or 'long-term' causes can be introduced (endemic social, economic, political, physical or ecological causes that may predispose events to occur) and contrasted with 'trigger' or 'short-term' causes that are the localised, unpredictable events that turn probability into certainty. Pupils can be asked to identify the background and trigger causes and important points can be made about background or long-term causes as they are central to pupils developing generalisations.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Reasoning**. They might also be used as part of assessment for learning to help pupils improve their own skills of reasoning through peer- and self-assessment.

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- Pupils select some data items that may be relevant, but cannot develop an explanation that addresses the question.
  - Pupils select one or two data items that are relevant and develop an explanation, but it does not fully address the question (*so they do not successfully explain why the 'witches' were hanged*).
  - Pupils select several relevant data items and develop an explanation but it does not fully address the question. There may be some limited linkage between data items but they are not all linked together to reach a successful conclusion. (*The explanation needs to include the role of Roger Nowell.*)
  - Pupils select several data items, which are likely to be grouped in some way. The explanation has clear causal connections linking the data items together using connectives such as 'because', 'and then' and 'meanwhile' appropriately. The question is answered successfully.
  - Pupils use wider knowledge to help interpret the information and make more general and abstract statements (*'People did not understand science fully at the time, so they looked for someone to blame for things which had natural causes'*). They are able to entertain more than one possible solution and are more likely to identify flaws in their own reasoning.

In progressing through these levels pupils are holistically improving other thinking skills, for example **Creative thinking** – because they will be generating more complex and plausible hypotheses and even appreciating that there may be a number of acceptable explanations.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils cannot picture or 'get into' the scenario.	Show some photographs or video of the scenario or read a contemporary account so that they begin to get pictures in their heads.
Pupils are overwhelmed by the data and are slow to make a start.	Reduce the number of data items and model the process, perhaps using an OHP or whiteboard.
The task is completely new to pupils and they don't get a sense of what to do.	Make comparisons with television detectives and how they have bits of evidence to sort and sift and make sense of, they make connections, they discover links between pieces that they thought were irrelevant, they have theories, test them and maybe discard them – this is what pupils will have to do.
Some groups cannot classify the statements into groups.	Pull out one statement and point out a key word on it, then ask pupils to find another with the same word.
Pupils do the task quite well but don't evaluate their theories or consider alternatives.	While they are still working, challenge them with a statement which doesn't fit into their theory or tell them that another group has a different theory, to sow some doubt.

## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to 'unpack' what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about reasoning. The pupil responses relate to the history example given above.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	'How did you start doing the task?'	<p>'We went through each card one by one and decided if it was relevant or not...'</p> <p>'At first I looked for cards about Alison and my partner looked for cards about Chattox...'</p> <p>'We started by spreading all the cards out and tried to see some connections between them...'</p>

<b>Reflective – general</b>	'How did you go on?'	<p>'We started to group cards together like "King James I was a Protestant" and "The Catholic faith was very strong in Lancashire".'</p> <p>'Yes...when we did that we began to link some of the "red herring" cards back in. Like, at first we thought the card about the Gunpowder Plot wasn't part of the story, then we realised that it helped to explain how James was very suspicious of Catholics, which would have made him nervous about Lancashire.'</p>
<b>Reflective – group work</b>	'How did you work together, did it help?'	'It helped to hear other people's ideas – I couldn't see the point of the "After 1660..." card, but someone else said it showed that people did not know much about science before then, so they were likely to blame illnesses on witches.'
<b>Challenge</b>	'What were the long-term/background causes and what were the short-term/trigger causes?'	<p>'King James being suspicious, lack of knowledge about science and the split between Catholics and Protestants...I think they're long-term causes.'</p> <p>'The triggers were more the deaths in Pendle, the behaviour of Alison, Chattox and Demdike and Roger Nowell's way of working.'</p>
<b>Reflective – visualisation</b>	'What did Chattox look like? How do you know?'	'Very old, wrinkled, frowning, piercing eyes, hunched, black clothes.'
<b>Application</b>	'How is this like the work of a detective?'	<p>'We are piecing together the evidence and trying to make connections...yes, looking for motives...why people did certain things.'</p> <p>'It's hard to be completely sure what actually happened.'</p>

<b>Reflective – specific</b>	‘What assumptions have you made?’	<p>‘People thought Alison and Chattox were witches.’</p> <p>‘Roger Nowell had them put to death to please the king.’</p> <p>‘Chattox may have been completely innocent – only Alison, a child, said bad things about her.’</p>
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## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of reasoning and solving mysteries. They can be used either at the beginning or the end of lessons. Some examples in school are:

- In English, when you are analysing a story or book, you have to select lots of small separate bits of information about the plot and the characters in order to say what it is about.
- In music, when you do listening tasks, you answer a number of questions to identify all the major characteristics of a piece – these are like the data items in a mystery. You select different ones to answer big questions about the piece.

Examples in everyday life:

- Your brain is like the table top – you put things into groups by comparing and contrasting them, you come up with ideas and check, you focus on one or two things and then have to consider other things.
- Most events and accidents in life and history have short- and long-term causes or trigger and background causes. Why did David Beckham move to Real Madrid? The short-term cause is that Real Madrid made a big offer and he was prepared to go, but what are the long-term causes? (Real Madrid wanting to sell lots of shirts and build up a fan base in Asia where David Beckham is a huge star. This allows them to develop the club as a global brand. It also fits with David Beckham becoming a more international fashion icon. There are also football and business reasons for Manchester United selling. And lots more besides.)
- If accidents and events have short- and long-term causes how do you help to prevent accidents happening?

# Reading images

*This very basic but powerful technique involves providing pupils with a photograph or other visual image (reproduced with a white border) as a source of information and asking them to annotate or label it. They are asked to make links to what they already know, whether from previous work or general knowledge, and should suggest a title or overall heading for the image. There are variations around this basic approach. As with other thinking strategies, it is important for pupils to be able to explain their thinking to others.*

## 1. Rationale

We live in a highly visual society saturated with educational, work and leisure images. This strategy aims to develop pupils' visual literacy so that they are better equipped to decode this type of information. There can be a pay-off on many levels.

- Working with visual information is a gateway to creativity and can boost the self-esteem of pupils who are struggling with literacy.
- Pupils with visual learning preferences can learn more effectively through images of various kinds.
- In examinations for many subjects, information is often provided in the form of diagrams, photographs, pictures and maps.
- There is great joy in being able to make sense of visual information.

The teacher's role is to get pupils to look harder, find patterns, make inferences and look for connections. The important point is about the difference between looking and seeing. Two people can look at something but they see different things because one is able to make more connections and therefore to make more sense of what they see.

## 2. National Curriculum thinking skills addressed

'Reading images' is particularly suited to developing all aspects of **Creative thinking**, including making hypotheses and applying imagination. It is also strong for:

- **Information processing** in terms of analysing part/whole relationships;
- **Reasoning** skills particularly explaining thinking, giving reasons for opinions, drawing inferences and making deductions.

**Enquiry** skills (asking questions) can also be addressed where the teacher creates opportunities.

### 3. Planning to use the strategy

The approach is to provide pupils with a photograph or other image of some kind that is relevant to the current topic or unit of work and ask them to annotate or label it:

- making links to anything they have already learned in the topic;
- suggesting a title or overall heading.

The hardest part is to find the photograph, drawing or other image – the Internet is an obvious source. The picture should be reproduced so that it has a white border for annotation. Alternatively, the picture can be ICT-based and the annotation can be on screen. An interactive whiteboard can help modelling and/or a plenary.

A powerful example in history would be a photograph of daily life in the trenches during World War I. This would give pupils the opportunity to make links to what they know, not only about living conditions, military engineering, weapons, etc., but also more abstract concepts such as leadership and conscription.

An example in mathematics would be a shape transformed in several ways on a pair of coordinate axes. The pupils have the opportunity to make links between any pair or pairs of shapes, since the object of the transformations is not specified. It will stimulate discussion of equivalence, inverse, scale and proportion.

A variation is to offer pupils a set of photographs or images. They can be asked to:

- sequence them in relation to a particular scenario (causes or effects of something, or what happened);
- make a case for something – different groups of pupils can be given different or opposing cases. So in the case of the First World War trenches one case to argue would be that the frontline soldiers were lions led by donkeys, while another case would be that the new technologies of weapons and defence made slaughter inevitable.

### 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Creative thinking** then 'Reading images' is a suitable strategy to choose. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Creative thinking that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **art example** is for the first lesson in the cycle. The lesson is based on the Year 9 QCA scheme of work, Unit 9A 'Life events', with the overarching objective, '*Pupils should learn to analyse and evaluate their own and others' work, express opinions and make reasoned judgements*'. For this lesson the objectives are for pupils to:

- speculate and hypothesise about people in images, based on evidence, inference and imagination, so that they have a range of ideas to consider;

- explain their interpretations of Picasso's 'Child with a Dove' painting and Sebastião Salgado's photographs from 'The Children' series.

For the purposes of the art and design lesson in which the 'Reading images' strategy would be launched, the teacher wants to stimulate thinking and discussion about what artists are trying to portray through an image.

Having distributed colour copies of Picasso's 'Child with a Dove' and four photographs from Sebastião Salgado's\* 'The Children' series (see examples below), the teacher might begin the lesson by holding up a book and saying: *'I know you can all read a book but in art and design, mathematics and history you're going learn how to "read" images (holds up one of the photographs). You need to do this every day – you see all sorts of visual images and you have make sense of them – you have to read them – from seeing that your brother is in a mood even when he doesn't tell you, to the washing and drying instructions on your favourite trousers.'*

The activity might begin with the teacher asking, *'What can you tell about the children in the images? You will need to explain your answers later on'.*

As the lesson unfolds pupils would be invited to work in pairs or groups to speculate about where each child lives and what kind of lives they have, making connections between the children and objects in the images. They can also be encouraged to make inferences, leading to discussion on how the different images communicate with them as 'readers'. In whole-class discussion pupils can be asked to justify their ideas, pinpointing the evidence they have used and identifying the creative leaps that they have made.

Pupils would then be asked to add annotations in the white space around each image. To encourage the cross-fertilisation of thinking, pairs of pupils could then be snowballed into fours, to exchange ideas – this is particularly useful in encouraging new perspectives and more-creative thinking. They would be encouraged to reflect on whether their ideas about one segment of the image fit with evidence from other segments – in other words, whether their parts make a sensible whole.

Finally, after they have carefully analysed the images, the teacher would ask pupils, in pairs, to suggest a title for each image and the group of images. This is an excellent way to challenge pupils to employ a higher level of thinking.

*\*Sebastião Salgado is a Paris-based, Brazilian-born photojournalist and UNICEF special representative. Examples of his work on migrations and refugees can be viewed at:*

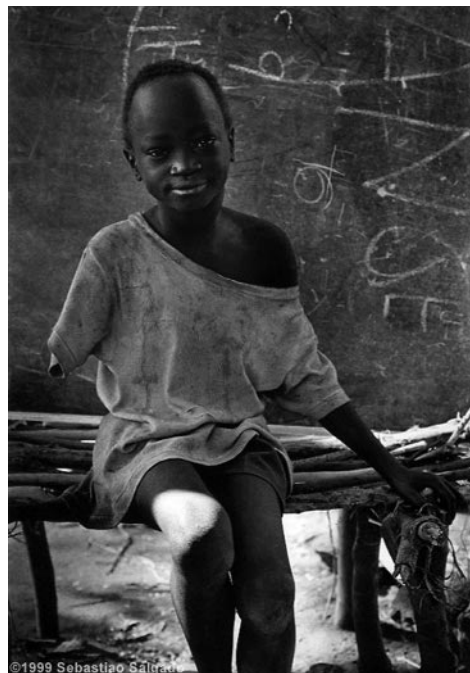
**<http://www.unicef.org/salgado/>**

**<http://www.kodak.com/global/en/professional/features/legendsV3Q5/menu>**





Child with a Dove, Pablo Picasso (1901).



The Natinga school camp for displaced Sudanese, Southern Sudan (1995).



The Kamaz camp for displaced Afghans, Mazar-e-Sharif, Afghanistan (1995).



A settlement of landless peasants, Rio Bonito do Iguaçu, Paraná State, Brazil (1996).

'Child with a Dove' by Pablo Picasso, © Succession Picasso / DACS 2004. Reprinted by permission.

Sebastião Salgado: Photographs by Sebastião Salgado, reproduced by permission of \*nbpictures, on behalf of Sebastião Salgado. © copyright Sebastião Salgado.

## 5. Creating the right level of challenge

To support lower-achieving pupils you might:

- model the process of making links and annotations using an OHP, projector or interactive whiteboard, centred on questions such as 'What can we see here?', 'What is happening here?' and 'What does this image show or suggest?'; \*\*
- place a 'grid' on a clear acetate sheet over the image and ask them to 'read' it square by square. This can support the analysis of part/whole relationships;
- create mixed-ability pairings to work collaboratively;
- encourage pupils to use questions such as 'Who are these people?', 'Where have they come from?', 'What are they doing?', 'Why are they doing this?' and 'When is this happening?'. This is termed 'using the 5Ws' – using *Who*, *What*, *Where*, *Why* and *When* as question stems.


To challenge higher-achieving pupils you can:

- encourage them to move beyond what they can actually see, to what it implies or means, thus making more abstract or generalised links;
- ask groups to make a case for something in the image – different groups of pupils can be given different or opposing cases;
- ask groups to put a number of images in a time or causal sequence.

\*\*There is an example of 'Reading images' being modelled in a geography lesson on the *Training materials for the Foundation subjects* video (DfES 0351/2002).

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Creative thinking**. They might also be used as part of assessment for learning to help pupils improve their own skills of creative thinking through peer- and self-assessment.

- 
- Pupils understand the task but the connections appear totally random.
  - Pupils identify one or two visible features in the image(s) and can connect it to the task.
  - Pupils identify three or more features in the image(s) and can connect them to the task but there is no clear linkage between the features.
  - Pupils identify several features in the image(s) and can link them together to create a whole idea, interpretation or theory. If asked to produce a title it is more likely to be descriptive, related to visible features in the image(s).
  - Pupils can generate several frames or theories to interpret the whole image(s). If asked to produce a title the pupil is capable of producing an abstract title that goes beyond the visible features.

Reading  
images

In progressing through these levels pupils would also be improving their skills in analysing part/whole relationships, and asking questions. They will also be improving their evaluation skills as they consider the merit of their own and others' ideas.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils come to this 'cold' and don't know where to start.	Model the process, encouraging early efforts and stressing that there is no one right answer.
Pupils focus only on visible features and are unable to make more abstract generalised links.	Scan systematically and focus on visible features using the 5W strategy ( <i>who, what, where, why, when</i> ) to take them beyond the visible.
Pupils do not justify the links they make.	Pupils need to be pressed, both in their groups and in the whole-class discussion, to justify the connection they make with the picture.
Pupils run out of steam quickly after finding two or three links.	Start with pairs working together and then put pairs together to make fours which exchange connections – this creates a bit of peer pressure.
Pupils can be quite timid, if they are unused to such approaches, in either challenging or extending connections made by others.	Again this can be modelled by the teacher, who might make a very vague connection and ask pupils whether enough had been said and invite pupils to ask questions for clarification, etc.

## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to 'unpack' what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about creative thinking. The pupil responses relate to the art and design example given above.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Warm-up</b>	'What connections have you made?'	'The children were on their own...they all seemed to be looking at you, but were thinking something, so we talked about what they might be thinking and feeling. They seemed poor and didn't have much stuff. We wondered how they could live with so little.'

<b>Reflective – general</b>	‘How did you do it?’	<p>‘Both our groups started by looking at the faces, then their clothes, then their surroundings. We kind of looked for the detail.’</p> <p>‘We found the photographs kind of easier to analyse first. They seemed much more...intense, like a really sad film or a documentary...like real people, not made up like in a painting.’</p>
<b>Reflective – specific</b>	‘What makes a good connection?’	‘When you can see the same thing in different images...they seem to be trying to give the same message...like about poverty or hope.’
<b>Reasoning</b>	‘What is your title and why that title?’	<p>‘“Lonely child”...because we thought the eyes told us what he was thinking.’</p> <p>‘“My life now”...we thought about what they were trying to say to us as viewers.’</p>
<b>Challenge / Reasoning</b>	‘Do you prefer or like anyone else’s title? Why?’	‘“Dignity”, because it is just one word, and the image is so simple, just a single figure. It seems to fit...I think it is all in the eyes and the lack of possessions...He still has the pride to look us in the eye, despite having a hard life.’
<b>Application question</b>	<p>‘Why is being able to “read” an image or picture of a real-life scene important?’</p> <p>‘Can you give an example from another subject?’</p>	‘In history, when we looked at photographs of the Jews in WW II...we had to think about how the Germans could have allowed the Holocaust to happen. We needed to connect what the photos were telling us to understand about propaganda.’

## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to read photographs. They can be used either at the beginning or the end of lessons. Examples in school:

- In an examination you often have to interpret information from a picture or a diagram.
- In history you have to use photographs and portraits as sources of evidence which you interpret or 'read'.

Some examples in everyday life:

- This is like the programmes that you see on television, where a detective visits a crime scene and looks around carefully, at photographs, things that tell them about the person and things that are out of place and don't make sense, using visual clues to build up a picture.
- If you ever watch a builder sizing up a repair or extension job, a doctor examining a new patient or a clothes consultant giving the 'once over' to a client, they all look at the 'problem' from all angles, looking for all the tell-tale signs, sizing up the job, making connections – they are reading the visual image.
- There are art experts who can look at a painting and can tell you not only what the painting is about but how it connects to the time and place it was painted and the ideas and motivation of the artist. For example, they might say that the priest in the background represents the power of the church and the dog curled up at his feet is the same one he had as a boy. As an alternative example, they might identify and discuss the 'deliberate error' in the work of Islamic artists, said to be included on the grounds that only God is perfect.

# Relational diagrams

*Relational diagrams provide a clear and accurate medium through which pupils can communicate their thinking. They illustrate the meaning that pupils give to terms that stand for classes of objects or concepts. Pupils are able to use overlapping, separate or subsumed shapes to show whether all, some or none of the terms of a particular class belong to another class. The visual simplicity of relational diagrams makes the explanation of the relationships easy to understand and more likely to be remembered.*

## 1. Rationale

Our understanding of words is generally developed through use and exposure, which is a gradual process. The resultant understanding does not equate to a precise definition and therefore our understanding is often a bit hazy. Pupils can, if provoked, tell you what something is or means – roughly. There is often a lack of clarity.

As well as helping pupils clarify their understanding of important subject-related terms, relational diagrams offer three further advantages.

1. The medium is substantially visual, thus offering a real bonus to those with a strong visual memory.
2. The visual representation encourages an understanding of the similarities and differences between terms – their relationship.
3. There is a useful link to classification of phenomena as relational diagrams allow one to show whether NONE, SOME or ALL of a particular group of things belong to another category of phenomena.

This is a good tool for clarifying understanding or clearing up misunderstandings. Once teachers have access to pupils' thinking it is possible to probe their understanding and to provoke cognitive conflict (a challenge to one's thinking) which, in this case, should force a revision of the thinking and hence the diagram.

## 2. National Curriculum thinking skills addressed

Relational diagrams are particularly good for **Information processing**, notably sorting and classifying, comparing and contrasting and analysing part/whole relationships.

Relational diagrams are also good for **Evaluation**. The important aspects of this skill are evaluating information and having confidence in their judgements.

Other thinking skills which can be significantly addressed, where the teacher creates opportunities, include:

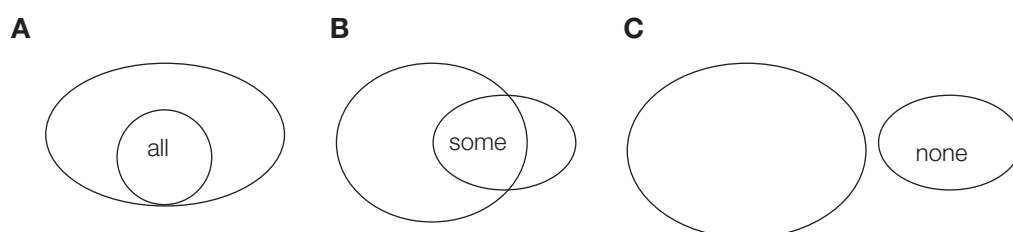
- **Reasoning** skills, as pupils have to give reasons for the relationships in their diagrams, make inferences and deductions, and explain precisely based on informed decisions about meaning;
- **Creative thinking**, as pupils have to generate ideas and suggest hypotheses.



### 3. Planning to use the strategy

From a subject perspective consider:

- starting with a small number of nouns, say between two and five, related to the subject you are considering. They must stand for classes of things or ideas of a similar nature. One example of a suitable set might be plants, trees, flowering plants and grasses. Another might be poetry, verse and limerick. Instruct pupils to draw any closed shape to represent each of the terms and how they are related to each other;
- modelling the thinking process using, for example, a simple set of 'mammals, humans, pets and rabbits' as in the illustrations below. In each case (A, B and C) the smaller shape is rabbits, and the larger shape is mammals in A, pets in B and humans in C. In **A**, for example, all rabbits are mammals (smaller shape inside the larger), in **B** some rabbits are pets but not all pets are rabbits (shapes overlapping) and in **C** no rabbits are human (the smaller shape is separate);



- encouraging pupils to examine their diagrams carefully, thinking about what each part of it represents and deciding whether they want to change any part of it. Pupils should be trained in the routine of looking at each area in the diagram and asking whether such a case exists. Can they describe the features of items in each separate region? Can they give an example for each?

In many cases there is a correct version of the diagram, based on recognised definitions of terms, sometimes restricted by the scope of pupils' current knowledge. This is an example of a convergent strategy, where the aim of the lesson is to develop an agreed relational diagram. In some cases, however, the task may be divergent and different diagrams could be defended on the basis of interpretation of terms, e.g. matters of opinion. In studying Nazi Germany, drawing a relational diagram to include such terms as *German*, *fascist*, *Gestapo*, *SS*, *brownshirt*, *Nazi*, *blackshirt* and *Aryan* can clarify misunderstandings and highlight those terms that have looser meanings in some contexts, such as *fascist*.

Another example, in RE, could use the terms *Christian*, *Methodist*, *Catholic*, *churchgoer*, *Moslem*, *Saint* and *worshipper*. *Churchgoer* and *Saint* are challenging terms to interpret here.

## 4. An example from a 3-lesson cycle

Where the three departments have decided to focus on the thinking skill of **Information processing** then the 'Relational diagrams' strategy is a suitable choice. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Information processing that is common to all lessons in the cycle and is revisited in the plenary;
- an objective related to the subject that is not the focus of the plenary but can be followed up in a subsequent lesson in that subject.

The following **mathematics example** is for the first lesson in the cycle and based around the terms: regular quadrilateral, irregular quadrilateral, rhombus, rectangle, parallelogram. This is an example of a convergent strategy, where the aim of the lesson is to develop an agreed relational diagram. In the subsequent lessons pupils will experience divergent tasks which are based around more subjective judgements. The mathematics department moved the teaching unit 'Shape, space and measures 1' to slightly earlier in the term to accommodate the timing of the cycle.

This lesson is based on the Year 8 teaching programme which specifies the objective, '*Classify quadrilaterals from their geometric properties*'. For this lesson the objectives are for pupils to:

- improve their Information-processing skills by comparing and contrasting information and analysing whole and part relationships;
- be able to classify quadrilaterals from their geometric properties.

The teacher might begin by saying: '*Today we are starting a new 3-lesson cycle to develop our information-processing skills, sorting out the meaning of some mathematical words using relational diagrams. You will use the same strategy to develop the skill in history and RE.*'

For the mathematics example described above pupils would be given two simple non-mathematical terms (e.g. the pets/rabbits example) and the drawing of a diagram would be modelled. Then pupils would work in small groups, drawing and annotating diagrams to show the relationship between just two of the terms, for example, in the pairings suggested below.

A	rectangle	rhombus
B	rectangle	regular quadrilateral
C	rhombus	parallelogram
D	rhombus	regular quadrilateral
E	irregular quadrilateral	parallelogram



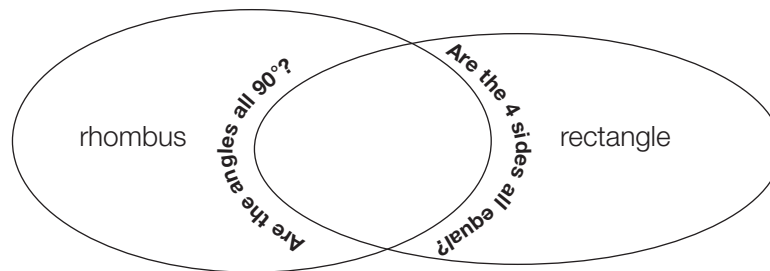
Pupils are then asked to suggest a specific example or description for each area of their diagram. No area should be left out. No example/description should be positioned in two separate areas. This strategy could prompt pupils to revise their diagram. For example, in this relational diagram for A above:



the left part of the diagram represents a shape which is a rhombus but not a rectangle, i.e. the internal angles are not 90 degrees; the middle overlapped part represents a shape which is a rhombus and a rectangle (namely a square); and the right-hand part represents rectangles which are not rhombi, i.e. the four sides are not of equal length.

Alternatively pupils are given some specific examples of shapes, e.g. square, and asked to position them in an area of their diagram. For some pupils, simple examples can help to reassure them of the accuracy of some relationships. However, there will often be common areas of misunderstanding, which will be revealed through careful choice of a more challenging example. As before, this tactic could prompt pupils to revise their diagram.

Finally, pupils could be asked to annotate the boundaries in a diagram to indicate what distinguishes one area from another. So in the relational diagram for the rhombus and the rectangle they could annotate the boundary between rectangle and rhombus to indicate the difference.



## 5. Creating the right level of challenge

To support lower-achieving pupils you might:


- model an easy example by talking through each step;
- start with a small number of terms;
- generate examples to be positioned on the diagram. Use cards, pictures or artefacts as concrete examples;
- ask pupils to give some simple specific examples to position on their diagram to reassure themselves of the accuracy of some relationships;
- start with a convergent task which is based on recognised definitions of terms. This may be restricted by pupils' current knowledge;
- help pupils compare and contrast two similar systems using prepared diagrams, e.g. two democratic systems.

To challenge higher-achieving pupils you can:

- give pupils a greater number of terms;
- require pupils to use abstract or more difficult concepts;
- ask pupils to position some more challenging examples in an area of their diagram;
- make the task divergent where the relational diagrams will depend on matters of opinion or how particular terms are interpreted;
- ask pupils to annotate the boundaries in a diagram to indicate what distinguishes one area from another.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Information processing**. They might also be used as part of assessment for learning to help pupils improve their own skills through peer- and self-assessment.

- 
- Pupils can locate some terms in part of a diagram but without adequate justification.
  - Pupils can correctly classify one or two terms into appropriate parts of a diagram (comparing and contrasting) but are unlikely to be able to use overlapping or subsets or be able to generate their own diagrams.
  - Pupils can correctly classify three or more terms into appropriate parts of the diagram but still cannot use overlapping or subsets consistently or generate their own diagrams.
  - Pupils can locate the majority of terms and use overlapping sets and/or subsets, i.e. they can use multiple criteria (usually concrete/visible) to classify something. They can also generate and label simple diagrams of their own, indicating a grasp of part/whole relationships.
  - Pupils can locate terms in a variety of positions in the diagram based on alternative interpretations of the term. They can confidently generate and use their own diagrams and use abstract terms in classifying.

In progressing through these levels pupils are holistically improving their sorting/classifying and comparing/contrasting skills, analysing parts and wholes, evaluating information and building confidence in their judgements.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils are new to the strategy and are unable to complete the diagram.	This is not unusual. Model an easy example, talking through each step of the diagram as you draw it, e.g. TV programmes, children's TV programmes, cartoons.
A significant number of pupils are unable to produce an intelligible diagram.	<p>The task may be unreasonably difficult, for example, there may be too many classes. Remove some classes to enable pupils to make a start.</p> <p>Alternatively, pupils could be misled by specific items masquerading as classes (dogs, big dogs, Yorkshire terrier). Remove the specific example or make it less specific, e.g. terriers.</p> <p>Both of the above can be avoided by making sure that you have worked through the task yourself.</p>
Different pupils create different diagrams.	Don't worry. A challenging task will lead to different outcomes. Encourage pupils to explain their diagrams and to consider the meaning of particular areas by positioning examples.
Pupils have areas on the diagram which are empty and have no meaning.	Ask questions such as, 'Give me an example of what would go in this area?', 'Can you tell me in which area this example should go?'.
Pupils struggle with the relative size of parts of the diagram.	Reassure them that relative size is not important, only the relationship illustrated.

## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to 'unpack' what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about information processing. The pupil responses relate to the mathematics example.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	'How did you decide where things went?'	'It is easier to just do something, you know, make a start. You might say "Well I think they look like this" and then the others can start to question what you have drawn. Just draw something – you can always change it if you ask good questions!'

<b>Reflective – specific</b>	‘What terms were most difficult to sort out?’	‘The rhombus was hard because you want it to be regular but then you realise the angles are not equal.’
<b>Reflective – insight</b>	‘Has drawing the diagram helped you to understand the meaning of the terms?’	‘Yes, because it has made me realise that every rhombus can also be called a parallelogram.’
<b>Reasoning</b>	‘Why did you revise your diagram? What prompted you to do it?’	‘I had to make rectangles and regular shapes overlap when I discovered that a square is just a special case of a rectangle.’
<b>Challenge question</b>	‘Do you have a mental picture of how one part of the diagram relates to another and do you think you will remember this relationship?’	‘I do for two of the things but I think it would be hard to try to put more than two together.’
<b>Application question</b>	<p>‘Why is this strategy more helpful than simply looking up words in a dictionary?’</p> <p>‘Can you suggest other topics where a diagram like this might be helpful?’</p>	<p>‘In a dictionary it just tells you what one thing is. I knew that already but this makes me realise that what matters is what makes some rectangles be called a square.’</p> <p>‘For triangles...’</p> <p>‘Maybe we could talk about symmetry...’</p>

## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to process information and use relational diagrams. They can be used either at the beginning or the end of lessons. Further examples in school that could be discussed:

- A class are barred from going on a school trip when it is only some of them who misbehaved on the last one.
- Other topics where a diagram like this could be useful, such as in geography, sorting out the meaning of such terms as *hurricane*, *oil spill*, *hazard*, *natural hazard*, *flood*, *pollution*, *disaster* and *global warming*.

Some examples in everyday life of how a relational diagram could be used to support or understand an argument:

- People who are prejudiced have got their relational diagrams all wrong. ‘Young men are lazy wastrels’, ‘Girls are swots’, ‘All chart music is manufactured rubbish’, are all examples of statements where the speaker is confusing ‘some’ with ‘all’, leading to gross overgeneralisations. Can pupils think of other examples? Discuss why people might do this.

- A parent says, 'You can only use the computer for two hours a day, for educational purposes only and no games'. The child could use a relational diagram to show that some games are educational and renegotiate this rule!
- Supermarkets have to group their products to make shopping easier. Relational diagrams could help them think about which groups need to be close together, e.g. baking and hot drinks (sugar and cocoa needed for both).

# Summarising

*We use summarising naturally, for example, when recounting an event. But effective summarising, selecting salient points and presenting them in a concise and ordered manner, is a skill that needs to be developed. Pupils who tend to give narrative accounts when they summarise need to make the step to sifting out themes and main messages. The basic idea is for pupils to find the main threads in the information and make connections between these threads. Summarising usually involves:*

- making inferences to fill in things that are not stated;
- synthesising information to give the main gist.

## 1. Rationale

The ability to summarise indicates a capacity to capture the meaning and essence of a passage, an event or an experience. It is important both for formal note taking but equally for pupils to help peers understand things that they have not made sense of yet.

You may have had the experience of listening to someone whose monologue is peppered with 'And she said...' and 'So I said...' and 'Then she turned around and said...'. It can be difficult to follow and you lose the plot. Or consider what follows when you ask a child what a book or film has been about and they recount what happened in minute detail (which is better than not remembering).

'Summarising' is more than recounting in fewer words, although this is valuable. It is also that ability to condense and convey meaning. It is evident that many higher education students are ill-prepared to summarise lectures, books and website text, which is an indication of the need for the skill.

## 2. National Curriculum thinking skills addressed

'Summarising' directly addresses **Information processing**, particularly collecting information, sorting and classifying and sequencing. 'Summarising' is also strong for **Evaluation** where pupils are asked to evaluate the appropriateness of the information they have selected and develop confidence in their judgements.

Other thinking skills, which can be significantly addressed, where the teacher creates opportunities, include:

- **Reasoning**, where pupils make inferences and deductions.

## 3. Planning to use the strategy

'Summarising' is a composite of different skills, and approaches will need to vary according to the nature of the information presented and the purpose of the task. Note taking, for example, includes: making sense of text; determining relevance and importance of information; selection of information; identifying relationships between ideas; transforming information into new forms; abbreviation and concise use of language.

If pupils' skills are not well advanced then a suitable activity to start with may be a combination of text marking and modelling. Make a case for the importance of summarising – if someone asks you what a film is like you can't describe every scene shot by shot without your friend falling asleep.

A helpful approach is to describe five steps for summarising:

- 1 Delete unwanted extra (trivial) details that can go without losing the overall sense.
- 2 Delete information which is repeated in some way.
- 3 Replace detail with more general terms or descriptions.
- 4 Select a topic sentence or create one if it is missing.
- 5 Check that there is sufficient detail to make sense.

Model this process for pupils by thinking out loud as you summarise a text and get them to use highlighters and pencils to select and delete text as you talk.

Another general approach is to use summarising frames. There are a variety of different frames depending largely on the text-type or genre. An example is the Problem or Solution Frame:

The sections of the frame	The summary
The problem	
The context in terms of time, place, people	
One or more possible solutions, with pros and cons	
Reaching a decision about the best solution	
Consequences of using this solution	

Much writing in citizenship, geography, design and technology, RE, history and certainly some in science, PE and English is of this type. Outlines of the use of various summary frames can be found in *A Handbook for Classroom Instruction That Works*, by Robert Marzano et al. (Association for Supervision and Curriculum Development, 2001). Key Stage 3 Strategy sources include:

- *Literacy across the curriculum* training materials (DfEE 0235/2001), Module 10 *Using the library/learning centre*, Handout 10.8, provides examples of graphic note-taking devices.
- *Training materials for the foundation subjects* (DfES 0350/2002), Module 14 *Big concepts and skills*, presents an approach to summarising through drawing symbols to capture meaning.

Summarising is usually thought of in terms of text or narrative, but examples in mathematics or science might be summarising the shape of curves by sketching main features, or the essence of a problem in a diagram representing key aspects and data, or transforming information into new forms, e.g. using chemical symbols and formulae. These forms of re-representing are very powerful in helping understanding.



## 4. Teaching a lesson in the cycle

Where the three departments have decided to focus on the thinking skill of **Evaluation** then the 'Summarising' strategy is a suitable choice to support and promote this. Lessons in the cycle should be set in the context of a forthcoming topic or unit of work in the appropriate subject, not 'one-off' lessons. Plan to include:

- an objective explicitly related to Evaluation that is common to all lessons in the cycle and is revisited in each of the plenaries, using planned questions to draw out pupils' thinking;
- an objective related to the subject or context of the lesson that is not the focus of the plenary but can be picked up in a subsequent lesson in that subject.

The following **ICT example** is for the second lesson in the cycle. In the first lesson pupils would have been introduced to simple summarising activities and have begun to evaluate the appropriateness of the information selected.

This lesson is based on the Year 7 scheme of work objective, '*Pupils should learn to identify valuable information and organise and refine ideas using word processing software*'. For this lesson the objectives are for pupils to:

- use criteria to evaluate the appropriateness of the information they have selected about sharks;
- be able to use ICT software to delete, draft and redraft the information.

In their previous ICT lesson, pupils were provided with selected websites to collect text about sharks in order to produce a multimedia presentation. The text from their searches had been saved centrally, copied and pasted into a word-processing package and the file made available in the shared area. The pupils had noticed that there was repetition of information from the different sites.

The teacher might start the lesson by saying to the pupils: '*Remember the first lesson in the cycle where you were focusing on summarising information by removing any unnecessary details without losing the overall sense. In today's lesson we are going to develop further the skill of evaluating the information we select and deciding whether it is appropriate.*'

The teacher reminds pupils of the audience for their final presentation and the maximum size of the summary produced in the lesson. A class discussion is used to agree some criteria for evaluating the final product, for example, that any images are referred to in the text and that information is arranged into clear paragraphs which contain a topic sentence. Where multimedia are used, the choice of media adds something to what has already been presented.

Pupils work in pairs to use cut-and-paste facilities to reorder the text so that similar references are paired together. The file is saved as the first version. They are then asked to use the software highlighter to mark any text which could be lost without detracting from the sense of the piece. In their turn pupils explain to one another the rationale for their choice and, once agreed, this second version is saved.

Pupils then read their work paragraph by paragraph to check that they have similar information in the correct place. They also check the appropriateness of the information for the chosen audience and save this as their final version. This version is e-mailed to another pair of pupils who evaluate the quality of the

summary using the agreed criteria. Comments could be added using either a different coloured font or call-out shapes. This would be e-mailed back ready for redrafting in the following lesson.

## 5. Creating the right level of challenge

To support lower-achieving pupils you might:


- model the process of text marking and allow pupils to practise it;
- model five steps for summarising, talking out loud as you do it;
- use a summarising frame or a graphic note-taking device;
- use an 'Advance organiser' to reduce the amount of material a pupil has to consider.

To challenge higher-achieving pupils you can:

- introduce a novel approach or ask pupils to summarise in different ways and compare them to decide when each might be most appropriate;
- ask pupils to transform information into another form, such as a concept map, to show relationships between ideas;
- challenge pupils to summarise the same information for different audiences;
- require pupils to identify bias in the information and judge validity and reliability.

## 6. Identifying successful thinking

Levels of response or staged success criteria can be used to support teachers in short- and medium-term planning for progression in **Evaluation**. They might also be used as part of assessment for learning to help pupils improve their own skills of information processing or evaluation through peer- and self-assessment.

- 
- Pupils can identify one or two criteria for evaluating the information they have selected but cannot apply them appropriately.
  - Pupils can suggest one or two criteria and apply them to selected information but cannot produce a complete evaluation.
  - Pupils can suggest a variety of criteria and can apply them individually to selected information but struggle to reach a conclusion about the work and how it could be improved – the evaluation is incomplete.
  - Pupils use a variety of criteria and can use them independently to come to a defensible position on why certain pieces of information should be in the summary. They can suggest sensible changes that would improve the overall quality of the work.
  - Pupils can generate 'insightful' criteria that go beyond the obvious and generate several appropriate summaries based on variations in purpose.

In progressing through these levels pupils are holistically improving their ability to collect information, sorting and classifying skills, sequencing skills, evaluation of the information and confidence in their judgements about the information selected.

## 7. Troubleshooting

Possible difficulties	Possible solutions
Pupils respond without enthusiasm and see this as 'old hat'.	Check the level of their skills – they may be very good, in which case move on. They may not be too good, in which case try to convince them of the value of summarising and use an approach that sparks their interest – perhaps model the process through 'thinking aloud' and asking them to spot deliberate mistakes or use the approach in the foundation subjects <i>Big concepts and skills</i> module (see page 106).
Pupils struggle with the tasks set. They cannot begin to sift out the main meaning.	Give them an advance organiser (see section on this strategy, page 33) and then support their use of the organiser. This reduces the amount of information they have to consider.

## 8. Metacognitive plenaries

Questioning for metacognition helps pupils to 'unpack' what and how they have learned and what they might do with this learning. The following sequence of generic questions can be used to encourage pupils to be metacognitive about summarising. The pupil responses relate to the ICT example.

Type of question	Generic teacher questions	Exemplar pupil responses
<b>Reflective – general</b>	'How did you decide what information to leave out?'	'We left out stuff about films like <i>Jaws</i> and decided to keep to descriptions and facts like how long they are and how heavy.'
<b>Reflective – specific</b>	'How do paragraphs help you when you are summarising?'  'What sentences in a paragraph are especially helpful in doing a summary?'	'Paragraphs group similar sentences about things together and the first sentence gives you the best detail.'
<b>Reasoning</b>	'Is this the best way you have come across of summarising – is there another way you would prefer? Why?'	'This was good because you saved the earlier version, so you could always get it back again if you made a mistake.'

<b>Challenge</b>	<p>'Why do you think it is important to consider the purpose of the summarising?'</p> <p>'What difference does it make if the summary is for you or for someone else?'</p>	<p>'You need to think about the audience and purpose of the piece. It is different writing for other people because you don't know what they know to start with and you do for yourself.'</p>
<b>Application</b>	<p>'Where can you use summarising to help you in school?'</p> <p>'What are the important things to remember when you are summarising?'</p>	<p>'Summarising helps when you have to write reports on things.'</p> <p>'Remember not to put in anything unnecessary and not to repeat things.'</p>

## 9. Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture with regard to the value of being able to evaluate. They can be used either at the beginning or the end of lessons. The ability to summarise is essential in:

- selecting key points for revision;
- making good notes in a lesson or contributing to the plenary.

In everyday life:

- Although people use it less often now, secretaries used to be trained in shorthand, so when their boss dictated a letter to them they could note it down in squiggles so that they could type up the letter almost word for word. Tape recorders are often used now. How do you take notes if someone is giving you instructions over the telephone?
- If you think about advertising, it is a form of summarising. On billboards you cannot give all the text to explain a product – you have to put a message that says something attractive about the product and images that are eye-catching or memorable. Once people are familiar with a product advertisement you can start to reduce the number of words further as they know the rest.
- If you go to college or university then you need to be good at summarising so that you can take notes from lectures and books. Many people are not good at it and work takes them longer, and sometimes they don't get the right things recorded.
- You summarise by telling your friends the main events from last night's soap opera or the gist of a conversation with a friend.

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## Appendix 1: Planning, observing and reviewing templates

The following templates are also available in Word format, so that you can adapt them to suit your purposes (refer to notes on page 12).

- Collaborative lesson planning template
- Lesson observation schedule
- Collaborative cycle review template
- Pupil information sheet
- Pupil review sheet/log

## Leading in Learning: collaborative lesson planning template

<b>Subjects and teachers:</b>		
<b>Subject:</b>	<b>Class:</b>	<b>Position in cycle (1, 2 or 3):</b>
<b>Topic:</b>		<b>Strategy:</b>
<b>Thinking skill:</b>		<b>Subsequent reflections</b>
<b>Thinking skill objective:</b>		
<b>Subject objective:</b>		
<b>Launch:</b>		
<b>Group work:</b>		
<b>Metacognitive plenary questions:</b>		
<b>Bridging:</b>		

## Leading in Learning: lesson observation schedule

Feature	Observations
Launch phase	
Refers to thinking skills focus and what is involved	
Bridges to other lessons, subjects, contexts	
Refers to learning behaviours, collaborative working, sharing ideas, etc.	
Involves pupils in clarifying terms and procedures, but leaves task open	
Group work phase	
Pupils actively engaged in group work, on a challenging problem or task	
Teacher eavesdrops on groups, noting points for plenary	
Teacher intervenes minimally, helping groups resolve difficulties or providing more challenge	
Plenary	
Uses planned questions and observations to draw out pupils' thinking:  ■ reasoning ('why?')  ■ reflection ('how?')  ■ challenge ('have you thought of?')  ■ application ('where else?')	
Develops extended responses and sharing of thinking using appropriate language	
Prompts pupils for justification, comments and questions, alternative approaches or conclusions, evaluation and rethinking	
Encourages pupils to reflect on the thinking skill and its wider application, bridging to other lessons and subjects and to contexts outside school	



## Leading in Learning: collaborative cycle review template

<b>Subjects and teachers in cycle order:</b>			
<b>Date:</b>	<b>Cycle no.:</b>	<b>Thinking skill:</b>	<b>Strategy:</b>
<b>Is there evidence that pupils' thinking skills have improved over the three lessons? Give examples.</b>			
<b>What were the key events in the lessons which enabled pupils to make progress? What did you do as teachers that helped this to happen?</b>			
<b>How might you change the lessons if you were to repeat them?</b>			
<b>What are the implications for developments in the next cycle?</b>			
<b>What are the longer-term implications for the way that the school supports and develops the teaching of thinking?</b>			

## Leading in Learning: pupil information sheet

We are working together on a school project in Year (X) to develop thinking and learning skills. Teachers in (*insert subjects*) are planning some lessons together so that the links between the way you learn in these three subjects is made clear. These lessons are planned to help you improve your thinking skills – skills such as comparing and contrasting, explaining, creative thinking, evaluating information and making decisions (*replace with details of particular thinking skill, if appropriate*). You use these skills in many lessons so if you get better at them you should be able to improve the way you learn in all subjects and apply these skills outside of school. They are the kinds of skills that are highly prized by employers.

We are asking for your help in this project in the following ways:

- Trying and thinking hard in the lessons, sharing your ideas with your teacher and classmates – like your usual self.
- Helping the teachers by explaining to them how you have learned in previous thinking skills lessons and how you think this links with the present lesson.
- Cooperating with observers or acting naturally during filming (we may video some lessons).
- Filling in a review sheet to say what you thought of the lessons and what you have learned from them.
- Talking about how the lessons have helped you. Talk to friends who haven't been in the lessons, other teachers, your parents or carers.
- Helping with interviews. A few of you will be asked for your thoughts on the lessons.

Thank you for your help. Some information will be produced at the end of the project to highlight the successes and spell out the next stages of development. This will be shared with you because you are important partners in the project.

## Leading in Learning: pupil review sheet

<b>Name:</b>	<b>Class:</b>	<b>Thinking skill:</b>
<b>Date:</b>	<b>1st lesson subject:</b>	
What did you learn about thinking?		
Where else could you use this kind of thinking in or outside school?		
<b>Date :</b>	<b>2nd lesson subject:</b>	
What did you learn about thinking and how have you improved in the second lesson?		
Where else could you use this kind of thinking in or outside school?		
<b>Date :</b>	<b>3rd lesson subject:</b>	
What did you learn about thinking and how have you improved over the three lessons?		
What stands out from what you learned from these three lessons as being particularly important, interesting or useful – and why?		

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## Appendix 2: Further steps in developing progression

### The SOLO taxonomy

Little is yet known about progression in thinking skills. So, for example, there is no clear map of the stages pupils might advance through in improving their creative thinking skills, nor indeed in the particular context of the 'Reading images' strategy. But as more schools engage with thinking skills there is a need for further development in this area.

The SOLO (Structure of Learning Outcomes) taxonomy was developed by Australian researchers Biggs and Collis (1982), who investigated recurring features of quality in pupils' written work across a variety of subjects. It has, therefore, an empirical base. The authors acknowledged that they were influenced by Piaget's description of stages in cognitive development.

The Leading in Learning pilot has indicated that the range of pupil performance in the strategies can be related to levels in the SOLO taxonomy. The following tables outline:

- the SOLO taxonomy as a generalised description in relation to thinking skills;
- generalised descriptions of performance in four of the National Curriculum thinking skills using the SOLO levels, with examples derived from one of the teaching strategies. (Enquiry is not included as it is a broader process than the others, not easily captured in these relatively simple descriptions.)

When referring to the tables note the following points.

- These descriptions are tentative. To improve their validity and usefulness they need further research based on the experience of other trios of teachers, to be disseminated by the Strategy.
- They are intended to help teachers assess performance in order to plan their teaching to move pupils on, not as summative judgements.
- Very few pupils will be working at the lowest levels, especially if they are working in collaborative groups, as this builds confidence and competence. Further, the SOLO taxonomy was developed from analysis of written work and it is very common for the quality of pupils' thinking and talking to be in advance of their written work.
- The jump from Relational to Extended abstract is probably the most difficult to make as it cannot easily be 'taught'. These levels represent different qualities of thought. Extended abstract thinking is characteristic of higher-order thinking.

<b>SOLO taxonomy levels</b>	<b>Generalised description in relation to thinking skills</b>
Pre-structural	Pupils may be able to engage with the data offered by the task but they don't address the task or question, although they do some 'work'. They may reveal misconceptions related to the data.
Uni-structural	The pupil identifies one or two data items that are relevant to the task and uses them to engage with the task, but does not manage to complete the task or answer the question successfully.
Multi-structural	The pupil identifies 3+ data items relevant to the task and uses them to engage with the task, but does not manage to complete the task or answer the question successfully.
Relational	The pupil selects relevant data items and links them together to reach an acceptable conclusion.
Extended abstract	The pupil generates multiple solutions. They tend to use considerable existing knowledge (i.e. not given) to interpret the problem and use abstract or advanced concepts to structure their solution.

## The taxonomy applied to particular thinking skills

The following examples are illustrative of how the SOLO taxonomy might be applied to the following thinking skills in context: Reasoning (context: Living graphs and fortune lines), Creative thinking (context: Reading images), Evaluation (context: Audience and purpose) and Information processing (context: Relational diagrams).

<b>SOLO level</b>	<b>SOLO-related levels for Reasoning, using 'Living graphs and fortune lines'</b>
	These skills enable pupils to give reasons for opinions and actions, to draw inferences and make deductions, to use precise language to explain what they think and to make judgements and decisions informed by reason or evidence.
Pre-structural	Pupils understand what they have to do and may be able to place a statement, but the answer is not defensible and reveals misunderstandings.
Uni-structural	The pupil produces one or two defensible answers – they have a reason, usually expressed in one clause. (Here, completing the task is interpreted as placing most statements.)
Multi-structural	The pupil places the majority of statements, each of which is defensible, but there is no linkage between the reasoning for any of the placements. Evidence to back reasons will be sparse.

Relational	The pupil places the majority of statements and there is linkage between their explanations, such as 'this one has to come after that one'. There is a thread connecting the statements so that there is an underpinning logic. They may use their own knowledge to aid interpretation and they are more likely to use evidence. They are likely to be using mental pictures to aid their thinking.
Extended abstract	The pupil can advance alternative positions for the statements which hinge on different assumptions. They have used substantial amounts of their own knowledge to aid interpretation. Their mental pictures will have considerable relation to reality.

<b>SOLO level</b>	<b>SOLO-related levels for Creative thinking, using 'Reading images'</b> These skills enable pupils to generate and extend ideas, to suggest hypotheses, to apply imagination and to look for alternative innovative outcomes.
Pre-structural	Pupils understand the task but the connections appear totally random.
Uni-structural	The pupil identifies one or two visible features in the image and can connect it to the task.
Multi-structural	The pupil identifies 3+ features in the image(s) and can connect them to the task but there is no clear linkage between the features.
Relational	The pupil identifies several features in the image and can link them together to create a whole idea, interpretation or theory. If asked to produce a title it is more likely to be descriptive, related to visible features in the image.
Extended abstract	The pupil can generate several frames or theories to interpret the whole image(s). If asked to produce a title the pupil is capable of producing an abstract title that goes beyond the visible features.

<b>SOLO level</b>	<b>SOLO-related levels for Evaluation, using 'Audience and purpose'</b> Evaluation skills enable pupils to evaluate information, to judge the value of what they read, hear and do, to develop criteria for judging the value of their own and others' work or ideas and to have confidence in their judgements.
Pre-structural	The pupil can suggest one or two criteria for evaluating how well a product or message suits its audience or purpose but cannot apply them appropriately.

Uni-structural	The pupil can suggest one or two criteria and apply them to the products.
Multi-structural	The pupil suggests a variety of criteria and can apply them individually to the products. They struggle to reach a conclusion about the 'best' solution as they cannot reconcile conflicting criteria.
Relational	The pupil uses a variety of criteria and can use them independently to come to a defensible position on which is the best or appropriate product or message.
Extended abstract	The pupil can generate 'insightful' criteria that go beyond the obvious, can generate several 'best' solutions based on variations in purpose and can imagine contrasting scenarios.

<b>SOLO level</b>	<b>SOLO-related levels for Information processing, using 'Relational diagrams'</b> Information-processing skills enable pupils to locate and collect relevant information, to sort, classify, sequence, compare and contrast and to analyse part/whole relationships.
Pre-structural	The pupil can locate some words in part of a diagram but without adequate justification.
Uni-structural	The pupil can correctly classify one or two words into appropriate parts of a diagram (comparing and contrasting) but is unlikely to be able to use overlapping or subsets or be able to generate their own diagrams.
Multi-structural	The pupil can correctly classify 3+ words into appropriate parts of the diagram but still cannot use overlapping sets or subsets consistently or generate their own diagrams.
Relational	The pupil can locate the majority of statements and use overlapping sets and/or subsets, i.e. they can use multiple criteria (usually concrete/visible) to classify something. They can also generate and label simple diagrams of their own, indicating a grasp of part/whole relationships.
Extended abstract	The pupil can locate words in a variety of positions in the diagram based on alternative interpretations of the word. They can confidently generate and use their own diagrams and use abstract terms in classifying.



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## Appendix 3: The evolution of teaching thinking skills

The Leading in Learning initiative is not a revolution, it is the culmination of decades of experimentation by educators who believed that it is important for pupils to be equipped to be good learners and thinkers. It is valuable to understand the nature of this legacy in order to build securely on it. One can recognise, perhaps, five main strands of thinking and innovation that have been interwoven to produce current understanding and practice.

### 1. The psychological perspective

The first strand is primarily psychological and focuses on how individuals think and learn, what factors influence these processes and indeed how these processes develop through childhood. This strand owes much to the Swiss psychologist, Piaget. His work was once a mainstay of teacher training courses, but is currently much less influential. There are many criticisms of his best-known work that described stages in cognitive development through childhood and adolescence. Nonetheless, the work remains important for understanding thinking skills teaching as, for example, he highlights some of the qualitative differences in thinking as adolescents proceed from concrete thought (or concrete operations) to abstract thought (formal operations). The transition from the former to the latter is associated with vital cognitive abilities, such as being able to consider alternative viewpoints, understand complex causation, proportionality and systems, and generate plausible scientific hypotheses. These abilities have much to do with being able to 'imagine' or model in your head how multiple variables or phenomena interact, when they cannot be directly experienced. Piaget has directly influenced the design and implementation of CASE (Cognitive Acceleration through Science and Education – see below) and CAME (Cognitive Acceleration through Mathematics Education), which are specific interventions through subject teaching.

### 2. The socio-cultural perspective

The inspiration of this field of research is the Russian social anthropologist, Vygotsky. Although he worked in the 1920s and 1930s his work was not widely known in the West until fifty years later. One critical difference in the work of Vygotsky compared to Piaget was that he stressed the role of language in development. So whereas Piaget implied that development was governed by a biological clock and that language was only the medium through which thought took place, Vygotsky regarded language as an instrument of thought which acted as a catalyst for cognitive development. He also developed the concept of a Zone of Proximal Development (ZPD), translated more recently as 'Zone of Potential Development'. The ZPD is the gap between what an individual is able to do alone and what they can do with an adult or peer who is more knowledgeable or skilled. This gap closes as the child gradually masters and internalises the thinking that they managed with peers or an adult. Vygotsky laid the foundations for believing that children could be taught to be better thinkers and learners, through the medium of language. In simple terms, Vygotsky leads us to believe that good thinking is a set of cultural tools passed on from one generation to another and

some low-achieving pupils have just missed out on the transmission process – the baton has been fumbled.

### 3. The philosophical perspective

Although philosophy has long been associated with ‘public’ schools, it is the American Matthew Lipman who has been most important in influencing current practice in teaching thinking. Lipman’s work became high profile from 1980 as he argued that young children are natural philosophers intent upon enquiry and he produced a number of novellas to stimulate logical reasoning. Furthermore, evidence shows that in the US there were long-lasting effects on both logical reasoning and reading scores in experimental groups. One of the most important features of the approach is group discussion in which reasoning (evidence, assumptions, prejudices and all) is verbalised so that it can be scrutinised and made accessible to all.

### 4. The metacognitive perspective

The fourth strand flows from cognitive science and the legacy of Piaget and Vygotsky. In simple terms metacognition means thinking about thinking, but its significance lies in the sense that it represents planning, monitoring and self-regulating during problem solving. It offers the prospect of pupils being less impulsive, making best use of what they do already know and becoming autonomous and independent in their learning. The development of metacognition is dependent on providing pupils with a language through which they can identify and manipulate thought processes and social interaction. Most programmes for teaching thinking stress the importance of metacognition.

### 5. Pupil motivation and self-theories

Finally in this brief review attention is drawn to research on pupil motivation and self-theories. The American researcher Carol Dweck has been especially important in building understanding in this field and making it accessible. Dweck argues that pupils’ willingness to engage in challenging open-ended tasks is strongly related to the ‘naïve’ theory they have about ability or intelligence. Some pupils believe ability is not fixed and that you improve by learning from challenging tasks, while others believe that you are born with a fixed ability. The latter group do not like learning challenges as they risk confirming that they are not clever or that they are not as clever as they think. Such pupils like routine or predictable work, and it is success in such mundane tasks that may encourage the theory of fixed ability.

## Teaching thinking skills in England in the last 25 years

It is pertinent to begin the recent history of teaching thinking in England with Instrumental Enrichment. The originator of this programme was an Israeli psychologist, Reuven Feuerstein, who worked with disadvantaged immigrant children. His analysis and intervention are based fundamentally on Vygotsky’s work.

Feuerstein therefore worked from the basis that thinking is a set of cultural tools passed down from one generation to another. In the case of the young people from culturally impoverished backgrounds, they had missed high-quality interaction with adults or more capable peers, so that they had not been inducted into important tools of thinking. This is seen as a cognitive 'deficit' which results in young people being impulsive, lacking the ability to perceive information accurately or identify the nature of problems, being prone to trial-and-error responses and being unclear in expressing themselves.

The programme consists of 14 progressively more demanding 'instruments'. The early ones cover such cognitive functions as pattern detection and orientation in space, while the later ones progress to more demanding thinking. The teacher's role is vital in encouraging pupils to focus, define problems, use what they know, plan strategies and develop a language for thinking and learning. This is 'instruction' in Vygotsky's theoretical framework. Further, Feuerstein places much emphasis on bridging to encourage connections with other contexts.

In a thorough evaluation of the use of the programme in Somerset, Blagg reported that there was no evidence of an effect on academic performance, but there was some evidence of improved motivation and behaviour. However, strong evidence of effects on academic attainment has been reported from other countries. Blagg's account was valuable in drawing attention to a variety of implementation factors that made success difficult in a system that was not geared to support it. Instrumental Enrichment has stimulated the development of many similar programmes, the most prominent of which are Somerset Thinking Skills ([www.somersetthinkingskills.co.uk](http://www.somersetthinkingskills.co.uk)) and *Top Ten Thinking Tactics* (Lake & Needham, 1993).

Another landmark in teaching thinking skills in England is CASE/CAME, which together have generated the best evidence of impact at both Key Stage 3 and GCSE. It is important to point out that CASE and CAME seek to improve the overall thinking ability of a pupil, through improving the capacity of what is termed the central processor. In this approach much transfer is achieved because the pupil has generically become capable of formal operations (high-order thinking) as outlined by Piaget. This is in contrast to most programmes which seek to improve specific thinking 'skills' such as sequencing. Thus the influence of Piaget is very strong on CASE and in addition uses another of his ideas – cognitive conflict. CASE (and CAME) lessons are designed to confound pupils through experiments that generate outcomes that conflict with their existing understanding of the world, which they are encouraged to resolve. It is thought that repeated exposure to such conflicts and their resolution develops a more generalised ability to think better.

In primary schools in particular, teaching based on the work of Matthew Lipman has become increasingly popular. Known generally as Philosophy for Children (P4C), it uses a technique called Community of Enquiry and is largely promoted and supported in England by the charity SAPERE (Society for the Advancement of Philosophical Enquiry and Reflection in Education, website: [www.sapere.net](http://www.sapere.net)). According to SAPERE, P4C uses philosophical enquiry both 'as a model of rigorous thinking and as a celebration of wonder and open-mindedness'. Such an approach finds a natural home in primary education because it stresses the importance of a community of learners, such as a class. However, a number of secondary schools have used Community of Enquiry to improve speaking and listening, to sharpen thinking skills and to focus on logic and the characteristics of

good thinking. While the roots of this approach lie very much in philosophy, it does align with the tradition of improving specific skills through practice and making thinking explicit.

Finally, in the last 10 years there has been a surge of work in infusing teaching thinking into subjects through the use of 'Powerful Pedagogical Strategies'. This work started in geography and then developed in other humanities subjects in north-east England through using very adaptable strategies such as 'Mysteries', 'Living graphs', 'Fact or opinion' and 'Taboo' (some of which are included in this handbook). The approach has spread into most other subjects including English and modern foreign languages. The 'Thinking Through' framework is an infusion methodology which offers great flexibility while using some of the tenets of Vygotsky. It places particular emphasis on teachers 'debriefing' pupils to help them explore not only their solutions but also how they have been derived and what can be generalised and applied in other contexts – they are teaching to develop metacognition. 'Big' concepts are identified in many contexts to help pupils see the recurring patterns in subjects and human thinking. Further, the popular work of Edward De Bono (e.g. *Six Thinking Hats*) and Tony Buzan is finding a home within this subject infusion methodology.

During these last 10 years the groundswell of interest in improving pupils' capacity to think and learn has led to local pockets of interest and expertise, which sometimes have become whole-school concerns. This flowering has had the following characteristics:

- It has been substantially bottom up, with individuals and groups infusing teaching into their subject teaching. Even with CASE and CAME there has been a tendency to customise in an effort to both strengthen the programme and make it more compatible with other agendas.
- There has been much sharing of practice by networks of teachers.
- It has dovetailed with the resurgence in teachers' action research and has proved a popular vehicle for exploring and developing practice.
- It has exposed some weaknesses in teaching, particularly plenaries (or debriefing), scaffolding (to help pupils progress within the Zone of Proximal Development) and aspects of subject knowledge, such as what a subject is fundamentally about, so that teachers often reach a plateau in their teaching and experience some frustration.
- Schools have struggled to make teaching thinking skills coherent across National Curriculum subjects as there has been no framework for describing progression or to connect learning in different subject contexts.

## Conclusion

McGuinness (1998), in her research review for the DfEE (as it was then) of the teaching of thinking skills, identified seven core concepts in a framework for the development of thinking skills. These are outlined in the table below with an indication of how they are addressed in the Leading in Learning programme.

Concept	Feature of Leading in Learning
The need to make thinking skills explicit in the curriculum	The 3-lesson cycle with the emphasis on transfer between and beyond lessons makes the thinking explicit.
Teaching through a form of coaching	Teachers are encouraged to 'assess' the current performance of groups and individuals in tasks, in order to move their thinking skills on.
Taking a metacognitive perspective	The plenary should explore how tasks have been done, pupils should be asked what they already know that they can use and finally, pupils have the chance to reflect on lessons in their learning logs.
Collaborative learning	It is stressed that most strategies should be done through group work with attention paid to developing pupils' ability to collaborate, not least in non-friendship groups.
Creating dispositions and habits of good thinking	Teachers are stressing and valuing good thinking rather than a particular right answer, thus encouraging pupils to take risks and think their way through problems.
Generalising framework to thinking curricula	The five National Curriculum thinking skills provide the backbone of planning, teaching and reviewing teaching and learning. They encourage an emphasis on the connections between subjects and the transfer of learning.
Creating thinking classrooms and thinking schools	The handbook lays out an important role for senior managers both in supporting and learning from the initiative.

## Further reading

Books that provide further guidance on powerful teaching tools:

Baumfield, V. (2002) *Thinking Through Religious Education*, Chris Kington Publishing.

Buzan, T. (2003) *Use Your Head*, London: BBC Consumer Publishing.

Counsell, C. (1997) *Analytical and Discursive Writing at KS3*, Shaftesbury: Historical Association.

De Bono, E. (2000) *Six Thinking Hats*, London: Penguin.

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- Leat, D. (ed) (1998) *Thinking Through Geography*, Chris Kington Publishing.
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- Nichols, A. (ed) (2001) *More Thinking Through Geography*, Chris Kington Publishing.
- White, R. & Gunstone, R. (1992) *Probing Understanding*, London: Falmer Press.
- More general reading:
- Adey, P. & Shayer, M. (1994) *Really Raising Standards*, London: Routledge. (Gives a comprehensive background to CASE and other interventions.)
- Biggs, J. & Collis, K. (1982) *Evaluating the Quality of Learning*, New York: Academic Press.
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- Resnick, L. (1987) *Education and Learning to Think*, Washington, DC: National Academy Press.
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- Wood, D. (1988) *How Children Think and Learn*, Oxford: Blackwell. (An introduction to the work of Piaget, Vygotsky and Bruner.)



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