Guidance

Curriculum and
Standards

Teachers

Status: Recommended

Date of issue: 02-2006

Ref: 2111-2006DWO-EN

Secondary
National Strategy
for school improvement

Leading in Learning: developing thinking skills in secondary schools

Key Stage 4 Handbook for teachers

department for
education and skills
creating opportunity, releasing potential, achieving excellence

Acknowledgements

We are grateful to the following local authorities for piloting the Leading in Learning materials at Key Stage 4: East Riding, Kensington and Chelsea, North Tyneside, Nottinghamshire and Worcestershire.

We are grateful to the following for permission to reproduce copyright material:

Getty Images for Gravestone 2005
[David Toase]/[Photodisc Green]/Getty Images

Corbis for Credit card 2005

Corbis for Bills 2005

Disclaimer

The Department for Education and Skills wishes to make clear that the Department and its agents accept no responsibility for the actual content of any materials suggested as information sources in this document, whether these are in the form of printed publications or on a website.

In these materials icons, logos, software products and websites are used for contextual and practical reasons. Their use should not be interpreted as an endorsement of particular companies or their products.

The websites referred to in these materials existed at the time of going to print. Tutors should check all website references carefully to see if they have changed and substitute other references where appropriate.

2 **Leading in Learning: developing thinking skills in secondary schools**
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Contents

Appendices

Foreword

The Leading in Learning programme has been developed as part of the Secondary National 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 Secondary 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 2 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 *Key Stage 4 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 *Key Stage 4 Guide for school leaders* and a *Key Stage 4 School training manual*. They complement the Key Stage 3 materials that were published in February 2005 (0034-2005 G) to promote systematic involvement of teachers in all subjects to ensure a full pupil entitlement to the development of thinking skills.

5

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Introduction

Leading in Learning: the approach

Leading in Learning is a whole-school programme for teaching thinking skills. 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 lessons in each of **three subjects**. For the occasional lesson teachers are invited, not to abandon their subject, but to set subject content in a context where the objective is to develop a selected thinking skill and how it might be used in other subjects or in real life.

The model was piloted in four local authorities (LAs) at Key Stage 3 and five at Key Stage 4. 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-subject cycles with chosen classes;
- other teachers gain experience of teaching lessons with a thinking skills focus in preparation for making a contribution to 3-subject 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.

The Key Stage 4 model has some similarity to that at Key Stage 3.

- It focuses on developing the five National Curriculum thinking skills.
- It involves three teachers from each of three subjects working collaboratively on thinking skills lessons.
- It is based on a set of ten teaching strategies, eight retained from Key Stage 3 and two new ones particularly suited to thinking skills at Key Stage 4.

It also has some distinctive features.

- As a first stage, it involves analysis of strengths and weaknesses in coursework in the three subjects, with a view to identifying common aspects of thinking skills for development.
- Rather than just the single lesson in each subject of the Key Stage 3 model, it proposes a flexible model for lesson cycles that involve up to three lessons in each subject, allowing for a particular teaching strategy to be used more than once in a subject.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

Supporting resources

This handbook provides information and advice to help teachers implement the programme. It includes:

- guidance on the initial task of coursework analysis to be completed by the teachers involved;
- guidance on the three-subject cycle, improving thinking skills lessons and developing progression;
- notes on each of the teaching strategies, to which you will need to refer selectively over time;
- some planning, observation and review templates.

As a starting point for discussion, the subject exemplification provided to supplement the *Key Stage 3 Handbook for teachers* is also relevant to Key Stage 4. It illustrates the distinctive contribution the subject can make to the development of pupils' thinking skills and, for some strategies, gives brief subject examples as a stimulus to further ideas.

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

National Curriculum thinking skills

The National Curriculum defines five thinking skills as follows.

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.

The National Curriculum 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 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.
At Key Stage 4 the process aspects are often assessed in the form of coursework. 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. A teacher in the Key Stage 4 pilot commented:

'It became evident … that pupils were beginning to recognise the importance of focusing on the skills involved … and by using them across more than one subject were able to identify where the skills could be used in other lessons, coursework and within exam revision'.

Teachers and pupils in the Key Stage 4 pilot noticed other benefits too. Teachers often commented that, although the focus for their lesson was a thinking skill, nevertheless the teaching strategies they used helped pupils to achieve a more secure grasp of subject content.

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 intention is that this should be a whole-school initiative, developing a systematic entitlement for all pupils. It is the role of the school leader to strategically manage levels of involvement for specific departments and teachers.

8

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

The section on analysing thinking skills used in coursework is an essential preliminary for teachers who will be involved in the initial 3-subject cycles. However, it should also inform other teachers, as it provides an opportunity to consider the National Curriculum thinking skills and how they contribute to coursework in their subject. They might then try out one or two of the suggested teaching strategies in lessons with a thinking skills focus. **It is also important to understand the 3-subject 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.

9

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Thinking skills and coursework

The explicit focus of the Key Stage 4 model is the link between developing thinking skills and improving pupil performance in GCSE coursework. This approach capitalises on the fact that production of coursework is an area in which pupils must use a range of independent study and research skills in order to do well. The strategies described provide the pupil with techniques to improve thinking and learning and to notice this improvement. Involving them in this way will influence the way they perceive themselves as independent learners.

Although the main focus of the development links to coursework, improving thinking skills will also help to raise standards overall, by helping pupils to do well in examinations. This is likely to result from three main factors.

- In test circumstances, pupils' responses will draw on the same skills.

- Many of the strategies that are used to develop these skills are equally useful as revision techniques.

- Any developments that help pupils gain greater understanding of the big ideas of curriculum areas are likely to help them remember and reproduce their understanding.

Establishing the thinking skills focus

The first task will be for the school leader to select the three subjects and three teachers ('*Leading thinkers*') who will be involved in the initial 3-subject cycles. They will also need to choose three teaching groups so that as many pupils as possible appear in all groups. Once this has been done the trio will need to meet in order to establish the thinking skills focus. The table 'Establishing the thinking skills focus' sets out the planning process for the collaborative analysis of coursework in order to establish this focus for the cycles. In order to use it the teachers involved need to have copies of:

- the table (on the next page);

- the section 'Thinking skills and coursework' (pages 12–17);

- subject-specific documents and scripts as specified in the table;

- the Coursework analysis template (from appendix 1);

- the matching chart 'Thinking skills and strategies' (page 42).

Note also that this section concludes with a case study of three departments in one particular school (School A).

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Establishing the thinking skills focus

Task	Notes
Each of the three teachers makes an initial analysis of coursework issues within their own subject. The aim is to answer the following question. **What are the strengths and weaknesses of our pupils in GCSE coursework?**	This could involve working with a small group of teachers who teach the same subject at GCSE and the subject/faculty leader. Use: ■ the coursework criteria; ■ the examiners' reports on coursework; ■ a small sample of coursework representative of the range of attainment in the teaching groups of the teachers involved. The outcome of this will be two or three paragraphs of strengths and development points.
The three teachers and the school leader meet and compare their individual findings from coursework analysis. They will answer the following questions. **What do the strengths have in common?** **What do the development points have in common?**	It will be helpful to other teachers to illustrate development points with examples of coursework.
Points for development emerging from coursework analysis are used to identify a thinking skills focus. The three teachers will answer the question: **Is there a particular aspect of a thinking skill or skills that would be a common focus for the three subjects?**	The section on National Curriculum thinking skills and coursework and case study A provide support for this. The Coursework analysis template (appendix 1) should be used to capture the emerging issues in order to share these with pupils. The focus should be tight at this stage. It may be an aspect of one thinking skill or aspects of one or two thinking skills. The thinking skill chosen will be a consistent focus and will be used to evaluate the impact of the lessons.
The thinking skills focus is used to inform the selection of strategies that will be used to plan the 3-subject cycle.	The matching chart 'Thinking skills and strategies' helps to do this. The choice of later strategies may be provisional at this stage and could be reviewed after the earlier lessons.

National Curriculum thinking skills and coursework

The National Curriculum defines five thinking skills. (See the *National Curriculum: handbook for secondary teachers in England, 1999*: 'Promoting skills across the National Curriculum', pages 22–23.) The five thinking skills are reproduced below. In addition, each aspect of a thinking skill is linked to common issues from coursework with an example from a particular subject.

1 Information processing skills

These enable pupils to:

locate and collect relevant information

This is a very important component of all coursework and influences the final outcome. Pupils need to search a variety of sources and be very selective in choosing those that are relevant. In geography, a range of primary and secondary sources should be used selectively to enable the higher levels to be attained.

sort, classify, sequence

Once the data is collected it needs to be collated in a way that is appropriate to the problem. In mathematics, for instance, the sections of a handling data report have to be sequenced logically to enable pupils to produce a coherent analysis.

compare and contrast

The results of testing done during coursework frequently need to be compared and contrasted. For instance, in science pupils need to repeat their experiment to check the reliability of results or to repeat readings to take an average or check for anomalies.

analyse part/whole relationships

The higher levels of the criteria for coursework require pupils to see their work in the context of big concepts. Many of these big concepts, such as cause and effect, are common to several subjects. For instance, in history pupils have to relate their knowledge of the context and of the purpose of historical sources to the actual sources in order to evaluate them effectively. The sources cannot be evaluated in isolation.

2 Reasoning skills

These enable pupils to:

give reasons for opinions and actions

At many stages in their coursework pupils need to explain the reasons for what they are planning to do or what they have done. This may mean explaining why certain information has been included and the rationale for the way it has been collected. In resistant materials technology, for example, when doing a 'design and make' project, pupils need to explain the way in which early stages of research have addressed the needs of the audience and informed the final product.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

draw inferences and make deductions

This could involve pupils in 'reading between the lines' of a literary text, a table of results, an image or an artefact. In media studies, for example, pupils need to interpret and 'read' the image in order to determine its audience and purpose, rather than simply describing what they see.

use precise language to explain what they think

Description only attains the lower levels of coursework marks. To gain higher marks pupils must explain their thinking and make good use of technical language to do this. In geography a clear and full explanation would use technical language linked by connectives, for example 'Erosion is greatest on the outside of the meander because the velocity is greatest, therefore abrasion is greater there'.

make judgements and decisions informed by reason or evidence

Extended work may involve pupils in considering cases where 'right answers' are not immediately obvious. An appreciation of a variety of outcomes and the need to justify opinions is essential. Prioritising factors and judging their influence on events leading to the Second World War would be typical of higher levels of history coursework.

3 Enquiry skills

These enable pupils to:

ask relevant questions

This aspect is fundamental to many parts of coursework. Higher-order skills such as analysis and evaluation depend on pupils being willing and able to ask many questions. In PE, for instance, pupils need to ask detailed questions about the needs of an athlete when performing an activity in order to design for them an effective personal fitness programme.

pose and define problems

For coursework to be successful the initial finding and analysis of a problem is essential to success in the later stages. Many pupils find this difficult. For example, in ICT pupils may decide to design a website for a school production. The needs of the school and the audience for the website should be very clearly defined so that the final design fulfils the identified needs.

plan what to do and how to research

The main stages of coursework and the finer detail within those stages need to be planned carefully in all subjects. Biology coursework, for example, requires that pupils plan to ensure control of possible interfering factors if they are to meet the higher-level criteria.

predict outcomes and anticipate consequences

These skills are important in two senses in coursework. In one sense pupils need to form an opinion based on their research. In religious studies pupils frequently need to predict outcomes of the influence of religious beliefs upon followers or opponents

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

of a particular religion. They might go on to anticipate the consequences of those differences at a global level. In a second sense pupils need to speculate about outcomes and their consequences, and to make decisions accordingly, for example in any coursework where sampling is involved.

test conclusions and improve ideas

Coursework requires pupils to think about the validity of their conclusions and to consider how they could improve their work in the current or a subsequent piece. For example, in all science subjects pupils are required to think about whether evidence is reliable or whether limitations are present due to the choice of equipment. In order to reach the higher levels of attainment they should also be able to point to any weaknesses or gaps in the data and explain exactly what more could be done to improve it.

4 Creative thinking skills

These enable pupils to:

generate and extend ideas

This skill is necessary in most subjects if pupils are to access the higher levels of the assessment criteria for coursework. In design and technology, pupils often find difficulty in generating a variety of ideas and then explaining why one is more suitable than another. They also find it difficult to combine several ideas to generate one really good one for the final design.

suggest hypotheses

The need to predict and suggest hypotheses is common in coursework. For example, pupils doing mathematics handling data coursework need to state a hypothesis, making it clear what it is they are trying to find out and then checking after the planning stage to ensure that the procedure they have chosen will allow them to address the hypothesis.

apply imagination and look for alternative innovative outcomes

These skills are obviously important in the arts subjects but apply equally to other subjects when pupils are aiming for the higher grades. In modern foreign languages, for instance, verbs can be used in combination in a variety of tenses and used in positive and negative senses when describing, say, a healthy lifestyle.

5 Evaluation skills

These enable pupils to:

Evaluate information

Evaluation is an essential aspect of coursework that is frequently done in a cursory way, thus losing marks. In food technology, for instance, evaluation is necessary at various stages in the 'design and make' cycle. Pupils need to evaluate existing products against an identified need and to evaluate their own product against criteria that would enable it to meet the identified need.

14 **Leading in Learning: developing thinking skills in secondary schools**
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

judge the value of what they read, hear and do

This is an essential skill in selecting relevant information from research findings. There is a need for pupils to use a variety of methods and sources for finding information and then judging whether it has value for their particular project. In English, for instance, they may find many examples of 'writing to persuade' but must then use their judgement to decide on the value of the examples for a particular audience.

develop criteria for judging the value of their own and others' work or ideas

This essential skill needs to be practised in all coursework. It is a major component of Assessment for Learning, which helps pupils to become independent lifelong learners. In textiles, pupils need to judge a product against a set of criteria in order to evaluate it. A hat might be assessed in terms of materials used, colour, ornamentation, construction and suitability for purpose. Another product might be judged against similar or different criteria, but the use of criteria against which to make an evaluation needs to become habitual.

have confidence in their judgements

In doing coursework pupils have to make many judgements and need confidence in their ability to do so. This confidence will enable them to write persuasively and evaluate more decisively. They need repeated and supported opportunities to make and share judgements in order to develop this confidence.

Case study: school A

The following examples – for geography, art and design and science – are presented to help to illustrate the outcomes that might emerge from an analysis of coursework.

Geography

Geography is done well at GCSE in comparison to other subjects. However, the department is anxious to improve their results further and considers that one way to achieve this is through improving coursework. The specification for their examination board recommends that their investigations follow the 'route to enquiry' as this 'encourages thinking and decision making and allows access to more of the higher criteria than in an investigation which is project based or totally teacher directed'.

Guidance for pupils from the department stresses the need to show 'initiative, imagination and independence of judgement' but teachers report that pupils find these aspects of the task difficult. There is also a tendency for pupils to use too many photographs and charts at various stages of the coursework rather than being selective, choosing the most relevant and being explicit about their reasons for inclusion. A more thorough analysis of visual data could move pupils into higher levels. The evaluation stage is also sometimes superficial.

Using National Curriculum thinking skills and coursework they pick out the following aspects of **Information processing**, **Reasoning**, **Creative thinking** and **Evaluation** skills as possible areas for development:

- compare and contrast, and analyse part/whole relationships;

15

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- make judgements and decisions informed by reason or evidence;
- apply imagination and look for alternative innovative outcomes;
- develop criteria for judging the value of their own and others' work or ideas and have confidence in their judgements.

Art and design

Art and design is improving. The department wishes to improve even further, particularly in strengthening pupils' analysis and research skills in coursework. They have scrutinised the examiner's report on coursework and recognised that some of their pupils struggle to sustain further exploration of ideas and refine their work. Some pupils do not show the tenacity to produce finished work of quality.

Further analysis shows that some pupils copy and replicate ideas rather than using research and analysis to influence their outcomes and to experiment with alternatives.

Using National Curriculum thinking skills and coursework the teachers pick out the following aspects of **Information processing**, **Evaluation** and **Creative thinking** skills as possible areas for development:

- analyse part/whole relationships;
- draw inferences and make deductions;
- generate and extend ideas, apply imagination and look for alternative innovative outcomes.

Science

Some pupils achieve well in science but the department knows that too many of its candidates are just below the C/D borderline at GCSE.

Analysis of the coursework marks and the examiners' coursework reports show that the pupils need to plan very carefully how to obtain evidence and check its range and reliability. They also need to analyse the results of their experiments, to evaluate whether the evidence is sufficient to support their conclusion and also to describe what they might do to provide further evidence. Members of the department wish the pupils to need less scaffolding and to show more individual initiative.

Using National Curriculum thinking skills and coursework they pick out the following aspects of **Enquiry** and **Evaluation** skills as possible areas for development:

- plan what to do and how to research; predict outcomes and anticipate consequences; test conclusions and improve ideas;
- evaluate information; judge the value of what they read, hear and do; develop criteria for judging the value of their own and others' work or ideas and have confidence in their judgements.

Choosing common aspects of thinking skills

After meeting and comparing these notes the three teachers agree that the two common aspects for development should be:

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- **Creative thinking** – apply imagination and look for alternative innovative outcomes (identified by geography and art and design);

- **Evaluation** – develop criteria for judging the value of their own and others' work or ideas and have confidence in their judgements (identified by geography and science).

Choosing strategies: They use the matching chart 'Thinking skills and strategies' (page 42) and the notes on each strategy to help them make a choice. They select:

- 5Ws;

- mysteries;

- reading images.

Planning the cycle: As a guide, they use the table Planning: before the cycle begins (page 22) to agree on the long or short cycle, the order of subjects, the roles of the teachers and to map out how to plan, teach and review each stage.

17

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

The three-subject cycle

To achieve greater transfer of learning, it is essential that the teachers involved collaborate so that deliberate efforts are made to connect lessons across subjects. For effective teaching of thinking skills at Key Stage 4, what is required is a model that is manageable within the context of a subject-focused, option-led curriculum.

The model that was trialled in the Key Stage 4 Leading in Learning pilot involves cycles of lessons in each of three subjects. Two ways of implementing this model were successfully tested:

- the **short cycle** where **one lesson** is devoted **to each subject** so a cycle of three subjects is complete over three lessons, taking about two weeks;

- the **long cycle** where **a sequence of three lessons** is devoted **to one subject** so the cycle of three subjects is completed over nine lessons and may take more than a term to complete.

One pilot teacher made this comment:

'After today's lesson I am not worried now because… it's been the thinking skill that's unlocked the content, not the content that has enabled them to think. Because they would never have come up with that level of analysis, with so many layers about the relationship of Romeo and Juliet, if they had not had the lessons on thinking skills. I know that for a fact!'

In the three lessons, connections are made by focusing on a particular thinking skill through the use of a common strategy, as depicted in the following diagram.

Thinking skill
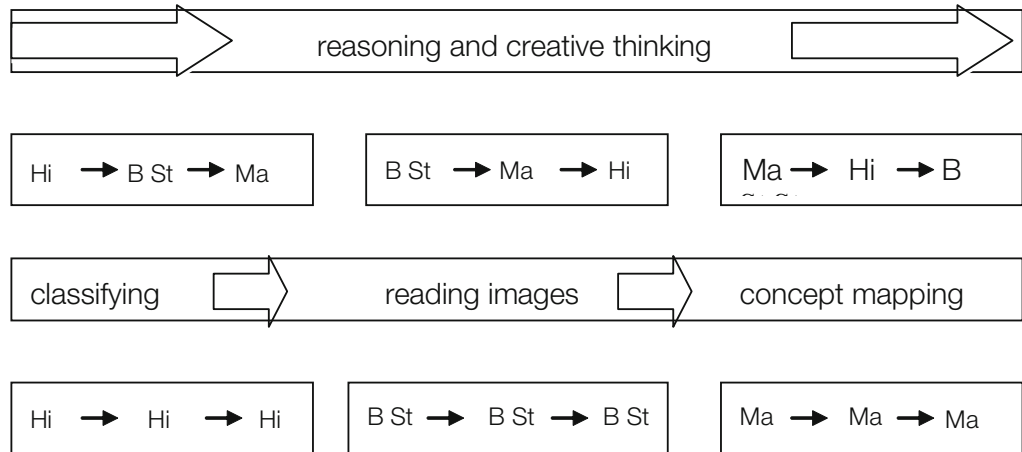
3-lesson cycle —————— Teaching strategy
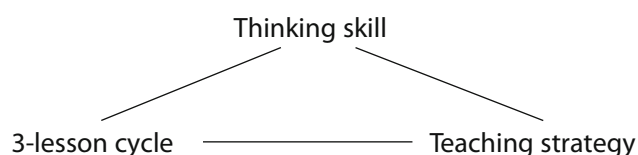
In both models the value of staying with the same strategy over the three lessons is twofold.

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 selection of teaching strategies follows coursework analysis and identification of a thinking skills focus. A range of ten different teaching strategies is offered in the section 'Ten strategies to make links'. It includes a chart (page 42) that 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.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

There is benefit in the three lessons being taught in a fairly short space of time so that pupils' learning is quickly consolidated. However, time does need to be allowed for teachers to plan and review together between the lessons.

Overview of three short cycles and a long cycle

reasoning and creative thinking

Hi → B St → Ma	B St → Ma → Hi	Ma → Hi → B St

classifying → reading images → concept mapping

Hi → Hi → Hi	B St → B St → B St	Ma → Ma → Ma

Case studies: school B

A scenario of three short cycles

A team comprising a history, a business studies and a mathematics teacher analyses coursework and decides to focus on aspects of **Reasoning** and **Creative thinking**. They each teach a single lesson focusing on reasoning skills using the strategy of classifying. In the next cycle they each teach a single lesson focusing on Creative thinking skills using reading. The third cycle reinforces both Reasoning and Creative thinking with each subject teacher using concept mapping for a single lesson. This completes three short cycles.

A scenario of one long cycle

A team comprising a history, a business studies and a mathematics teacher analyses coursework and decides to focus on aspects of **Reasoning** and **Creative thinking**. The history teacher teaches a sequence of lessons developing reasoning skills using the chosen strategy of classifying. In the next sequence of three lessons the business studies teacher focuses on Creative thinking skills using the reading images strategy. For the third sequence the mathematics teacher teaches three lessons using the concept mapping strategy to reinforce reasoning and creative skills from the previous sequences. This completes the long cycle of three subjects.

Roles and responsibilities

Whichever cycle is chosen, all three teachers need to collaborate in the analysis of coursework and in planning, executing and reviewing each lesson. Within each lesson teachers will take on one of three clearly defined roles.

■ The **subject teacher** is the regular teacher of the group. He or she leads the teaching of the greater part of the lesson.

19

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- The **plenary teacher** observes and monitors learning outcomes during the lesson and leads the metacognitive plenary. Because they are from a different subject specialism this considerably sharpens the focus on metacognition and transfer.

- The **observing teacher** gathers evidence by observing, talking to pupils and making notes. This teacher could act as a coach, if suitably experienced and trained.

As examples, in a cycle involving history, business studies and mathematics, teachers might adopt roles as shown in the following table.

One short cycle: teacher roles			
	Lesson 1	**Lesson 2**	**Lesson 3**
subject teacher	history	business studies	mathematics
observing teacher	mathematics	history	business studies
plenary teacher	business studies	mathematics	history

Part of a long cycle: teacher role			
	Lesson 1	**Lesson 2**	**Lesson 3**
subject teacher	history	history	history
observing teacher	mathematics	mathematics	mathematics
plenary teacher	business studies	business studies	business studies

Note that in the short cycle it is helpful if the plenary teacher of one lesson is the subject teacher of the next, as they are then able to follow up issues in the launch of their lesson. In the case of the long cycle, the business studies teacher would become the subject teacher for the next sequence of three lessons and the mathematics teacher would become the plenary teacher. Further notes on these roles are included in the section on 'Improving thinking skills lessons'.

Choosing a model

The evaluation of the pilot indicated that both short and long cycles are valid alternatives for improving pupils' thinking skills in preparation for coursework. It is likely that some organisational factors will affect the decision in each school but the following summary of advantages and disadvantages is provided to further inform the discussion.

The **short cycle** allows for all three teachers to develop the thinking skill by each teaching one lesson using the same strategy. The teachers change role over the three lessons. The strategy stays the same but the subject, the teacher roles and the make-up of the teaching groups change. The advantage is that transfer is explicit, as some pupils experience the same skill in different contexts. The disadvantage is that a smaller number of pupils may be common across these three lessons, making progression harder to develop.

The **long cycle** allows one subject teacher to develop a thinking skill using the same strategy over a three-lesson sequence. Each teacher keeps the same role over these three lessons. The subject, the strategy, the teacher roles and the make-up of the teaching group are changed for the next sequence of three lessons. (Note: in the pilot some teachers adopting the long cycle changed to a different strategy after two lessons, to be picked up by the second subject.) The advantage is that the pupils are common to all three lessons in any one sequence and this could help develop progression. The disadvantage is that although transfer and bridging are described in the plenaries they are not enacted until the next three lessons take place.

The planning process

As a support to collaborative working a number of templates are provided in appendix 1. They are also available separately in Microsoft Word format.

The **Coursework analysis** template provides a way of sharing the aims of the initiative with pupils. After the analysis has been completed this template can be used to note the thinking skills and sub-skills that have emerged as the focus for the lessons (the others on the table could be deleted). Then, using the evidence from discussions, some relevant subject examples can be added to the third column. The examples could be quite short, perhaps similar to the examples in the 'Thinking skills and coursework' section (page 12).

The **Collaborative planning** template is for the team of teachers to use to plan each lesson, agree roles to be taken on during the lessons and plan how to collect evidence of progress.

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

The **Collaborative review** template can be used to provide a record of the joint review at the end of each sequence of three lessons.

The **Pupil information sheet** can help to gain pupils' interest and make them feel a valued part of the initiative. This should be adapted to suit the needs of the school and might be used in conjunction with the outcomes of coursework analysis.

The **Pupil review sheet**, which might be supplemented by some sample pupil interviews, is valuable in circumstances where time can be found to discuss and complete it. Where lessons are long and pupils write easily, review sheets could be completed at the end of the lesson. However, teachers in the pilot found that they needed to allow plenty of time for the metacognitive plenary and completing pupil reviews in the lesson was often not practicable. Some teachers tried the following approaches:

- using the template at tutor time, immediately after a sequence of lessons;
- adapting the template for one teacher to use as a summary in the first lesson they had with the class after the end of the cycle;
- using the template to focus on the progress of a small group of pupils, with teaching assistant questioning and support.

The following table sets out the planning process for the long or the short cycle. It is to be used by the three teachers involved and the school leader.

Planning: before the cycle begins	
Task	**Notes**
School leader selects three subjects and three teachers.	For guidance on selecting subjects and teachers see *Key Stage 4 Guide for school leaders* or *Supplement to Key Stage 3 Guide for school leaders*.
Three teaching groups are chosen so that as many pupils as possible appear in all groups.	A teaching group entirely common across three subjects is unrealistic at Key Stage 4. The pupils who do appear in more than one of the teaching groups should be used as a focus group to monitor the cumulative impact of the lessons.
The three teachers meet to analyse coursework and establish the thinking skills focus.	See 'Establishing the thinking skills focus' (page 10). Consider how you will share the emerging issues (captured on the Coursework analysis template) with the pupils.
Decide on one long cycle or three short cycles, the order of the subjects, and define and clarify roles of each teacher in each lesson.	For help with selecting a model, see 'Choosing a model' (page 20). Consider where the most experienced and confident teacher is placed: ■ they might start the cycle in to model the lesson for colleagues and ensure a lively beginning; ■ alternatively they might go last to secure transfer and progression; ■ they may be suitably trained to act as a coach.
Select a common strategy to use in all three lessons for the thinking skill you will address. The strategy should: ■ be appropriate for teaching the selected thinking skill; ■ provide a suitable context for each lesson.	The strategy will usually be changed after each set of three lessons. The matching chart 'Thinking skills and strategies' (page 42) will help with the choice of strategies.
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 the detail of the Collaborative planning template for lesson 1.	Lessons 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 the chosen thinking skill that is common to other 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 subsequent lessons in that subject.
Plan how the first lesson will be captured so that subsequent lessons are planned to pick up the learning outcomes.	The most important way in which this can be done is through lesson observation. The observing teacher takes the lead on this task and should pay particular attention to pupils who appear in more than one of the teaching groups. See 'Roles and responsibilities' (page 19).

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

Planning: during the cycle	
Task	**Notes**
Teach the lead lesson and adjust planning for the second lesson.	Teachers meet to evaluate the first lesson, led by evidence gathered by the observing teacher. Discuss aspects of managing the strategy and ways of developing metacognition (e.g. identifying thinking words that pupils need). Adjust plans for the second lesson by adding detail to the Collaborative planning template for lesson 2.
Teach the second lesson to build on the first lesson in terms of pupil learning. Use outcomes to adjust planning for the third lesson.	The second lesson should make explicit reference to the first lesson in both the launch and the plenary. Pupils may have targets for improvement set in the first lesson that should be revisited. Teachers meet to evaluate the second lesson. Check for progression in the chosen thinking skill by increased emphasis on metacognition in the plenary. Plan and refine the detail of the third lesson by adding detail to the Collaborative planning template for lesson 3.
Teach the third lesson to build on the first two and capture accumulated pupil learning outcomes.	The third lesson should refer explicitly to the first two lessons. In the plenary, push pupils to be more explicit in describing the thinking skill, asking where else it might be used and why.
Teachers and pupils review the outcomes from the first three lessons, focusing on the thinking skill and the points for development that emerged from coursework analysis.	Teachers meet to review the learning evident in the third lesson. Consider evidence for transfer of the thinking skill across the lessons and complete the Collaborative review template. Collect Pupil review sheets, where appropriate. Interview a focus group of pupils if feasible.
Teachers choose the new strategy to use in the next three lessons and plan to address any issues emerging from the evaluation.	The matching chart 'Thinking skills and strategies' on page 42 shows that there are several strategies for each thinking skill. In addition, many strategies can be used to develop a range of thinking skills. The particular skill emerges from the way the lesson is orchestrated, especially the questions which are asked.
At the end of the long cycle or the third short cycle pupils complete a piece of coursework in at least one of the subjects.	The pupils should use their review templates as a reminder of skills that they have developed and that will be helpful to them in their coursework. Teachers might arrange a display of key words, diagrams or charts that will act as thinking prompts and reminders of the group experience.
Together, the three teachers evaluate the coursework against the thinking skill focus and the particular points for development.	Use the points recorded on the Coursework analysis template.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Over the course of the nine lessons, teachers will have the chance to develop their planning, improve teaching and foster transfer of and progression in pupils' thinking skills. The next three chapters are addressed directly to the three teachers and 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 three-subject cycles and gives some tentative suggestions for progression in pupils' responses.

24

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Improving thinking skills lessons

It is important to 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 that includes notes on each one of the strategies.

Planning the lessons

At the heart of the three-subject cycle is a focus on the common thinking skills identified through the analysis of coursework. Each subject will have different subject-related objectives. However, for this cycle the thinking skill objectives should be given the main emphasis, particularly in the plenary. When specifying objectives for a thinking skills lesson, you will need to consider the following points.

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.

- Process descriptions in your subject's 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.

- It is essential to address the thinking skill explicitly with pupils in both the launch and the 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:

The Key Stage 4 Leading in Learning DVD shows extracts from a lesson 'Evaluating in English'. The teacher states her prime objective as 'To develop evaluation skills, particularly applying and using criteria.'

Learning outcomes will focus on how pupils have applied their thinking to the task set. For example, some pupils will be able to evaluate 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 developed criteria for evaluating the usefulness of an analogy;

- give an example where using criteria to inform judgments 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 planning taking place during the lesson.

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 you are 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, for example:

  'Your challenge today, as we begin to prepare for GCSE coursework, is to think about how we can classify ideas.'

- 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, for example:

  'During the lessons think carefully about what you are able to do because you are working as part of a team. Working together will help you to learn how to repeat these skills when you have to work more independently on your coursework.'

- 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 they have been set. It is essential to make links to other subjects in the cycle.

  'You have been working on classifying skills in mathematics and geography. Think about how this might help you outside school. For example, imagine that you have to reorganise the shelving system in the stockroom for your Saturday job.'

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.

26 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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. In this way 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 metacognitive plenary, making notes on anything that may be useful.

If you need to intervene in a group that is really stuck:

- encourage the group to discuss their own difficulties to see whether 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 two 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'. To lead an effective plenary you need to ask the right kinds of question and provide the language structures 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.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- **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, critique, 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 like a broker for ideas and reasoning, so that good thinking is offered to all.

- **Focus on the 'how'.** On some occasions focus on how tasks have been done and dig out 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 that pupils can see the wider purchase and application of the emerging learning. The examples in the bridging scenarios for the appropriate strategy should provide some stimulus.

- **Establish generalisations** that relate to the five National Curriculum thinking skills so that they become more visible and transferable in other lessons and contexts. In particular, draw out the relevance of the skill to producing good coursework in more than one subject. It may be useful to illustrate with points that emerged from your shared analysis of coursework issues.

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 the 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 question outlined below don't 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.

28

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Reflective questions

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

- 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:

'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 critique each other's thinking.

Application questions

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

'Why is… important?'

'Where else might you…?'

'Imagine you were… what…?'

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 story contexts or analogies that 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, in mini-plenaries throughout the lesson, the lead teacher might offer a bridging context within the subject. It is the more general bridging cues, however, that have the greatest potential for opening pupils' eyes and minds and promoting

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

transfer. You will draw on these in the main plenary.

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 question is one approach to progression in teaching thinking.

Language and thinking

Pupils may find it helpful to be alerted to 'thinking words and phrases' they can use in both group discussion and 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* (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	examine	realisation
analogy	experience	recall
apply	experiment	recognise
assess	explain	reconstruct
assumption	extrapolate	refine
attitude	formulate	reflect
belief	hypothesise	reorganise
clarify	identify	response
classify	image	scan
combine	imagine	sequence
compare	implement	short-term memory
compose	interpret	skim
consider	interrelate	specification
context	judge	stereotype
contradict(ion)	justify	stimulus/stimulate
contrast	juxtapose	structure
convert	link	summarise
decide	long-term memory	symbol
decipher	meaning	synthesise
decode	metaphor	transform
define	model	translate
design	negotiate	trigger
develop	organise	visualise
differentiate	paraphrase	
distinguish	plan	
evaluate	predict	
evidence	prioritise	

Thinking phrases

You might consider identifying some key phrases to introduce to pupils, perhaps displaying them for pupil 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…'

31

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Roles of visiting teachers in the lesson

Observing teacher

During the lesson the observing teacher is the 'eyes and ears' of the trio, watching and listening to the others and to the pupils. In particular, pupils who appear in more than one of the teaching groups should be used as a focus group in order to monitor the cumulative impact of the lessons. The observing teacher's note taking is guided by two documents.

- The Lesson observation schedule (appendix 1 page 110) provides prompts for noting critical teacher and pupil behaviours during each episode of the lesson.

- Section 6 of the relevant strategy – 'Identifying successful thinking' – will help you track pupils' progress.

The observing teacher also has a critical role to play in the review of the lesson. As teachers comment on the lesson the observer takes on a more objective role and enables the others to take a step back from the situation. The contribution of the observing teacher should include:

- positive features and less strong points in the teaching;

- insights into the pupils' response;

- drawing the discussion back to points for improvement;

- observations on pupil progression.

Plenary teacher

Having the plenary led by a visiting teacher has a number of advantages:

- it allows for more concentrated eavesdropping during group work by a teacher who is not distracted by management of the lesson;

- because they are not the subject specialist, the plenary teacher is much less likely to focus on the subject content of the lesson. This will mean that the plenary is focused on the processes of the lesson and particularly on the thinking skills.

This will be a challenge, but things only improve through taking risks. One teacher in the pilot made the following comment.

'At the beginning I was very worried about doing a plenary (in another subject). But now that the cycle has finished I have quite enjoyed doing the plenaries. It's getting the idea that the subject is not the issue, but drawing together the thinking skills and emphasising them to the pupils. So the subject, really, you leave behind once you start the plenary.'

As plenary teacher, consider the following points.

- In the planning phase consider how the chosen strategy relates to your subject and the third subject. Don't worry that some pupils don't experience all three lessons of the cycle. You could say, 'What you have done today is really useful in more than one subject. In mine it would be useful because… The very fact

that it can transfer shows that it is important generally. Think about your other subjects as we reflect together; it will help you to focus on transferring these skills.'

■ Look at the plenary questions for the strategy. Do not work your way through them just because they are there – this will lead to a plodding plenary that goes nowhere. You have to decide what you want to draw out based on the thinking skill focus and the questions might suggest a way of doing this.

■ Consider whether any of the bridging scenarios might help you make connections, help pupils see the point, or encourage transfer. If you can think of ones that will appeal to your pupils, so much the better.

■ During the lesson, watch and listen to pupils – you are on the lookout for good strategies, good thinking, good group work behaviour, common problems, stages that groups went through and even conflicting ideas from different groups to cause some debate.

■ Before the end of the lesson, work out a rough agenda – what you will cover and which groups or individuals have interesting strategies or thoughts. You are stage managing the discussion.

■ Be interested and open-minded.

33 **Leading in Learning: developing thinking skills in secondary schools**
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Troubleshooting

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

- the 'Improving thinking skills lessons' section;
- the notes on the particular teaching strategy you are using.

These sections provide a basis for discussions with colleagues in school or with the LA 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-subject 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 your subject's flow of content temporarily. This is balanced by the gain in the pupils' thinking skills and how they approach the subject.

- There is exemplification in most subjects for a range of strategies. Although most examples are from Key Stage 3, 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 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 are not used to group work, or maybe the dynamics of the groups is not working well? Try changing the composition of the groups, set tight requirements and persevere – they 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 *Unit 10: Group work*, a study guide from *Pedagogy and Practice: Teaching and Learning in Secondary Schools* (0423-2004).

- Sometimes the task may have a degree of openness or ambiguity that 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. Consider the following 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 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* – they 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 the section on language, page 30.)

- 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 whether you are 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 27–30) should help, as should observation of a skilled colleague. In the end, there is no substitute for perseverance and practice!

- Short training sessions on developing effective plenaries to thinking skills lessons are provided in the *Key Stage 4 School training manual*. For more general guidance see *Unit 7: Questioning* and *Unit 10: Starters and plenaries*, study guides from *Pedagogy and Practice: Teaching and Learning in Secondary Schools* (0423-2004).

35 **Leading in Learning: developing thinking skills in secondary schools**
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Developing progression in thinking skills

Progression needs to be considered on different timescales:

- across three lessons taught using the same strategy;
- across nine lessons developing the same thinking skill using three different strategies in total;
- 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 Leading in Learning 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

This is a way of planning progression so that successive lessons that use the same strategy both follow from the one before and provide further challenge for pupils. This can be done in several ways.

Increase the difficulty of the task. This might be done by providing more complex information, by introducing conflicting information halfway through an activity or by 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.

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.

Increase the complexity of the group work by, for example, asking pupils to work with those they don't normally work with, perhaps in mixed-gender groupings. Asking pupils to use cue cards can also extend the richness of the group work and talk. 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?'

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 some pupils were feeding back from their evaluations that they had learned something valuable.

Level of response

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 pilots indicated that the range of pupil performance in the strategies can be related to levels in the SOLO taxonomy. The table below outlines the SOLO taxonomy as a generalised description in relation to thinking skills.

SOLO taxonomy levels	Generalised description in relation to thinking skills
Pre-structural	The pupil may be able to engage with the data offered by the task but does not 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 more than three 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.

This table is adapted in section 6 'Identifying successful thinking' in the notes on each of the ten strategies, to give some guidance on judging pupils' response to the specific task.

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 Secondary National 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.

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' (ZPD), proposed by influential Soviet educational researcher Vygotsky.

The second part of the handbook is devoted to ten strategies to make links.

Appendix 1 incorporates the templates referred to earlier. Appendix 2 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.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 skill (see matching chart 'Thinking skills and strategies', page 42);

- 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 to select a strategy suited to their subject (as well as the chosen thinking skill) and to the issues emerging from the analysis of coursework.

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

1. 5Ws
2. Advance organisers
3. Analogies
4. Audience and purpose
5. Classifying
6. Collective memory
7. Concept mapping
8. Mysteries
9. Reading images
10. Summarising

Eight of the strategies have been carried over from the Key Stage 3 programme and two new ones have been introduced (5Ws and concept mapping). These new strategies are particularly suited to the Key Stage 4 context and are powerful strategies for addressing aspects of enquiry.

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 the following 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 and coursework** highlights components of the five thinking skills that the strategy is strong in developing and other components that can be addressed if the teacher creates opportunities. It also outlines the contribution the strategy can make to developing skills required in coursework in various subjects.

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. It also includes some teaching variations that may be helpful for teachers who want to use the same strategy more than once in a particular subject. The variations help to provide freshness to the same strategy whilst allowing pupils the opportunity to make progress with their thinking in a familiar context.

4. **An example from a 3-subject 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** 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 some tentative levels of response based on the SOLO taxonomy. These aim to help identify what pupils can and cannot do and inform planning to improve their capability and performance. Note that level of response is one component of pupil progression. (See preceeding chapter for a more extensive discussion of progression)

7. **Troubleshooting** describes common teaching difficulties encountered and gives suggestions for dealing with them.

8. **Metacognitive plenary** 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 27-30.)

9. **Bridging scenarios** are stories, prompts, analogies, scenarios, etc. to encourage pupils to make connections, generalise, and see a big picture. They are usually used at the beginning and the end of lessons. Bridging to coursework in different subjects is of particular importance at Key Stage 4.

To supplement the notes provided here, exemplification for 13 subjects is provided. For each subject it includes:

- notes on National Curriculum thinking skills and the subject;
- subject examples for particular strategies (mostly chosen from Key Stage 3);
- selected references to other sources of ideas.

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

Identifying strategies suitable for teaching your chosen thinking skill

Following the analysis of coursework and identification of an aspect or aspects of one or two thinking skills, you are in a position to choose the strategy to use in the first three lessons. On page 42, you will find a chart that sets out which of the ten teaching strategies are particularly suited to each of the five thinking skills. Two levels of suitability are indicated:

- thinking skills that the strategy develops strongly (darker shading);
- thinking skills that 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 straitjacket. In

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

practice, there is considerable flexibility in which thinking skill a given strategy can be used to address. The way 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. In a short cycle the process of choosing a strategy is a collaborative enterprise with other subjects 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 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 for other subjects.

- Accept that there will need to be some compromise and adjustment in planning to accommodate the use of one strategy in three subjects – some 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.

41 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Thinking skills and strategies

		STRATEGIES									
NATIONAL CURRICULUM THINKING SKILLS		5Ws	Advance organisers	Analogies	Audience and purpose	Classifying	Collective memory	Concept mapping	Mysteries	Reading images	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				■	▨	▨		▨		■

The strategies

5Ws – Who, What, Where, Why, When

In 5Ws pupils use Who, What, Where, Why and When as primary stems for thinking of questions where they need to interrogate a source or scenario. 5Ws therefore, acts as a scaffold that develops the habit of asking questions. Further classroom processes can be introduced that help pupils to judge the value of particular types of question in particular situations. 5Ws is a form of advance organiser, which is developed as a separate strategy in this handbook.

1 Rationale

5Ws has a distinct power to encourage pupils to ask questions. One of the endemic problems in teaching is that teachers ask most of the questions in lessons and most of these are closed questions – there is a strong irony in this as they are the experts and pupils are the novices. If classrooms are to be powerful learning environments in which pupils develop their capacity as autonomous learners, then they need to acquire the habit of asking questions. Questions are the bread and butter of learning and enquiry. What do toddlers do if they are curious learners? They keep asking relentless questions. One of the side-effects of school can be that of de-skilling pupils in the art of asking questions and the 5Ws is a scaffold for reinstating that wonderful habit.

2 National Curriculum thinking skills and coursework

5Ws is very powerful in **Information processing** in the mode of collecting relevant information, whether in the early stages of an enquiry or when faced with a dense source of information. The strategy is clearly also important in relation to:

- **Enquiry,** as it stimulates the process of asking questions and enables pupils to plan and predict, to some extent, what they intend to find out;

- **Creative thinking,** as it helps open new horizons of thinking and hypothesis generation.

5Ws could be useful to pupils in coursework in the following ways.

- 5Ws is extremely valuable at the start of certain types of coursework where there is a need to pin down the area or questions within which one is working, or the information that is relevant. This can help substantially with refining key questions or aims and give a sense of ownership. In some subjects pupils are actually assessed on their ability to ask relevant questions.

- At the end of the coursework the 5Ws questions can be invaluable in both **Evaluation** (which might relate back to questions posed at the start) and in **Reasoning**, especially about the causes or effects of something.

3 Planning to use the strategy

There are two obvious approaches to introducing this strategy. The first is to confront pupils with a mass of information or text to demonstrate that it is so easy to be overwhelmed by data, especially in the age of the Internet. In geography you could explore the effects of a natural hazard such as earthquakes from website data by modelling how 5Ws can be used to structure pupils' analyses of the information. This might be done by posing such questions as:

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- Who was affected?

- What happened to them?

- Where did it happen?

- Why did it happen?

- When did it happen?

These questions can then be used by pupils to guide their sense-making process in dealing with the data.

A different approach is to use the 5Ws process as a way of stimulating thinking about a topic. In generating a specification in a design subject, these stem questions can be used by pupils to focus on the purpose of the object or process and the target market. Here, relevant questions might include:

- Who will be using this?

- What will they be using it for?

- Where will it be used?

- Why do they want it? Why will they use it?

- When will it be used?

It is a strategy that can easily be internalised by pupils with a limited amount of revisiting and it becomes more powerful when its application is demonstrated across a range of subjects and contexts.

4 An example from a 3-subject cycle

5Ws is a suitable choice of strategy where the three departments have decided to focus on the thinking skill of **Creative thinking**. 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 **PSHE** example is for the fifth lesson in a **long cycle** involving history (mysteries) and PE (reading images). In the history thinking lessons the pupils had understood the task and improved their selection of relevant data but could not develop a full explanation. In the previous PSHE lesson the pupils had been introduced to the 5Ws to help them analyse a number of articles about the risks of financial over-borrowing. For this lesson the objectives were for pupils to:

- formulate a range of relevant 5Ws questions in order to suggest more than one hypothesis for what happened to Mr Watson;

- identify a range of factors that contribute to financial problems and debt.

The teacher did not share the objectives initially but began the lesson by grouping the pupils into pairs. Pupil A had an image of a taxi, which their partner was not allowed to see. Pupil B had to reproduce the image by asking questions. The pupils

45

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

were then invited to reflect on what questions were asked and how effective the questions were for the task.

The teacher shared the objectives and gave a brief overview of how the pupils could use the 5Ws approach to interrogate five images relating to financial struggle (see page 47). They then used 5Ws to suggest a number of possible hypotheses about what might have happened to Mr Watson.

Each pair joined with another two pairs to share their hypotheses and agree the one that they felt was most likely to apply to Mr Watson. This was shared with and evaluated by the whole class.

At the start of the following lesson, the pupils were asked to assess the relevance of the questions they had devised, how closely they linked together and which questions they might now change.

46

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

DAILY NEWS

Man dies in bank robbery attempt

Read more on this story on page 4.

© Royalty-Free/Corbis

© Royalty-Free/Corbis

Stress £

In Loving Memory of

© Getty Images
[David Toase]/[Photodisc Green]/Getty Images

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

5 Creating the right level of challenge

With lower-achieving pupils more modelling through a thinking aloud process may be necessary, gradually allowing pupils to join in with your suggestions about possible questions.

With higher-achieving pupils two interesting developments can be added. The first is to add the question 'So what?' to stimulate thinking about the effects or consequences of situations or issues and indeed their importance in the world. This should take you and them into the area of 'Does this matter?' and 'Should we be interested?' The second is to demonstrate that these questions link strongly to the very nature of knowledge. 'Who?' and 'What?' relate to the characteristics of events and people, 'When?' relates to time, 'Where?' to location and 'Why?' to causation. 'So what?' takes them into the realms of personal significance and meaning.

6 Identifying successful thinking

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO level	Performance level
Pre-structural (Irrelevant)	Pupils can think up one or two questions but these are not very relevant to the context/problem.
Uni-structural (Basic)	Pupils can think up one or two questions that do relate to certain features or aspects of the context/problem.
Multi-structural (Advanced basic)	Pupils can think up several questions that do relate to the context/problem, but these questions are all one-offs and do not obviously link together. For example, in designing a piece of luggage they might ask 'Who is it for?' and 'What would it carry?' but would not be linking the answer from the first question to the second question.
Relational (Understanding)	Pupils generate a variety of questions and there is a unifying theme or wholeness to them (especially evident in the answers) – thus they link together.
Extended abstract (Advanced understanding)	As above, but pupils also use substantial amounts of their own experience and knowledge in their questions to show evidence of predicting or hypothesizing about realistic outcomes. There are also more supplementary or second-order questions.

7 Troubleshooting

Possible difficulties	Possible solutions
Pupils cannot immediately use 5Ws independently.	This is more likely to occur with some low-achieving pupils – modelling should build their confidence and allow them to work in pairs for mutual support. Interactive whiteboards can be very useful for modelling.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

Pupils are able to ask 5Ws questions but they are superficial and don't really relate to the context/problem.	This tends to occur where pupils lack sufficient knowledge or understanding about the context/problem and are therefore unable to ask relevant questions. As a prelude to the 5Ws task pupils might carry out an information processing activity, e.g. classification or sequencing relating to the context/problem. This would enable them to engage with the appropriate vocabulary and to establish some simple understanding.

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things.

1. Crystallise what they have done – used the 5Ws as stems for generating their own questions to interrogate or make sense of a topic, problem or mass of information.

2. Unpack the process of doing the task. The following categories of question might be useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights, and they can be seen as a cumulative series.

Type of question	
Reflective – general	'Why is 5Ws useful?' 'When can you use 5Ws?'
Reflective – specific	'How do you generate the questions?'
Challenge	'How do the questions help you when you are reading a piece of text/image?' 'Can you put two W questions together?'
Evaluation	'Was one of the Ws more useful than others? Why?' 'Was one of the Ws less useful? Why?' 'Would the value of particular Ws be different in other contexts?'
Application	'Why does 5Ws work?' 'How would this way of thinking help to structure the way you tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

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 using 5Ws to process information and develop advance organisers. They may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. Further examples

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

are given below.

- If you phoned the emergency services these are some of the essential questions that they would ask you to find out the necessary details of the incident. The police would also use questions using the 5Ws stems if they interviewed you afterwards to get at the essence or the main things of what happened.

- If a friend phones you with a juicy bit of gossip, these are the types of question you would use to get the details from their excited gushing: 'Who did what? Where? When? Why?'

- Most questions start or could start with these stem words – they are question words. If you are in an examination and you are trying to drag up the details of some example or case study, you can ask yourself these questions to help you remember and put in the right details: Who? What? Where? Why? When?

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Advance organisers

An advance organiser is a device used to enable pupils to orient themselves to a topic through what they already know. It is an organisational framework 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, a concept map, spider diagram, flowchart, story or anecdote or a 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 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 and coursework

Advance organisers are powerful in developing **Information processing**. The key thinking skills are comparing and contrasting, and analysing part/whole relationships.

Other thinking skills that 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.

Advance organisers could be used in coursework in the following ways:
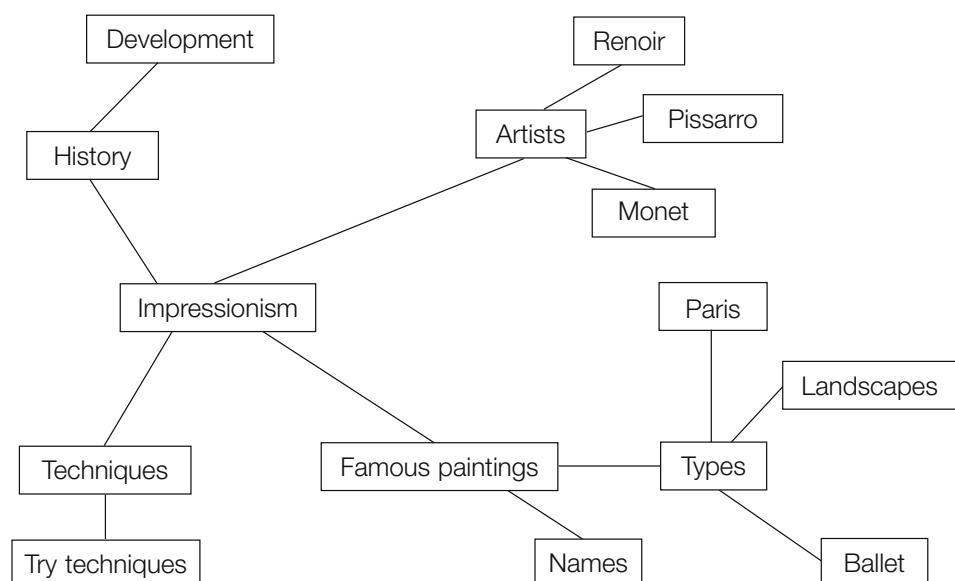
- to increase awareness of the need to plan coursework and as a device to use when planning coursework;
- to increase the range of strategies available for analysing and representing data and processes, for example through flow diagrams;
- to encourage creativity by activating prior knowledge through tools such as concept mapping (developed as a separate strategy in this handbook).

3 Planning to use the strategy

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

- the knowledge or processes 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 – some possibilities for the format include the following.

  - **Summary** – a description of the new knowledge or process that pupils will be learning. It could be 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 organiser** – a visual representation of what the pupils are going to learn such as a table, chart, flow diagram or 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.

52

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

4 An example from a 3-subject cycle

Where the three departments have decided to focus on the thinking skill of **Enquiry**, advance organisers make 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 **Enquiry** that is common to other 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 second lesson in a **short cycle**. In the previous English lesson the pupils were introduced to an advance organiser showing the main components of coursework. Pupils worked in small groups to annotate this organiser with questions they needed to consider when planning their coursework.

The lesson uses the concepts and vocabulary from the English lesson to formulate a plan for the handling data coursework. For this lesson the objectives were for pupils to:

■ improve their enquiry skills by planning what to do and how to research;

■ be able to formulate a plan for a statistical investigation.

The teacher began by asking the pupils to recall the previous lesson where they had been developing their enquiry skills using the strategy of an advance organiser.

The pupils began the lesson by discussing the data handling cycle as an example of an advance organiser for the whole process. They then compared this to English coursework to look for similarities and differences in the planning and research skills needed for each.

The teacher reminded them that they were working towards a piece of coursework to investigate the heights and weights of Year 10 and Year 11 pupils. For this lesson pupils were asked to focus on the 'Specify the problem and plan' section by producing their own advance organiser on A3 versions of the table below. Vocabulary/concept cards were available from the previous lesson.

Brief introduction/what will you investigate
State a hypothesis
Explain how you might get some data (give clear reasons)
Explain how you might go about testing your hypothesis

Envoys were used to take the sheets to other groups in turn and further annotations were made to the advance organiser as appropriate. Back in their original groups the pupils were asked to assess the annotations:

■ by considering whether they had used the most appropriate thinking words;

53

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- by highlighting those statements related to the process of planning in one colour and those related to research in another colour;

- by identifying the annotations that could support good coursework in other subjects.

Prior to the plenary each group had to say, in no more than three sentences, how they would use the advance organiser to support their enquiry skills.

5 Creating the right level of challenge

To support lower-achieving pupils you might use the following approaches for each type 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. For example, give the main headings and pupils have to 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 use the following approaches.

- **Summary** – ask them to annotate the advance organiser while watching a video or during discussion; invite them to devise questions for clarification or 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 two texts describing the same event but from a different perspective, for example 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

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO level	Performance level
Pre-structural (Irrelevant)	Pupils use the advance organiser ineffectively, e.g. they skim the text but pull out irrelevant information.
Uni-structural (Basic)	Pupils can identify some parts of the advance organiser that are familiar but cannot make links between new and current knowledge.

54

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Multi-structural (Advanced basic)	Pupils can use the advance organiser to give an overview with some understanding of the detail – they might ask questions for clarification.
Relational (Understanding)	Pupils are able to transform, rather than just transfer, information in the advance organiser and ask questions as they identify gaps in their understanding (reasoning skills coming into their own).
Extended abstract (Advanced understanding)	Pupils adapt the advance organiser to increase its effectiveness and usefulness as a thinking tool (creative thinking being used).

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 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 advance 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/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 it explicit to pupils how this will help their learning. Make pupils aware of the differences between holistic and serialist thinkers.

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things:

1. Firstly, Crystallise what they have done – used advance organisers to orient themselves to a topic using what they already know. This has helped them to focus on the new information.

2. Unpack the process of doing the task. The following categories of questions might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights, and they can be seen as a cumulative series.

55

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Type of question	
Reflective – general	'How did the advance organiser improve your learning in this topic?'
Reflective – specific	'Do you think there is anything missing from the advance organiser?'
	'What techniques did you use to help you skim a piece of writing?'
	'Could you improve any part of what you did?'
Reasoning	'Why do you think an advance organiser is useful to have at the start of a topic?'
Challenge	'Do you think we could have used a different advance organiser? Explain your answer.'
Application	'What good are advance organisers?'
	'Which subjects/topics would you find advance organisers useful for?'
	'How would an advance organiser help you to begin an extended piece of work such as coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

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 may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. 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 somewhere so that you know the layout of a place or some of the things you might expect to see, visit or experience;

- skimming a very thick, new computer manual to give a useful overview of the main sections covered;

- a personal account by a refugee, which can help you understand a more factual reporting of events in a war-torn country.

56

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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, for example the structure of the atom is like a solar system. These analogies support way that something is described or explained so that pupils can understand it better;*

- *functional, for example 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 to think with.

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 can be helpful in understanding something or explaining it to others.

2 National Curriculum thinking skills and coursework

Analogies are very powerful in 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 important 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:

57

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- **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.

Analogies could be used in coursework in the following ways:

- to understand the whole process of conducting an enquiry or investigation (a piece of coursework) – it is like a murder enquiry in a TV programme;

- to understand a sub-process of the coursework, such as managing or looking after all the data or evidence gathered – it is like managing a full squad of footballers and then carefully selecting the best 11 to match the opposing team;

- as a scaffold in the written Reasoning and Evaluation sections, which are integral aspect of many pieces of coursework.

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 using the strategy of 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, for example *the heart is like a pump; a telephone exchange is like the road system*. Then 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, for example 'Do we need to specify the type of pump (balloon, foot, electric, submersible) or to find out more?'

Pupils can then think about the aspects that make it a good analogy, for example a pump demonstrates pushing and compression. They can then think about where it fails as a good analogy, or could indeed encourage misconceptions, e.g. a pump needs something/someone to work it but a heart beats on its own; a 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 being explored, for example 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,

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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-subject cycle

Where the three departments have decided to focus on the thinking skill of **Creative thinking**, analogies can be 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 analogies 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 **performing arts: dance** example is for the fifth lesson in a long cycle involving art and design and mathematics. In the previous three art and design lessons pupils were asked to speculate what meanings or messages an artist is trying to convey in their work by using 5Ws as their thinking strategy.

Their first performing arts thinking lesson helped pupils to understand certain dynamics of movement. Pupils watched a selection of brief video clips and devised analogies to describe the portrayal of movement. The range of analogies was used to help structure their initial movement phrases.

This lesson uses analogies to start the process of structuring a dance piece. For this lesson the objectives were for pupils to:

■ think creatively by generating and extending their previous analogies to develop the structure of their piece;

■ select and develop compositional material using theme and variation as the structure.

The teacher began by asking the pupils to recall the previous dance thinking lesson and talk about the relationship between their chosen analogies and their movement phrases.

The teacher then gave an analogy that could be used to explain how variations keep the same sequence of time and movement as the original theme but have their own character, colour or flavour, e.g. *like a teenager doing the same thing, but on different days*. They listed the features of the source and related it to the target, e.g. changing moods from sulking, high energy, silly or sophisticated. This was illustrated using an extract of a Greek folk dance (the *Pantozali*), showing five clear variations and Monet's *Poplars* series, depicting the same scene at different times of the day.

The pupils were asked to work in fours and agree other analogies that could describe the varied structure, e.g. like driving a car on the same road in different weather conditions or like a day at school. They gave their analogies to another group, which listed the aspects that made it a good analogy for theme and variation and those that failed to make it a good analogy. Consensus followed as to whether it was good enough. These analogies were shared with the whole class as a resource for developing their compositions.

Each group of four composed a short theme from their previous action phrases that would be the basis of their composition. Then they developed their second varied phrase using one or more of the analogies agreed previously as a guide.

They performed these two phrases to another group and discussed whether their understanding of theme and variation as a structural device corresponded to the analogy chosen. This unfinished composition would be used as a basis for their completed compositions in their next dance lessons.

Finally, pupils were asked the following questions as a whole class.

- How did the use of analogies help you to understand theme and variation?
- How did you connect the analogy to your compositional ideas?
- How is theme and variation different in painting, a timeless art, from music or dance, which are both temporal?

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 they are trying to clarify;
- ask them to explain how the analogy could lead to some misunderstandings.

6 Identifying successful thinking

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

SOLO level	Performance level
Pre-structural (Irrelevant)	Pupils engage with the task but the features or functions identified in the source are not connected correctly or adequately to the target.
Uni-structural (Basic)	One or two appropriate features or functions in the target are connected satisfactorily to the source and explained.
Multi-structural (Advanced basic)	Three or more appropriate features or functions are connected and explained.
Relational (Understanding)	Pupils explain most of the connections between the target and source and explain the general pattern or relationship between the two. They can identify ways in which the analogy does not work.
Extended abstract (Advanced understanding)	Pupils explain most of the connections in detail and the general pattern. They can generate their own analogy and evaluate the strength or value of particular analogies.

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 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 into 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.	First 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 or is not a good enough model.

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things:

1. Crystallise what they have done – used analogies to support the way that something is explained so that they understand it better.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

2. Unpack the process of doing the task. It is suggested the following categories of question might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

Type of question	
Reflective – general	'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?'
Reflective – specific	'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?' 'Did you go through each point in turn and decide whether it was applicable?'
Reasoning	'Which aspects of the analogy work the best and can you explain why?' 'Which aspects of the analogy work least well or not at all and can you explain why?' 'Could the analogy be developed or amended or is a new one needed?'
Challenge	'Can you think of any audiences that the analogy will not be suitable for?'
Application	'Why do we need analogies? How do they help anybody?' 'How could this way of thinking help to structure the way you explain parts of an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios

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 may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis.

Analogies are by definition bridging activities but you might like to try the following.

■ Make the point that analogies are a common device in literature (books and stories). Ask someone to tell you the rough outline of a story such as the hare and the tortoise. Ask what the story is meant to tell people and establish that it is a form of analogy.

62

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

■ 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.

63

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 writing 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, 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 realm of meeting a need or a demand rather than just doing or supplying something.

2 National Curriculum thinking skills and coursework

Audience and purpose is useful in addressing the skill of **Evaluation**, where pupils can judge the value of information against criteria they have developed. It is also valuable 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:

- **Enquiry**, 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.

Audience and purpose might be used in coursework to:

- help clarify the aims or purpose of work or to help in the design of an experiment or product;
- help pupils to identify successful features of a piece of coursework by assessing whether the work has been presented for the particular audience (examiners) to serve a particular purpose (achieving the highest possible grade

64

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

against agreed criteria);

■ inform ongoing monitoring and evaluation of their own work.

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). Although the following is a simple example, it could be used even in Key Stage 4 to convey the essence of this strategy.

Given a number of descriptions of 'meals to go' and a number of 'eating scenarios', pupils could be 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 brightly coloured lunch box.

■ **Meal 2:** a flask, a bottle of water, a plastic box with six cheese 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 well-paid rail commuter going to work;

■ **B:** a mother and toddler joining a nursery group to celebrate Eid;

■ **C:** a greenfinch looking for morning food;

■ **D:** a five-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 twenty-fifth 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 ten 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) that 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:

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- what the person likes or is likely to eat;

- a meal that meets the nutritional needs in the circumstances in terms of amount of food, variety and the different foods going well together;

- a meal that is appropriate to the occasion (especially the anniversary);

- the immediate container (e.g. the plastic box for sandwiches, the plastic feeder);

- the overall packaging (e.g. the rucksack, the paper carrier, the seed feeder).

Other possibilities are 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.

4 An example from a 3-subject cycle

Audience and purpose is a suitable choice of strategy where the three departments have decided to focus on the thinking skill of **Reasoning**. 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 other 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 **ICT** example is for the first lesson in a **short cycle**. The other subjects involved in the cycle are media studies and English. The teachers wanted to develop the pupils' thinking so that by the English lesson, for example, the pupils would be able to deduce the audiences from two texts, justify their choice of questions and give evidence for the deductions made. Prior to starting the three-lesson cycle pupils had a session on asking questions using 5Ws.

In the previous ICT lesson the pupils had begun to look at an exemplar database where the field names and types were already included. They had also discussed the purpose and design of familiar video shops. For this lesson the objectives were for pupils to:

- develop reasoning skills by explaining why they chose particular extra field names and types for the database;

- be able to select and devise appropriate database fields.

The teacher began by revisiting the database and video shop discussion from the previous lesson. It was made clear to pupils that the Reasoning objective was the main one for the lesson.

The pupils began the lesson by looking at the fields included in the exemplar database and discussing what questions should be asked to determine why these fields were used. At the end of the discussion they had to justify any changes they would suggest to these field types.

The teacher led a mini-plenary to enable pupils to consider how audience and purpose is a key determinant in deciding the field types.

66

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

The lesson continued with the pupils thinking about the audience for, and purpose of, the video shop database. Working in small groups they determined what extra fields needed to be added and had to explain their choices by thinking about the questions they asked to help them make their decisions. They considered the consequences of adding or not adding these fields to the database for the chosen audience.

Finally, two smaller groups joined together to compare results and to explain what informed their judgements and decisions. To focus pupils firmly on the reasoning dimension of audience and purpose the teacher asked them to consider why their exact database could not be used for a different shop, e.g. one selling and hiring cycles.

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;
- show them television adverts, 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

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO level	Performance level
Pre-structural (Irrelevant)	Pupils engage with the task but their choices are not justifiable.
Uni-structural (Basic)	Pupils can give adequate reasons for one or two choices.
Multi-structural (Advanced basic)	Pupils can give adequate reasons for most or all of the choices but there is no unifying theme or generalisation to their answer. They cannot link them together.

67

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Relational (Understanding)	Pupils can give adequate reasons for all (or nearly all) of their choices that take account of context and there is a unifying theme or generalisation to their answer, which allows them to make comparisons if pressed. They may be using considerable amounts of their own knowledge.
Extended abstract (Advanced understanding)	Pupils can give lengthy reasons for their choices, strongly related to context, they can generate alternative answers in some contexts, the unifying theme may be more abstract and they can predict how changes in context would change the choice.

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 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 groundwork with them, e.g. photographs. If they know a bit don't worry as their thinking will reveal misconceptions that you or others can correct. The process can also be the start of a small enquiry – what is this place/context like?

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things.

1. Firstly, Crystallise what they have done – used audience and purpose to think hard about why things are done, making connections in terms of the idea of meeting needs in different contexts.

2. Unpack the process of doing the task. It is suggested the following categories of questions might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

Type of question	
Reflective – general	'When do you need this type of thinking?'
Reflective – specific	'Which one did you do first? Last?' 'Which ones did you find easiest? Why?' 'Could you picture any of the products or scenarios?'

Reasoning	'Why do we use different criteria at different times?
Challenge	'Why do we need criteria for judging things?'
	'Why do we use different criteria for things at different times?'
	'Are some criteria more important than others?'
Application	'Why do you have to think, at times, about audience and purpose?'
	'How would this way of thinking about audience and purpose help to structure the way you tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

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 may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. 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. ball game for disabled pupils.

Audience and purpose in everyday life can be elicited by the following questions.

■ Ask who sends Christmas cards or cards for other festivals or events. If you send cards to, for example, friends, boy/girlfriends, grandparents, uncles and aunts, pen friends or 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 should be different audiences/markets.)

■ Ask what TV 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 types of programme appear on different channels, so it is all about audience and purpose.

■ Ask about the adverts that are on in between such programmes – these show that the companies that are advertising think the audience of this programme is also the audience for their product.

■ Show a few job adverts and highlight the criteria for applicants. Draw attention to the terms 'essential' and 'desirable' and compare this to the pupils' discussion about the relative importance of different criteria.

69

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

■ Consider the scenario of 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?

70

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 other 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 retrieve what they need quickly 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 these 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 and coursework

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

Other thinking skills that 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 which may be developed if the classifying process is used as the starting point for testing the ideas and categories produced.

Classifying could be used related to coursework in the following ways:

- to develop awareness, prior to coursework, of major concepts or procedures

71 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

that should underpin many pieces of coursework. Examples include cause, effect and management in geography and sources and reliability in history;

■ introducing tables and Venn diagrams as a method of classifying and thus ordering information in data analysis, based on a sound appreciation of the significance of such methods;

■ helping pupils develop headings through classification which will inform different sections of their coursework. It will assist them in pulling together questions and evidence and thus drawing conclusions.

3 Planning to use the strategy

If you are using a set of cards 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 work 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.

4 An example from a 3-subject cycle

Classifying is a suitable choice of strategy where the three departments have decided to focus on the thinking skill of **Reasoning**. 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 nine lessons

72

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

in the long 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, drawn from Romeo and Juliet coursework, is for the second lesson in a **long cycle**. In the previous thinking skills lesson pupils had been asked to sort and classify key phrases in the play's opening Prologue. The pupils were asked to explain how they had sorted the phrases and whether any were difficult to place. They may have sorted by theme, plot, character or language, for example.

Prior to the second thinking skills lesson the pupils had viewed, read and discussed the first four scenes in Act 1 and they were now moving on to the fifth scene. For this lesson the objectives were for the pupils to:

■ improve their reasoning skills by drawing inferences and making deductions from their classification;

■ identify how close language study develops the reader's understanding of characters, themes and the plot.

The teacher began by asking the pupils to recall how, in the first lesson, classifying had helped them sort information and their ideas about the play's themes and plot and to explain how they justified their thinking.

The pupils were given two copies of a large piece of paper each showing (centrally positioned) Romeo's speech on first sight of Juliet starting with '*O, she doth teach the torches to burn bright…*' and ending with '*For I ne'er saw true beauty till this night.*' (1v)

Their first task was to work in pairs and quickly text-mark one of these sheets selecting striking phrases that may reveal aspects of Romeo's character.

After doing this each pair then considered a set of ten cards each of which showed a word that could describe a person's character. Two of the cards were blank for the pupils to add their own words, the other eight each showing one of the following:

rash, passionate, selfish, nervous, mature, foolish, brave, impressionable.

Pupils had to decide whether any of the cards seemed to match aspects of Romeo's character as revealed by this speech. Teacher prompts include 'What would you think if you did not know him but overheard this speech?' Pupils could choose to compose one or two cards of their own.

Next pupils chose between two and four cards, which they thought *most accurately* described Romeo's character as revealed by this speech and classified their highlighted text under these headings. To do this they worked on the clean text and marked the text in different colours. For example, all text marked blue could be used to infer that Romeo was impressionable.

Discussion with groups and for the whole class would focused on *how* the pupils worked through this process, in particular:

73

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- why particular pieces of text were chosen in the first instance;

- how characteristics were sorted;

- whether new characteristics were added and why;

- how they used the text to support their inferences.

In pairs, pupils repeated this process working from Juliet's conversation with her nurse following Romeo's departure, starting with '*Come hither, Nurse. What is yon gentleman?*' and ending after '*That I must love a loathed enemy.*' (1v)

The pupils were then put into groups of four to compare their preliminary character analyses of Romeo and Juliet, under headings such as Similarities and Differences. A column for textual evidence could be included, if wished. For any areas of disagreement, the pupils had to justify and explain their reasoning and try to reach a working consensus to test in their further study of the play. They were encouraged to evaluate the process of classifying evidence, which sets up the basis for evidence-based discussion.

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–disadvantage–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* (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.

74

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

6 Identifying successful thinking

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO level	Performance level
Pre-structural (Irrelevant)	Pupils engage with the task (start forming groups) but results are difficult to justify.
Uni-structural (Basic)	Pupils can form one or two categories based on more concrete or surface characteristics, so they might not be mutually exclusive.
Multi-structural (Advanced basic)	Pupils can sort data into more than three categories that may not be mutually exclusive.
Relational (Understanding)	Pupils can sort most of the data into groups (with some left out) based on concrete or visible characteristics and have a clear rationale for why one item is in a particular category rather than another (they have decided on the importance of certain characteristics).
Extended abstract (Advanced understanding)	Pupils use more abstract characteristics to develop categories and can sometimes develop alternative categories based on different criteria and can critique their headings. They can use overlapping categories (Venn diagrams).

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 'wacky' 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 that 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.

75 | **Leading in Learning: developing thinking skills in secondary schools**
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things.

1. Crystallise what they have done – used classifying to work with information in new ways, considering and justifying criteria and hence developing skills and understanding.

2. Unpack the process of doing the task. It is suggested the following categories of questions might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

Type of question	
Reflective – general	'How did you choose your criteria for sorting?'
Reflective – specific	'Which card was particularly difficult to place?'
	'What tip would you give to someone who was struggling to classify that card?'
	'How did any new (later) categories emerge?'
Reasoning	'Can you show me a set of three linked cards where you can easily explain the connection… why?'
	'Which set of cards do you think are linked but the connection is hard to explain… and why?'
Challenge	'Which category could you split and which categories could be merged?'
Application	'Why is classifying important?'
	'When does classifying become stereotyping (might need defining)?'
	'Could you use these categories in other similar contexts?'
	'How would this way of thinking help to organise ideas when you tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

76

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 classifying information. They may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. 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, as these examples show.

- You are in a supermarket. You look up at the notices that label the aisles. What kinds of thing do they say? What will you find in an aisle marked 'household'? Where will 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 eighteenth 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.

77

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Collective memory

In this strategy pupils work in small teams to recreate a map, picture, diagram, photograph, advert, 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 go, 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 and coursework

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 that can be significantly addressed, where the teacher creates opportunities, include:

- **Reasoning** skills, as they 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.

Collective memory could be used in coursework in the following ways:

- to encourage pupils to reflect on the way they work together in terms of planning, checking and evaluating strategies and outcomes;
- to develop the understanding of the relationship between the big picture and the detail in any planning or creative context;
- to develop visual literacy through an understanding of the conventions of visual representations so that pupils are better at making use of them.

78 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 them being 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 advert or annotated photograph, 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 flowchart (D&T), 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 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 go. They can have 2 minutes before the first go to plan their general strategy and what the first person will do. After each go, give them 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-subject cycle

Collective memory is a suitable choice of strategy where the three departments have decided to focus on the thinking skill of **Evaluation**. 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 other 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.

An analysis of coursework across the school identified that pupils' evaluation skills were underdeveloped. It was decided that more pupils would benefit if English, mathematics and science worked together in a long cycle with the expectation that pupils would transfer the skills to all subjects. In the previous English and mathematics lessons the audience and purpose and summarising strategies had been used to help pupils begin to judge the value of information for a particular purpose and develop criteria for making those judgements.

The following **science** example is for the eighth lesson in a **long cycle**. In the seventh lesson pupils used the collective memory strategy to reproduce a flowchart detailing the stages of an investigation. For this lesson the objectives are for pupils to:

- develop criteria for judging the effectiveness of the strategies used to complete the task;

79

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

■ identify a list of questions that should be considered when compiling a table of results.

The teacher began by asking pupils to recall the previous lesson, particularly the plenary session, and explained how pupils would develop their evaluation skills further.

The pupils began the lesson by discussing strategies they found helpful and changes that might improve the process.

The teacher introduced the task and invited a pupil to remind the class how the task should be done. The image to be recreated was a results table, shown below.

Distance travelled down slope, in m	Time taken to travel down slope, in seconds				Average speed, in ms⁻¹	Speed at bottom, in ms⁻¹	Stopping distance, in m			
	1	2	3	Av			1	2	3	Av
0.30	0.78	0.84	0.78	0.80	0.38	0.76	1.00	1.01	1.05	1.02
0.40	0.86	0.89	0.93	0.89	0.45	0.90	1.21	1.22	1.24	1.22
0.50	0.99	0.99	0.97	0.98	0.51	1.02	1.37	1.42	1.41	1.40
0.60	1.08	1.07	1.10	1.08	0.56	1.11	1.59	1.55	1.60	1.58
0.70	1.13	1.23	1.22	1.19	0.59	1.18	1.84	1.77	1.82	1.81
0.80	1.30	1.24	1.30	1.28	0.63	1.25	2.00	2.10	1.97	2.03
0.90	1.39	1.31	1.33	1.34	0.67	1.34	2.16	2.23	2.20	2.20
1.00	1.36	1.41	1.37	1.38	0.72	1.44	2.34	2.42	2.41	2.39

The average speed and speed at bottom are in ms^{-1}.

After the allotted time for viewing and recreating this image each group would be asked to reflect on their strategies. The teacher would pose the question:

'How do you know whether the strategies you used were successful?'

Pupils would be given a few minutes to agree on criteria and would be pressed to be specific and not simple settle for 'if our table is right'.

Finally the accurate image is displayed for pupils to use in order to judge their performance as a group. Two groups would then join together to share both the judgement and the criteria with one another.

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 getting an idea about the overall nature of the image;

■ create groups so that pupils with strong visual memories (if you know who these are) 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

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO level	Performance level
Pre-structural (Irrelevant)	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.
Uni-structural (Basic)	Pupils can identify one or two strategies and can make valid comments on how well they worked or how they could improve. They are evaluating and using criteria.
Multi-structural (Advanced basic)	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.
Relational (Understanding)	Pupils can link their strategies together to present it as a plan – 'first we did this, then we did this, and at the end …'. They have a sequence or a whole for which they have a rationale. They are aware of how they might have changed their strategies or plan and can give reasons for this. They will have used some prior knowledge.
Extended abstract (Advanced understanding)	Pupils can present their strategies as linked together in a plan that may have changed over time, which they can explain. They are more aware of how they worked and interacted as a group. They used prior knowledge to help interpret the image and used such knowledge to predict certain features of the image. They might also predict how the strategy might have to change in other circumstances.

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.

81 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

| The classroom looks chaotic. | Learning is not always achieved in ordered conditions and although there is some hubbub pupils are usually very much 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 *Training materials for the Foundation Subjects* (0351/2002), a lesson where this strategy had been used. |

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things.

1. Crystallise what they have done – used collective memory to highlight the importance of using strategies, planning and checking, looking hard at things and making the links between the big picture of something and the detail.

2. Unpack the process of doing the tast. The following categories of questions might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

Type of question	
Reflective – general	'How did you do the task?' (The most important question. Give them a few minutes to discuss in groups before reporting back.) 'Why is such planning important?' 'Were you surprised by anything that you did or that happened?'
Reflective – group work	'How did you work together?' 'Did particular group members specialise?' 'How did you help each other?'
Reflective – specific	'What did the first person do – was this different from the second two people?' 'How did your tactics change?' 'Why did you need to review after each go?' 'What was hard about the 10 seconds?' '(If you speeded up later visits) What happened when you speeded up and had no time to review?'
Application	'Think about other things we've done in (subject). Where else might this have helped you to learn better?' 'How could your strategy be improved if you did this again?' 'How would this way of organising your thinking help to tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

82

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

9 Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see the bigger picture with regard to the value of being able to evaluate and use the strategies developed in collective memory tasks. They may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. Further examples in school where you have to analyse and learn visual representations include the following.

- You can do better in examinations (in geography, history, science, religious studies 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 include the following.

- When you are in a new place it is useful to get a quick overview of a map 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 am I 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 (perhaps the way that they tackle different levels in computer games)?

- 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 then 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.

83 | **Leading in Learning: developing thinking skills in secondary schools**
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Concept mapping

Concept maps allow pupils to make or identify links or relationships between the most important concepts in a topic in a very visual form. As they provide an overview, they are a type of advance organiser but with very particular properties.

1 Rationale

Concept maps are an exceptionally powerful tool for helping pupils get a sense of the big picture in a topic or piece of work and they have an impressive research record in improving learning outcomes in a wide range of subjects and age ranges. Such Research shows that they aid memory, make learning more meaningful, improve understanding and reveal misconceptions. It is through the linking of new information to existing patterns of knowledge that we create new forms of understanding. If our knowledge is fragmentary, our understandings are partial. By mapping concept words (or images) pupils can make visible their thinking about the interrelationships between the parts and construct their own overarching understanding or big picture for an issue, planning task or topic.

The visual nature of concept maps mean that some pupils retain the image of the map in their long-term memory, which acts as a very powerful gateway to recall and understanding.

2 National Curriculum thinking skills and coursework

Concept maps are very good for developing **Information processing**, especially analysing part/whole relationships. They support the development of **Reasoning** skills as they help pupils to draw inferences and explain what they think. They also encourage **Creative thinking** as pupils can make links that they might otherwise not have made.

Concept maps could be used in coursework in the following ways:

- to identify the important factors or variables in a topic and establish some of the links between them, thus underpinning understanding;
- as a way to show causes and effects, or 'causation', in analysis or conclusions. In some subjects concept maps are an acceptable alternative to extended writing and can therefore enable pupils with weak literacy skills to demonstrate analytical thinking and an ability to synthesise information;
- to encourage creativity through activating prior knowledge;
- as a tool in planning extended writing when pupils are sufficiently practised to identify complex causal chains by explaining a link from one concept to a second and then on to a third. So in science, for example, if one were mapping the linkages in an ecosystem, one could start with the decline in predator species and follow this through to an increase in the number of herbivores leading to overgrazing of vegetation. They also allow pupils to identify where several factors might combine to cause a single effect.

3 Planning to use the strategy

The starting point is to decide what the main concepts are in a topic. (A concept is a group or class of things so that most nouns, excluding names of people and places,

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

are also concepts.) When pupils are first introduced to concept mapping the teacher probably needs to do this for them. With practice, pupils will be able to perform this task, thus demonstrating their increasing autonomy and ability to transfer learning. In some subjects, especially the humanities, a good way of identifying important concepts is to think of causes and effects related to the topic or issue. The concepts are written on cards or slips of paper and arranged in a circle around a large sheet of paper (such as sugar paper). In some subjects, including science, sometimes the concepts are arranged hierarchically from the most general or abstract at the top of the sheet and the most concrete lower down. Where pupils can make a connection between two of the concepts they draw a connecting line and write a word or phrase on the line to represent the nature of the link. An arrow can be used to show the direction of the relationship.

4 An example from a 3-subject cycle

Concept mapping is a suitable choice of strategy where three departments have decided to focus on the thinking skill of **Reasoning**. 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 other 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 second lesson in a **short cycle**. In the first lesson, in science, pupils collaboratively constructed a concept map for atomic structure prior to starting the topic. In this activity the key words, e.g. electron, proton, nucleus, mass number, charge, isotope, reactions were provided by the teacher. Pupils wrote their own links between the key words having observed the teacher modelling a couple of examples.

The lesson was located towards the end of a piece of coursework based on the geographical enquiry question '*Why does land use vary across an upland area?*' In order to research this question pupils carried out a field trip to an upland area within a national park and collected a range of primary and secondary evidence. Having mapped, graphed and analysed this evidence pupils had reached the point where they could begin to plan their overall conclusion. For this lesson the objectives were for pupils to:

- use precise language to explain complex interrelationships;
- synthesise this understanding and draw conclusions about how different factors collectively influence land use in an upland area.

The teacher would begin by sharing the GCSE examination board criteria for the 'Data interpretation' (level 3) section of the coursework with the pupils.

The candidate demonstrates links through a detailed analysis of the material. In referring specifically to the data valid conclusions are drawn that relate to the original purpose of the enquiry (AQA GSCE geography specification A).

The pupils began the lesson by discussing what this statement might mean and how

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

they thought the concept mapping strategy used in science could help them. They were asked to reflect on the importance of writing relevant links and the difference between one-way and two-way arrows.

Working individually, each pupil was then provided with blank cards on which they were asked to write the factors that influence land use in the upland area they had studied. Each pupil classified the cards by grouping them on a large piece of sugar paper. Once a pupil was satisfied with their classification, the cards were stuck down leaving room between for writing the links and giving a title to the links. Next the pupils were asked to identify links between the factors using single and double-headed arrows and to explain the links as concisely as possible. (One example of the kind of concept map that a group of pupils might produce is illustrated overleaf.)

At the end of the lesson the teacher asked the pupils to think about how they would use this strategy to write detailed and reasoned conclusions or use it as a plan for extended writing.

5 Creating the right level of challenge

In the early stages of using concept maps to support lower-achieving pupils you might:

- give only three or four concepts to work with in the first instance, adding additional concepts for them to consider as the maps take shape;

- introduce each concept using some concrete introduction;

- supplement concept words by a photograph or sketch;

- expect that the nature of the link will be fairly simple, such as 'X makes Y happen'.

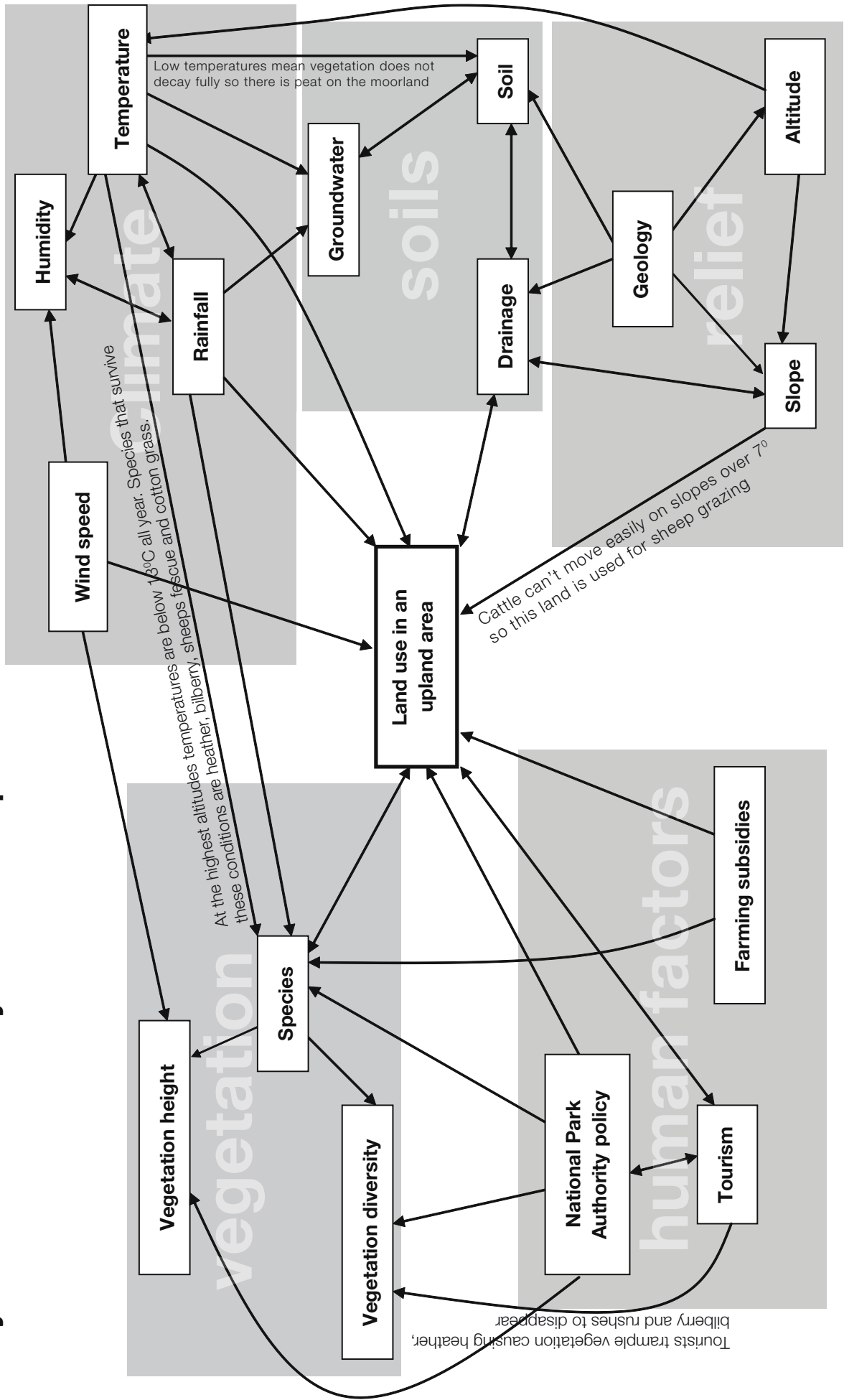To challenge higher-achieving or more confident groups you might:

- provide up to ten concepts to be handled (remember that the number of possible links increases exponentially as the number of concepts increases);

- increase the control pupils have over the process by providing them with blank cards or slips of paper they can use to identify extra concepts. This is a good stepping stone to greater independence in the use of concept maps;

- expect that the relationships between concepts would be more sophisticated, for example 'as X increases so Y declines'.

Identifying successful thinking

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Why does land use vary across an upland area?

Temperature decreases by 1°C for every 1000 metres height gained. At 545 metres the temperature was 11°C (10.00 hours) but at 300 metres it had incresed to 16°C (14.00 hours)

climate

Temperature

Low temperatures mean vegetation does not decay fully so there is peat on the moorland

Humidity

Rainfall

Wind speed

Species that survive are below 10°C all year. Species that survive and cotton grass.

At the highest altitudes temperatures are heather, bilberry, sheeps fescue and these conditions are

soils

Soil

Groundwater

Drainage

relief

Altitude

Geology

Slope

Cattle can't move easily on slopes over 7° so this land is used for sheep grazing

Land use in an upland area

vegetation

Vegetation height

Species

Vegetation diversity

human factors

Farming subsidies

National Park Authority policy

Tourism

Tourists trample vegetation causing heather, bilberry and rushes to disappear

SOLO Level	Performance level
Pre-structural (Irrelevant)	Pupils engage with the task (start drawing links and writing) but the links are hard to justify.
Uni-structural (Basic)	Pupils can make one or two justifiable links between concepts but explanations are simple, e. g. X makes Y happen.
Multi-structural (Advanced basic)	Pupils can make more than three justifiable links between concepts. The explanations on the links may still be limited and several relevant concepts are not linked satisfactorily.
Relational (Understanding)	Pupils can make justifiable links for most of the concepts and can tie together several links to make a causal chain or a triangle of understanding with some concepts interrelated to create a whole idea or interpretation. They use a considerable amount of their own knowledge and can generate their own limited concept maps.
Extended abstract (Advanced understanding)	Pupils do the above, but can also see many multiple and reciprocal relationships. They can use concept maps independently and explain complex interrelationships. They identify their own pertinent concepts in topics.

7 Troubleshooting

Possible difficulties	Possible solutions
Pupils come to this 'cold'.	Model the process and explain the thinking and usefulness of concept mapping.
Pupils only make superficial links between the concepts.	Develop more depth through whole-class discussion. Ask particular pairs or groups to read out their link and press them to explain what they mean in greater detail. Explore with the class the success criteria for a good causal link.
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, for example, using a mystery to provide concrete information about the causes and effects for the topic.
The pupils make many links and seem to show understanding in their discussion but they cannot translate this into writing.	The increased understanding is beneficial anyway. In time, the concept map can be used to support writing by encouraging pupils to use them as a form of writing frame.

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things.

1. Crystallise what they have done – used concept mapping to give pupils an

overview of a topic and how the main elements of it are linked.

2. Unpack the process of doing the task. The following categories of questions might be useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

Type of question	
Reflective – general	'How do concept maps work?'
Reflective – specific	'How did you start making links?' 'What links did you come up with first?' 'Why these?' 'What makes a good link?' 'How did you create new concepts to add into the map?'
Reasoning	'What is the link between those two concepts?'
Challenge	'Why are these concept maps (from different pairs or groups) different from each other?'
Application	'What good are concept maps?' 'How would you create your own for a new topic?' 'Which subjects/topic would you find concept maps useful for?' 'How would you use them in (subject)?' 'How would this way of thinking help to structure the way you tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

9 Bridging scenarios

Stories, prompts, analogies and scenarios should be used to encourage pupils to make connections, generalise and see a bigger picture. They may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. Further examples could include the following.

■ In some TV detective programmes you see a concept map on a wall or board, showing the murder victim, the suspects, the links between them and links to motive, opportunity and murder weapon or means. These things are linked by arrows and the people are usually shown by their photographs.

■ Concept maps are a bit like the big battlefield models seen in some films, where commanders can see the forces on both sides and the terrain of the battlefield. They can then see the links between the forces and them and the land they are fighting on.

■ Students in sixth form, college or university get hooked on this way of thinking and they do concept maps for all topics they are studying and put them on the wall. They say that they can see the map in their head when they are doing an answer in an examination or writing an essay.

89 **Leading in Learning: developing thinking skills in secondary schools**
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 (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 that 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 on the table. 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 and coursework

Using mysteries is outstanding as a strategy in that it is good for all of the National Curriculum thinking skills, indicating both its flexibility and its 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.

Mysteries can be used to address coursework in the following ways:

- to focus on the need to use evidence to support reasoning or explanation in extended writing;
- to help understanding of the way in which components, reasons or causes can be structured to present a coherent argument (as this can be physically demonstrated through the grouping of the data items);
- to encourage creative thinking and the consideration of alternative solutions or scenarios, as mysteries do not normally have a single right answer. Pupils can

90 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

transfer this skill and consider whether their theories stand up, identifying the assumptions that they have made and the evidence that exists to support their ideas;

■ as a very powerful approach to improving the extended writing required in many pieces of coursework. As a follow-up to the mystery itself the groups of cards can be used to inform paragraphs with headings for groups used to produce topic sentences.

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. Approximately 15–30 data items will be needed. To design the mystery, think in the following terms:

■ a story line or narrative – there need to be some slips that describe characters and what happens to them in a particular scenario;

■ some place/time context which usually provides the subject knowledge background for the mystery;

■ data items that 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 Key Stage 3 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-subject cycle

Mysteries is a suitable choice of strategy where three departments have decided to focus on the thinking skill of **Enquiry**. 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 **Enquiry** that is common to other 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 **business studies** example is the first lesson in a **short cycle**. In a previous business studies lesson the pupils had been considering the advantages and disadvantages of different types of business. For this lesson the objectives are for pupils to:

- develop their **Enquiry** skills by predicting the outcome of the mystery question and consider the consequences of their answers;
- consider the advantages and disadvantages of being a sole trader.

The teacher began by explaining that the pupils were going to think hard about the question 'Should Dave become a sole trader?' to develop their enquiry skills. An important part of the lesson was for pupils to identify the key questions used to enable the answer to be reached. Pupils were told that they would need to use their previous knowledge to interpret and group the information contained in the mysteries envelope. The pupils would work collaboratively in groups to solve the mystery. The cards for this mystery included the following statements.

Dave Prosser is not happily married.	Dave Prosser wants to apply for Small Earnings Exception.
Dave's motorbike has broken down.	Limited companies are more organised.
Dave and Anne Prosser have never been refused credit.	Dave Prosser gave up work for two years to look after his children.
Ten years ago Dave Prosser was part of a limited liability partnership.	Anne Prosser has three children from a previous marriage.
Creditors have a right to personal assets.	Dave Prosser is a hairdresser.
Dave has a grade B in maths GCSE.	Dave Prosser has taken a course in accountancy.
Anne Prosser is due to receive a large inheritance.	Dave regularly works long hours.
Businesses feel safer dealing with limited companies.	Dave Prosser has very few close friends.
Dave Prosser likes to take three holidays a year.	Dave and Anne Prosser have a joint mortgage of £150,000.
Being a sole trader suits a large number of small business people.	Dave Prosser was born in 1968.

Each group shared their findings, stating clearly the questions they deemed relevant to address and the evidence on the cards that resulted in their chosen outcome. Following this groups were given the chance to reconsider their outcomes and the evidence for these before moving on to consider the possible consequences for Dave and what further information they might need to research the problem fully.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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.

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 causes' 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 causes' 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

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO levels	Performance levels
Pre-structural (Irrelevant)	Pupils select some data items, which may be relevant, but cannot develop an explanation.
Uni-structural (Basic)	Pupils select one or two data items that are relevant, and develop an explanation, but it does not fully address the question.
Multi-structural (Advanced basic)	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 some data items but they are not all linked together to reach a successful conclusion.

93

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Relational (Understanding)	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.
Extended abstract (Advanced understanding)	In addition to the above, pupils use wider knowledge to help interpret the information and make more general and abstract statements. They are able to entertain more than one possible solution and more likely to identify flaws or weaknesses in their own reasoning.

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 TV 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 them 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 that doesn't fit into their theory or tell them that another group has a different theory to sow some doubt.

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things:

1. Crystallise what they have done – tackled an open problem with no single right answer and practised all the skills needed to do this. They have also organised their thinking through organising the data items.

2. Unpack the process of doing the task. The following categories of questions might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

94

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Type of question	
Reflective – general	'How did you start doing the task?' 'How did you go on?'
Reflective – specific	'What assumptions have you made?' 'How did you know what was relevant?' 'How did you form groups of statements?' 'Did you reject any theories? Why?' 'What did you assume?'
Reflective – group work	'How did you work together?' 'How did you help each other?'
Challenge	'What were the long term/background causes and what were the short term/trigger causes?'
Application	'How is this like the work of a detective?' 'So what have we learned about how things are caused?' 'How would this way of thinking help to structure the way you tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

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 may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis.

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.

Some examples in everyday life follow.

■ Your brain is like the table top when you are using it to sort objects – 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

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 stop accidents happening?

96

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 the same thing 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 and coursework

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

■ **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), which can also be addressed where the teacher creates opportunities.

Reading images can be relevant to coursework in the following ways:

■ the strategy could help activate pupils' knowledge in relation to a particular topic;

■ it could encourage pupils to be more creative in their thinking both about the subject matter conveyed through an image and more generally to consider the way images are used to communicate meaning;

■ it could encourage pupils to evaluate visual representations presented to them and to be more discerning about images they devise to present as part of their own work.

97 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 web 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.

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.

The Key Stage 4 Leading in Learning DVD includes extracts from 3-subject cycle developing reasoning using reading images. The teachers are from Marden School in North Tyneside.

- In the second lesson the RE teacher presents pupils with two images of funerals drawn from different cultures and religions.
- In the third lesson the history teacher uses a selection of images concerning Nazi treatment of the Jews.

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).
- They can be asked to make a case for something – different groups of pupils can be given different or opposing cases.

4 An example from a 3-subject cycle

Reading images can be a suitable choice of strategy where the three departments have decided to focus on the thinking skill of **Reasoning**. 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 reading images that is common to other 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 **RE** example is for the second lesson in a **short cycle** involving mathematics and history. In the first lesson, mathematics, the images offered were unlabelled graphs and charts and pupils were asked to draw inferences from them, giving reasons for the opinions they presented.

98

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

This RE lesson was located at the start of a unit focusing on knowledge and beliefs about death. For this lesson the objectives are for pupils to:

- draw inferences and explain thinking;
- activate knowledge about death and beliefs about death.

The teacher prepared two images drawn from different religions.

- The first was a group of about 12 children all aged about nine or ten years with one adult; their faces were visible. They were standing around a grave; the headstone indicated that this was the grave of a stillborn baby boy.
- The second image was a wider view of crowds of people in front of a Buddhist temple watching funeral pyres on the banks of the river Ganges.

Pupils worked in groups of three annotating an image that was pasted on a large sheet surrounded by three unlabelled borders as shown below. Working from the image outwards, they were directed to place their annotations in each border according to which question they were addressing. To focus pupils on evidence for opinions the questions were given orally and groups spent equal amounts of time on each stage. The teacher chose this structure because previous lessons had shown that higher-attaining pupils were rushing towards interpretations that were not necessarily supported by detail.
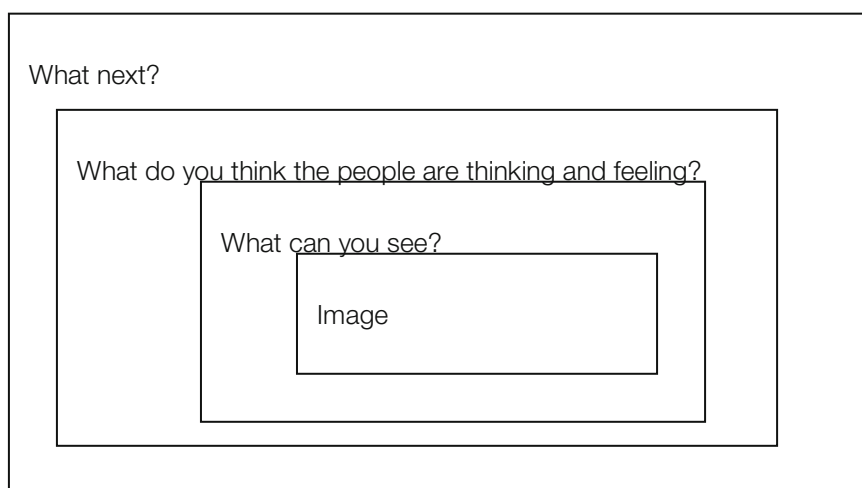
Each image was debriefed by whole-class discussion using the three stages to draw out evidence for the inferences pupils were making.

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?';

  An example of reading images being modelled is shown in a geography lesson in the *Training materials for the Foundation Subjects* video, 0351/2002.)

- place a grid on a clear acetate sheet over the image and ask them to read it

99 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 using the 5Ws – Who, What, Where, Why and When – as question stems. (Notes on the 5Ws as a separate strategy are provided in this handbook.)

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.

6 Identifying successful thinking

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO level	Performance level
Pre-structural (Irrelevant)	Pupil responds to the task but the connections made to features in the image appear random and not substantiated.
Uni-structural (Basic)	Pupil makes one or two relevant connections to features in the image but cannot make an obvious link between them (would struggle to capture them under one heading).
Multi-structural (Advanced basic)	Pupil makes more than three connections to features in the image but cannot make an obvious link between them (would struggle to capture them under one heading).
Relational (Understanding)	Pupil makes several relevant connections to features in the image and can link them in some way, for example by generating an overall heading. The linkage is likely to be through concrete visible features.
Extended abstract (Advanced understanding)	As above, but the linkage may be more abstract, prompted by less visible features, indicating a wider general knowledge. Pupils are likely to be able to generate more than one heading or critique a heading (see how it does not fit).

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

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 5Ws strategy (Who, What, Where, Why, When) 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 who 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 plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things:

1. Crystallise what they have done – used reading images to look harder, find patterns, make inferences and look for connections.

2. Unpack the process of doing the task. The following categories of questions might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

Type of question	
Warm-up	'What connections have you made?'
Reflective – general	'How do photographs and other visuals help in showing something or in solving a problem?' 'How did you do it?'

101 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Reflective – specific	'What makes a good connection?'
	'What strategies did you use to go beyond the frame of the image?'
	'Did anyone put themselves in the picture?'
	'Did you have any 'aha!' moments when you suddenly realised something?'
Reasoning	'What is your title and why that title?'
Challenge/reasoning	'Do you prefer or like anyone else's title? Why?'
	'What difference does a title make?'
Application	'Why is being able to read an image, picture or real-life scene important?'
	'Do artists and photographers try to make you think certain things by looking at their images? Can you do this?'
	'How would this way of thinking help to structure the way you tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

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 reading images. They may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. Further examples in school could be:

■ 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 include the following.

■ This is like the programmes you see on TV, where a detective visits a crime scene and looks carefully around, at photographs, things that tell them about the person, 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, a clothes consultant giving their client a once-over, 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 a priest in the background represents the power of the church. Alternatively 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.

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 and equally for pupils to help peers understand things 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 you get 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 the ability to condense and convey meaning. It is evident that many students in higher education 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 and coursework

Summarising directly addresses **Information processing**, particularly collecting information, sorting and classifying and sequencing. Summarising is also a powerful tool 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, that can be significantly addressed, where the teacher creates opportunities, include **Reasoning**, where pupils make inferences and deductions.

Summarising could be useful in coursework in the following ways:

- summarising primary or secondary evidence that is being collected;
- summarising such evidence when it is being used to persuade or explain;
- summarising conclusions without losing necessary detail.

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

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

ideas, transforming information into new forms, and 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 the film scene by scene without them 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 that 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 aloud 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. A variety of different frames support different text types and genres. An example is the problem or solution frame.

Sections of the frame	Summary
the problem	
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, D&T, 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 of Classroom Instruction*, by Marzano, R. *et al. A Handbook of Classroom Instruction*, Association for Supervision and Curriculum Development, ISBN 087120522X. Key Stage 3 National Strategy sources include:

■ *Literacy across the curriculum* training materials, module 10: Using the library/learning centre. Handout 10.8 provides examples of graphic note-taking devices;

■ *Training materials for the Foundation Subjects* (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, summarising the essence of a problem in a diagram representing key

104 Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

aspects and data, or transforming information into new forms, for example using chemical symbols and formulae. These forms of re-representing are very powerful in helping understanding.

4 An example from a 3-subject cycle

Summarising is a suitable choice of strategy where the three departments have decided to focus on the thinking skill of **Information processing**. 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 other 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 **music** example is for the second lesson in a **short cycle** involving English and drama. The teachers wanted to help pupils understand how to identify and draw out salient points from narratives, by locating relevant information, sequencing what has been heard and comparing and contrasting different elements within the narrative. In the previous English lesson, pupils were introduced to summarising using the five steps above. They had to identify the salient points made by two people arguing for and against the actions of Macbeth in committing murder.

In previous lessons, pupils had studied both traditional Indian music and western pop songs. This lesson is based on the need for pupils to identify and describe how a piece of music in a fusion style (in this case, Bhangra) incorporates musical elements from two different traditions, and merges them to create a new style. For this lesson, the objectives are for pupils to:

- summarise information to make comparisons;
- compare and contrast two fusion pieces, recognising how the sequence of influences can be different in each.

The teacher began by grouping the pupils into threes and explaining that, as a piece of fusion Bhangra music was played, one person in each group would listen for:

- features/conventions of Indian music;
- features/conventions of western pop songs;
- aspects of the lyrics that might inform either or both sets of conventions.

105

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

The pupils discussed and completed the summarising frame below.

Features of the music	Indian	Western pop
Melodic systems		
Structures		
Rhythms		
Instrumentation		
Lyrics		

On second playing the pupils sequenced the order in which the features were heard.

The teacher then played another song in the same Bhangra style but with different fusion features and pupils repeated the process.

Still working in small groups the pupils compared the two pieces of music and from the discussion decided the best way to summarise their comparison.

Finally, to debrief the task, the pupils discussed how they decided what should go into the summary and why they did or did not include notation.

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 aloud 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

These are descriptors of levels of response in this task. They will give you an indication of the thinking ability of pupils and they should inform future planning. So, if many of your pupils are stuck at the multi-structural level, what can you do to improve their thinking and work?

SOLO level	Performance level
Pre-structural (Irrelevant)	Pupils can identify some of the elements in the text (e.g. the problem or one of the solutions) to be summarised but cannot summarise them.
Uni-structural (Basic)	Pupils can identify one or two elements and can summarise some of them adequately, but cannot summarise the meaning of the whole text.
Multi-structural (Advanced basic)	Pupils can identify more than three elements in the text and can summarise them adequately, but cannot summarise the meaning of the whole text.
Relational (Understanding)	Pupils can summarise most elements of the text adequately and link them together so that they are a reasonable representation of the text. In the process they make inferences based on their own knowledge.
Extended abstract (Advanced understanding)	Pupils can summarise the text in a variety of ways and are aware of the advantages of each method. They make greater but valid use of inference and their own knowledge and may use high-level organising (abstract) concepts to do so – they transform the information.

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 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 'Big concepts' module.
Pupils struggle with the tasks set. They cannot begin to sift out the main meaning.	Give them an advance organiser (see the section on this strategy) and then support their use of the organiser. This reduces the amount of information they have to consider.

8 Metacognitive plenary

This is the key session of the lesson where, in many cases, a visiting teacher will be drawing out the learning to encourage generalisation and transfer. The value of the lesson is undermined without this section.

Try to do three things.

1. Crystallise what they have done – synthesised information to present in a concise and ordered manner, practised the skills needed to make inferences and give the main gist.

2. Unpack the process of doing the task. The following categories of questions might be particularly useful. However, bear in mind that there should be two or even three lessons over which you can develop the generalisations and insights and they can be seen as a cumulative series.

107

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Type of question	
Reflective – general	'How did you decide what information to leave out?' 'Do you prefer summarising in words or diagrams/ pictures?' 'What are the important things to remember when you are summarising?'
Reflective – specific	'How do paragraphs help you when you are summarising?' 'What sentences in a paragraph are especially helpful in doing a summary?'
Reasoning	'Is this the best way you have come across of summarising – is there another way you would prefer? Why?'
Challenge	'Why do you think it is important to consider the purpose of the summarising?' 'What difference does it make if the summary is for you or for someone else?'
Application	'So why do we need summarising – why is it so important?' 'Where can you use summarising to help you in school?' 'How would this way of thinking help to structure the way you tackle an extended piece of work such as GCSE coursework?'

3. At the beginning or the end of lessons, try some bridging scenarios.

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 summarise. They may be used by the subject teacher in the launch and will be critical for the plenary teacher at the end of the lesson. Don't forget to make connections to your own subjects and aspects of the coursework that emerged from the initial analysis. Further examples in school could be:

■ selecting key points for revision;

■ making good notes in a lesson or contributing to the plenary.

Examples in everyday life include the following.

■ Although people use it less often now, secretaries used to be trained in shorthand, so when a letter was dictated to them they could note it down in specially coded symbols and type up the letter later word for word. Tape recorders are often used now. How do you take notes if someone is telling you instructions over the phone?

■ Advertising is a form of summarising. On billboards you cannot give all the text to explain a product – you have to use a message that says something attractive about the product and images that are eye-catching or memorable. Once people are familiar with a product advert you can start to reduce the number of words further as they will know the rest.

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

- 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. Lots of people are not good at it and this means that 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.

109

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

Appendix 1: Planning, observing and reviewing templates

The following templates are also available in Microsoft Word format so that you can adapt them to suit your purposes.

- Coursework analysis
- Collaborative planning
- Lesson observation schedule
- Collaborative review
- Pupil information sheet
- Pupil review sheet

Leading in Learning Key Stage 4: Coursework analysis

Thinking skill	These enable pupils to:	Example of the application of this skill in coursework in (subjects)
Information processing skills	▪ locate and collect relevant information ▪ sort, classify and sequence ▪ compare and contrast ▪ analyse part/whole relationships	
Reasoning skills	▪ give reasons for opinions and actions ▪ draw inferences and make deductions ▪ use precise language to explain what they think ▪ make judgements and decisions informed by reason or evidence	
Enquiry skills	▪ 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 skills	▪ generate and extend ideas ▪ suggest hypotheses ▪ apply imagination and look for alternative innovative outcomes	
Evaluation skills	▪ evaluate information ▪ judge the value of what they read, hear and do ▪ develop criteria for judging the value of their own and others' work or ideas ▪ have confidence in their judgements	

Leading in Learning Key Stage 4: Collaborative planning

Subject teacher:			
Subject and topic: **Date:**	**Class:**	**Please circle** **Cycle: Long/Short** **Lesson: 1 2 3 4 5 6 7 8 9**	
Thinking skill objective:		**Strategy:**	
Subject objective:		**Subsequent reflections**	
Launch:			
Middle/group work:			
Metacognitive plenary questions:			
Bridging:			

Leading in Learning Key Stage 4: Lesson observation schedule

Feature	Observations
Launch phase	
Refers to thinking skills focus and what is involved	
Bridges to other lessons, subjects, contexts and to coursework	
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, to coursework skills and to contexts outside of school	

Leading in Learning Key Stage 4: Collaborative review

Subjects and teachers:				
Date:				
Cycle: Long/Short	After lesson number: 3 6 9		Thinking skill:	Strategy:

Is there evidence that pupils' thinking skills have improved over the three lessons? Give examples.

What were the key events in the lessons that enabled pupils to make progress?

What did you do as teachers that helped this to happen?

How might you change the lessons if you were to repeat them?

What are the implications for developments for the next sequence of lessons?

What are longer-term implications for the way that pupils are supported to develop coursework skills?

Leading in Learning: developing thinking and learning skills

Pupil information sheet

We are working together on a school project in Year 10 to develop thinking and learning skills. Teachers in (*insert subjects*) are planning some lessons together so that the links between the skills you need to complete coursework in these three subjects are made clear. These lessons are planned to help you improve your thinking skills – skills such as (*insert specific skills here*). You need these skills in all subjects so if you get better at them you should be able to apply them to all your coursework as well as to other situations in and out of school. We are hoping that the quality of your coursework and hence the marks you get will be higher. These are also the kinds of skills that are highly prized by employers.

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

- Work hard in the lessons by cooperating with your classmates, sharing ideas and listening to the views of others – as you usually do.

- Helping the teachers by explaining to them how this links to other subjects.

- Cooperate with the extra teachers and other observers who are likely to be in the lesson by acting naturally.

- Complete a review sheet to help us know how well you are learning and what you think of the lessons.

- Talk 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 any interviews. A few of you may be asked for your thoughts on the lessons.

- Use what you have learned from these lessons to help you with your coursework.

We also ask you to discuss this project with your parents or carers. You can do this firstly by sharing the information on this sheet with them, and then follow this up by discussing what you learn in the lessons as they happen. They will then be able to help you remember to apply what you learn when completing your coursework.

Thank you for your help!

Leading in Learning Key Stage 4: Pupil review sheet

Class:	Cycle: Long/Short
	After lesson number: 1 2 3 4 5 6 7 8 9
Name: Gender: male/female	Class:
Date:	Subjects:

Thinking skill:

What stands out from what you have learned as being particularly important?

How does this help you to learn about thinking?

How would this help you in other subjects?

How could this be useful in your GCSE coursework?

What else is important for you to say?

Appendix 2: 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 50 years later. One critical difference in the work of Vygotsky from that of Piaget was that he stressed the role of language in development. 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 that 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 earned a 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 United States, 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 the UK in the last 25 years

It is pertinent to begin the recent history of teaching thinking in England with Instrumental Enrichment (IE). 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. Therefore, Feuerstein 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 '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

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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. IE has stimulated the development of many similar programmes, the most prominent of which are Somerset Thinking Skills (www.somersetthinkingskills.co.uk) and Top Ten Thinking Tactics (Lake and Needham, 1993).

Another landmark in teaching thinking skills in England is CASE/CAME, which 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 that seek to improve specific thinking 'skills' such as sequencing. Thus the influence of Piaget is very strong on CASE, which also 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 it is largely promoted and supported in England by the charity SAPERE (Society for the advancement of Philosophical Enquiry and Reflection in Education, www.sapere.net). 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 the community of enquiry technique 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 ten years there has been a surge of work on 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

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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. The popular work of Edward De Bono (for example *Six Thinking Hats*) and Tony Buzan is finding a home within this subject infusion methodology.

During the last ten years the groundswell of interest in improving pupils' capacity to think and learn has led to local pockets of interest and expertise, which have sometimes 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 ZPD) 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 (1999) 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-subject 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.

120

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN

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 of 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*, BBC Consumer Publishing

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

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

Fisher, P. (2002) *Thinking Through History*, Chris Kington Publishing

Harris, I. and Caviglioli, O. *Think it – Map it!*, Network Educational Press

Joyce, B., Calhoun, E. and Hopkins, D. (1997) *Models of learning – tools for teaching*, Open University Press

Lake, M. and Needham, M. (1993) *Top Ten Thinking Tactics*, Questions Publishing

Leat, D. (ed) (1998) *Thinking Through Geography*, Chris Kington Publishing

Lin, M. and MacKay, C. (2004) *Thinking Through Modern Foreign Languages*, Chris Kington Publishing

Marzano, R., Norford, J., Paynter, D., Pickering, D. and Gaddy, B. (2001) *A Handbook for Classroom Instruction that Works, Association for Curriculum Supervision and Development*

Nichols, A. (ed) (2001) *More Thinking Through Geography*, Chris Kington Publishing

White, R. and Gunstone, R. (1992) *Probing Understanding*, Falmer Press

More general reading

Adey, P. and Shayer, M. (1994) *Really Raising Standards*, Routledge.

(Gives a comprehensive background to CASE and other interventions)

Biggs, J. and Collis, K. (1982) *Evaluating the Quality of Learning*, Academic Press

Claxton, G. (1999) *Wise-Up – The Challenge of Lifelong Learning*, Bloomsbury

Dweck, C. (2000) *Self-Theories; Their Role in Motivation, Personality and Development*, Psychology Press

Feuerstein, R. (1980) *Instrumental Enrichment*, University Park Press

Lipman, M., Sharp, M. and Oscanyan, F. (1980) *Philosophy in the Classroom*, Temple University Press

McGuinness, C. (1999) *From Thinking Skills to Thinking Classrooms: A review and evaluation of approaches for developing pupils' thinking*, DfEE Research report RR115

Resnick, L. (1987) *Education and Learning to Think*, National Academy Press

Shayer, M. and Adey, P. (eds) (2002) *Learning Intelligence*, Open University Press

Wood, D. (1988) *How Children Think and Learn*, Blackwell
(An introduction to the work of Piaget, Vygotsky and Bruner)

Leading in Learning: developing thinking skills in secondary schools
Key Stage 4 Handbook for teachers
Secondary *National Strategy*

© Crown copyright 2006
2111-2006DWO-EN