



11:THINKING SKILLS

What do we mean by thinking skills?

When considering the place of thinking skills in your school, first ensure that colleagues are agreed on a definition.

THINKING SKILLS

- De Bono (1976) distinguishes thinking from knowledge and intelligence. He defines it as 'achieving a desired mental state or result'. The skills covered here are broad and complex; they are not as narrow as reasoning skills, or, even more narrowly, confined to knowing the rules of logic and avoiding logical errors. They encompass 'knowing what to do, when and how to do it, what tools to use and the consequences' (de Bono, 1976).

This explains three models for teaching them in school: structured programmes additional to the curriculum; targeted 'subject or domain-specific work': and the 'infusion' model across the curriculum. While there is inevitably some overlap, the focus in this launch pad is more on classroom practice.

Writers describe and classify thinking skills in different ways. Bloom, in his taxonomy of cognitive goals (1956), gives an hierarchical model, in which he places

- the thinking skills involved in evaluation
- those involved in synthesis
- those involved in analysis
- those involved in application,

and so on. People may infer from this that the skills are discrete; they may also agree with him that evaluation covers the 'highest-order' thinking skills. But many are agreed that any categories of thinking skill are not mutually exclusive. Fisher (1990) describes at least three important aspects of skill in thinking:

- Critical thinking
- Creative thinking

- Problem-solving.

Loosely, critical thinking is synonymous with Bloom's notion of the skills of evaluation; creative thinking with his concept of synthesis; and problem-solving with his headings of application and analysis. However, Fisher stresses that there is overlap between each aspect. For example, problem-solving should include the invention of problems and questions to explore (creative thinking) and the evaluation of proposed solutions (critical thinking). Critical thinking should include the organisation of one's thinking skills into a combination of tools that will work (creative thinking). In its turn, creative thinking should include critical thought. Problem-solving may be creative, that is to say exploratory, open-ended, divergent, etc. And so on.

It appears that ability in one or more of these areas may or may not be connected with high IQ.

➤ **Critical thinking**

Fisher describes three interdependent types of critical thinking strategies:

- Affective strategies, i.e. the ability to think independently of others. This should include taking others' views into account.
- Macro-abilities, i.e. the ability to harness, and have insight into, the mechanical or other skills being used for any task. Bloom values as a 'highest-order' thinking skill the quality of Metacognition, namely the ability to be aware and critical of one's own thought and learning processes.
- Micro-skills. Within these, Fisher stresses learning how to question, when to question, and what questions to ask; and learning how to reason, when to use reasoning, and what reasoning methods to use.

He argues that critical thinkers should have:

- A readiness to reason
- A willingness to challenge
- A desire for truth.

He quotes R.H. Ennis (1962), who gives twelve aspects to the micro-skills of critical thinking:

1 Grasping the meaning of a statement	<i>Is it meaningful?</i>
2 Judging whether there is ambiguity in reasoning	<i>Is it clear?</i>
3 Judging whether statements contradict each other	<i>Is it consistent?</i>
4 Judging whether a conclusion follows necessarily	<i>Is it logical?</i>
5 Judging whether a statement is specific enough	<i>Is it precise?</i>
6 Judging whether a statement applies a principle	<i>Is it following a rule?</i>
7 Judging whether an observation statement is reliable	<i>Is it accurate?</i>
8 Judging whether an inductive conclusion is warranted	<i>Is it justified?</i>
9 Judging whether the problem has been identified	<i>Is it relevant?</i>
10 Judging whether something is an assumption	<i>Is it taken for granted?</i>
11 Judging whether a definition is adequate	<i>Is it well defined?</i>
12 Judging whether a statement taken on authority is acceptable	<i>Is it true?</i>

Fisher gives special importance to:

- Asking the right questions
- Analysing questions
- Logical reasoning
- Sequencing, e.g. temporally, logically, causally
- Classifying, e.g. ideas, objects
- Judging, e.g. whether there is enough evidence
- Predicting (and justifying predictions)
- Theorising
- Understanding others and oneself.

➤ **Creative thinking**

Fisher (1990) believes that creative thinking consists largely of rearranging what we know in order to find out what we do not know. Guilford (1966) and Fisher find indicators of creative thinking skills in:

- Fluency of thinking (the ease with which we use stored information when we need it)
- Flexibility (the ability to overcome mental blocks and apparent obstacles)
- Originality (the ability to produce an unusual or rare response)
- Elaboration (the ability to add extensively to an idea, including divergent thinking).

Creative thinkers often demonstrate:

- Curiosity
- Risk-taking
- Wit.

Fisher (1990) emphasises that creative thinking should involve critical judgement: 'Creativity is not merely a question of generating new solutions to problems but of creating *better* solutions'. This reminds us that creativity is strongly linked to problem-solving.

He and de Bono (1970, 1982) give special importance to:

- Substituting
- Combining
- Adapting
- Modifying
- Putting things/ideas to other uses
- Eliminating
- Rearranging.

➤ **Problem-solving**

Gilhoey (1996) lists several kinds of problem:

- Puzzles (often closed)
- Decision-making (like puzzles, but involving choice)
- Adversarial problems (e.g. chess)
- Non-adversarial problems (e.g. mathematical).

Fisher (1990) identifies three sets of interacting factors involved in problem-solving. Able problem-solvers need:

- an appropriate attitude: interest, motivation and confidence
- cognitive ability: knowledge, memory and thinking skills, including metacognition – understanding of how to apply knowledge and memory
- experience: familiarity with content, context and strategies.

Indicators of able problem-solvers include:

- ability to notice problems, or to invent them
- ability to understand problems, e.g. seeing problems from many angles, thinking what is meant, perceiving causes of problems and repercussions of solutions
- ability to suggest or plan action
- ability to tackle a task, e.g. showing perseverance despite setbacks
- ability to review/adapt/modify action
- ability to evaluate action/solutions.

WHY ARE THINKING SKILLS AN IMPORTANT FOCUS IN THE EDUCATION OF GIFTED AND TALENTED PUPILS?

- There is not necessarily a link, in all pupils, between high IQ and high ability in thinking skills. As IQ has become less well regarded as a sole or reliable indicator of ability, different kinds of thinking skills have become more highly regarded as indicators.
- Many gifted and talented pupils in different areas of the curriculum have superior thinking skills – critical, creative and/or problem-solving – in common. Teachers should aspire to develop these skills in their pupils to the best possible advantage. Research shows that work on thinking skills improves pupils' ability to generalise and to transfer knowledge and skills.
- Work on thinking skills, critical thinking skills and metacognition in particular, may help potentially able pupils (i.e. the underachieving able) to become able thinkers. Thus you need to consider carefully how far your school provides opportunities to develop their thinking skills further.
- What are some practical aspects to consider? Unit 2, Section 4 of your course suggests three 'macro' options for how to incorporate work on thinking skills in your school. Below are 'micro' suggestions for generic approaches, whichever option your school favours. These could be considered in relation to any 'published product'. Examples are Blagg *et al's Somerset Thinking Skills Course*, Lipman *et al's Philosophy for Children Programme*, and Lake and Needham's *Top Ten Thinking Tactics*. Alternatively, the approaches could be related to your own 'homegrown' lessons and materials. Do these materials use them, or take them into account?
- Peirce and Dewey, Fisher, Lipman and many others stress that the development of thinking skills requires the ethos of a 'community of enquiry' in the classroom (e.g. Fisher, 1998) in which
 - the teacher takes on a non-didactic role, as facilitator, mediator and participant in discussion
 - there is support: someone to listen, praise and advise

- there is an atmosphere of ‘intellectual flow’ of questions and thoughts, constantly provoking further questions and thoughts, not leading to closed or ‘right’ conclusions and answers
- there is a structure, in terms of planning, personal help and resources (for example, Lipman’s programme does not map out any progression in the development of thinking skills)
- there is order : a disciplined and anxiety-free environment, where pupils feel happy when challenged and asked to take risks, and in which there is time to reflect, review, revise opinions, return to topics, etc.

Research also shows that discussion and argument act as a catalyst to thinking, and that pair and group work is preferable to asking individuals to work alone.

- There is more debate about the extent to which work on thinking skills should be language-based, and whether it should be primarily or solely oral or should incorporate published/recorded elements. The latter would include pictures/literature which provides a stimulus, or written notes to record key questions. This needs careful thought which takes into account pupils’ wide variety of preferred learning styles and the latest research on brain-based learning

- **Approaches to stimulate critical thinking**

The launch pad on questioning skills has much advice which is relevant to this section.

On the notion of ‘philosophy for children’, and on critical thinking generally, Fisher (1998) suggests the following steps in the classroom:

- Creating a ‘thinking circle’ and a community setting (detailed in his book)
- Presenting a stimulus
- Listing questions
- Choosing a question for discussion
- Facilitating the discussion
- Reviewing the discussion
- Extending the enquiry, for example through
 - exercises e.g. what is similar? what is different?
 - ‘discussion plans’ : a group discussing questions around a single concept, relationship or problem
 - games
- Evaluation and assessment.

The Socratic method is slightly different:

- It focuses on one question or problem instead of encouraging free-ranging discussion
- It aims for consensus of opinion instead of the expression of alternative viewpoints
- Its dialogue includes a ‘metadiscourse’, with the teacher keeping attention focused on the central question, instead of participants ‘tacking in the wind’
- Questions or statements are written down during discussion, instead of before it
- There is a written, not an oral, review of discussion

- The format continues into further dialogue rather than follow-up activities and exercises.

However, in both cases the enquiry centres on questions that are important to participants. The teacher is 'philosophically self-effacing', taking on a role of scholarly ignorance, and placing the focus on what students have to say and think.

Teachers need to give pupils opportunities to practise such critical thinking skills as the following, and to make this focus explicit to them:

- Estimating
- Evaluating
- Justifying
- Classifying
- Hypothesising
- Analysing
- Reasoning.

Pupils should be encouraged to describe what they do when they exercise these skills, and to evaluate their success (metacognition).

➤ **Approaches to stimulate creative thinking**

Fisher (1990) suggests a format for stimulating creative thinking in the classroom:

- Presenting a stimulus
- Helping the pupils to explore
- Ensuring that pupils plan their action
- Helping the progress of action on an idea or set of ideas
- Reviewing and evaluating the action.

Teachers need to set tasks which allow pupils to practise the features described above:

- Fluency – Ask: how many –'s can you think of which...?
- Flexibility – Set tasks which imply rules that don't actually exist, e.g. pupils could use materials other than those provided
- Originality – Ask: how many uses can you think of for... ?
- Elaboration – Use Fisher's (1990) SCAMPER technique, ie ask pupils to Substitute, Combine, Adapt, Modify, Put to other uses, Eliminate, Rearrange):

Substitute	Who else instead? What else instead? Other place? Other time? Other material? Other approach?
Combine	Bring together? Unite with another? Combine purposes? Combine ideas?
Adapt	What else is like this? What ideas does it suggest? Can it be adjusted for a purpose?
Modify	Magnify? Minify? Multiply? What to alter? To add? Change colour, form, shape, motion? Other changes?
Put to other uses	New ways to use? Other uses if modified?
Eliminate	
Rearrange	What to remove, omit or get rid of? Part or whole? Try different pattern, layout or scheme? Turn it round, upside down,

	inside out? Try opposites?
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Otherwise, teachers may use de Bono's many CoRT techniques, e.g.:

- CAF (Ask pupils to Consider All Factors)
- C & S (Ask them to think of the Consequences and Sequel)
- AGO (Ask them to consider their Aims, Goals and Objectives, which need not be strictly classified into these categories)
- FIP (Ask them to think of the First Important Priorities)
- APC (Ask them to run through the Alternatives, Possibilities and Choices)
- OPV (Ask them to look at the task from Other Points of View).

De Bono stresses that it is essential to get pupils used to these acronyms, and to discuss explicitly what they entail. Again, this promotes the skills of metacognition, i.e. describing methods of organising thinking and making thinking 'visible'.

Other techniques and games encourage such important skills as making associations and seeing patterns. For example, the teacher and/or pupils can select or nominate some random ideas, facts, concepts or objects, and pupils should try to find connections between them.

➤ Approaches to stimulate problem-solving

Pupils need to be exposed to a range of problems, from puzzles to adversarial problems (see list above). Problem-solving can often take the format:

- **Finding a problem** – i.e. 'a task with a certain number of given conditions, items of information and a context' (Fisher, 1990). Problems can be formulated by asking questions about statements, facts and ideas, and encouraging pupils to ask them: What?, Where?, When?, Why?, How?, Who?
- **Understanding the problem.** Get pupils to ask such questions as:
 - Who owns the problem?
 - Who wants to find the solution? What caused or might have caused this problem?
 - What is it that is known?
 - What is it that is unknown?
 - What different points of view might there be about this problem?
 - What kind of solution are we after?
 - What is preventing us from reaching the solution?
 - What might be the consequences of finding one?
- **'Mulling over' the problem**, considering various ways of solving it and planning how to solve it before embarking on action. This may require intervals of time for reflection before proceeding. The following approaches will also help. Ask pupils to:
 - Consider all Factors (de Bono's CAF), try to get the total picture, re-read/reword the question, consider the alternatives etc.
 - Think of a similar problem. How did they solve that? How might that help?
 - How were obstacles overcome?
 - Simplify the problem, e.g. try a part of it first; use a step-by-step approach.

Model the problem, using objects, diagrams, pictures etc.
 Discuss and/or record their plan, thinking of logistics, any materials needed, a sequence of at least three or four moves, etc.

Such techniques as brainstorming and concept mapping can also be used.

- **Tackling the problem.**

Teachers can help at this stage by:

- describing with interest what the pupil is doing
 - asking what the pupil is doing, and listening/responding with interest. This and the first approach help to develop metacognition
 - supporting the process when needed, e.g. by suggesting other, less obvious or even unlikely avenues, allowing for breaks for reflection or relaxation, showing pupils new facts, ideas or tools, or helping break the task into parts.
- **Reviewing/adapting/modifying the action taken.** Again, teachers may need to leave time for pupils to 'absorb' what they have learned or accomplished before asking them to describe it. Some effective approaches are for pupils to :
 - report back in groups (which encourages metacognition)
 - teach or challenge the teacher or other pupils to undertake the same problem or a similar one
 - focus on a key concept in the process and explore its implications.
 - **Evaluating action/solutions.** Ask such questions as:
 - What worked/helped?
 - What didn't work/help?
 - What would you do differently next time?
 - Where could you go from here?
 - What are all the uses you can think of for what you have learnt/found out?
- **De Bono's 'six thinking hats'** approach may be of use in much of the work on thinking skills. The idea is to avoid criticising but to encourage divergent or unexpected thinking by asking thinkers to don one of 'six hats':
- The 'white hat' to encourage factual thinking, in which thinkers distinguish between facts and interpretation or extrapolation
 - The 'red hat' to encourage expression of subjective points of view and feelings
 - The 'black hat' to encourage the passing of critical, logical judgements
 - The 'yellow hat' to encourage positive, optimistic thinking which recognises benefits and aspirations
 - The 'green hat' to encourage new ideas, alternatives and approaches
 - The 'blue hat' to encourage thinking about the thinking which a given situation demands (metacognition).

WHAT MIGHT WE DO IN SCHOOL?

- Review your school's register of the gifted and talented. Consider the named individuals you personally know. What critical or creative thinking skills, or problem-

solving skills, are you aware they have? Are there other pupils who have these skills but are not being recognised by you or others?

- Using the advice above, spend time evaluating a range of published resources which the school might find it useful to adopt or adapt, e.g. those in the reading list below. To what extent do the materials lend themselves to:
 - the criteria suggested above, e.g. the concept of the teacher as facilitator and participant, or the importance of a sense of structure?
 - your preferred approach to incorporating thinking skills into your school's teaching: as a separate subject, within individual subjects, or infused throughout the curriculum?
 - pupils' use of a range of media and learning styles in a range of subjects, e.g. not just written or oral methods?

- Audit, either throughout your school or in your own teaching, the extent and frequency with which units of work and lessons offer opportunities for:
 - Critical thinking
 - Creative thinking
 - Problem-solving

Decide which of the detailed skills outlined in each of these three broad aspects are being addressed. Determine how often the lesson formats and approaches suggested above are used. If you are applying this audit to the whole school, note where there are gaps. Are there any skills that are rarely, if ever, consciously addressed? Are there any colleagues who never explicitly teach thinking skills at all? You may wish to suggest that certain skill areas are particularly the domain of some subject departments, or that certain subjects sit especially comfortably with some of the lesson formats outlined above.

- Meet with at least one teaching colleague. Share some recent lesson plans. How could you have enhanced the 'thinking skills' elements of your lessons: in content, teaching approaches used, and the design of lesson formats?

RECOMMENDED READING

de Bono, E. 1970. *Lateral Thinking*. London: BBC Books.

de Bono, E. 1976. *Teaching Thinking*. London: Penguin Books.

de Bono, E. 1985. *Six Thinking Hats*. London: Penguin Books.

Burden, R. and Williams, M., ed., 1998. *Thinking through the Curriculum*. London: Routledge.

Fisher, R. 1990. *Teaching Children to Think*. Oxford: Basil Blackwell.

Fisher, R. 1995. *Teaching Children to Learn*. Cheltenham: Stanley Thornes.

Fisher, R. 1998. *Teaching Thinking: Philosophical Enquiry in the Classroom*. London: Cassell.

Gilhooney, K.J. 1996. *Thinking, Directed, Undirected and Creative*. London: Academic Press.

Lipman, M. 1991. *Thinking in Education*. Cambridge: Cambridge University Press.

Non-subject-specific materials

Bailey, T. 1987. *Instrumental Enrichment and Cross-curricular Bridging: a handbook of suggestions*. London: London Borough of Enfield.

Blagg, N. *et al*, 1988. *Somerset Thinking Skills Course*. Oxford: Basil Blackwell.

de Bono, E. 1973. *The CoRT Thinking Programme*. Oxford: Pergamon Press.

Bowkett, S. 1997. *Imagine That...: a handbook of creative learning activities for the classroom*. Stafford: Network Educational Press.

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Teaching Thinking journal edited by Sharman, H. Contact Imaginative Minds (Publishers) 27 Frederick Street Birmingham B1 3HH

Wallace, B *Teaching Thinking and Problem Solving Skills* in NACE Newsletter Summer 2000 Oxford:NACE

Subject-specific materials

Adey P. *et al*, 1995 (2nd ed.). *Thinking Science: the materials of the CASE Project*. Walton-on-Thames: Thomas Nelson & Sons.

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