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'We need to think better if we are to become better people.' Paul, aged 10

Introduction

In recent years there has been growing interest across the world in ways of developing children's thinking and learning skills (Fisher 2005). This interest has been fed by new knowledge about how the brain works and how people learn, and evidence that specific interventions can improve children's thinking and intelligence. The particular ways in which people apply their minds to solving problems are called *thinking skills*. Many researchers suggest that thinking skills are essential to effective learning, though not all agree on the definition of this term. If thinking is how children make sense of learning then developing their thinking skills will help them get more out of learning and life. This chapter looks at the implications of research into ways to develop thinking children, thinking classrooms and thinking schools.

Objectives

The aims of this chapter are to enable you to:

- inform your understanding of 'thinking skills' and their role in learning
- understand some key principles that emerge from research into teaching thinking
- know the main approaches to developing children's thinking
- see how you might integrate a 'thinking skills' approach into classroom teaching

What are thinking skills?

Thinking skills are not mysterious entities existing somewhere in the mind. Nor are they like mental muscles that have a physical presence in the brain. What the term refers to is the human capacity to think in conscious ways to achieve certain purposes. Such processes include remembering, questioning, forming concepts, planning, reasoning, imagining, solving problems, making decisions and judgements, translating thoughts into words and so on. Thinking skills are ways in which humans exercise the *sapiens* part of being *homo sapiens*.

A skill is commonly defined as a practical ability in doing something or succeeding in a task. Usually we refer to skills in particular contexts, such as being 'good at cooking' but they can also refer to general areas of performance, such as having a logical mind, good memory, being creative and so on. A thinking skill is a practical ability to think in ways that are judged to be more or less effective or skilled. They are the habits of intelligent behaviour learned through practice, for example children can become better at giving reasons or asking questions the more they practice doing so.

If thinking skills are the mental capacities we use to investigate the world, to solve problems and make judgements then to identify every such skill would be to enumerate all the capacities of the human mind and the list would be endless. Many researchers have attempted to identify the key skills in human thinking, and the most famous of these is Bloom's Taxonomy (see Fig 1).

Bloom's taxonomy of thinking skills (what he called 'the cognitive goals of education') has been widely used by teachers in planning their teaching. He identifies a number of basic or 'lower order' cognitive skills - knowledge, comprehension and application, and a number of higher order skills – analysis, synthesis and evaluation. The following are the various categories identified by Bloom and processes involved in the various thinking levels.

Bloom's Taxonomy (Source: Bloom & Krathwohl 1956)

Cognitive goal ---------- Thinking cues

1 Knowledge ----------Say what you know, or remember, describe, (knowing and remembering) repeat, define, identify, tell who, when, which, where, what
2 Comprehension ---------- Describe in your own words, tell how you feel (interpreting and understanding) about it, what it means, explain, compare, relate
3 Application ----------How can you use it, where does it lead, apply (applying, making use of) what you know, use it to solve problems, demonstrate

4 Analysis ---------- What are the parts, the order, the reasons why, (taking apart, being critical) the causes/problems/solutions/consequences

5 Synthesis ---------- How might it be different, how else, what if, (connecting, being creative) suppose, put together, develop, improve, create your own

6 Evaluation ---------- How would you judge it, does it succeed, will it (judging and assessing) work, what would you prefer, why you think so

You could plan or analyse many learning activities in terms of the above categories. For example when telling a story, a teacher might ask the following kinds of questions,

1 Knowledge *What happened in the story?*
2 Comprehension *Why did it happen that way?*
3 Application *What would you have done?*
4 Analysis *Which part did you like best?*
5 Synthesis *Can you think of a different ending?*
6 Evaluation *What did you think of the story? Why?*

Bloom's taxonomy built on earlier research by Piaget and Vygotsky that suggested that thinking skills and capacities are developed by *cognitive challenge.* Teachers need to challenge children to think more deeply and more widely and in more systematic and sustained ways. Or as Tom, aged 10 put it: 'A good teacher makes you think ... even when you don't want to.' One way inwhich you, as a good teacher, can do this is by asking questions that challenge children's thinking.

TASK 1: Questions for thinking

Choose a story, poem, text or topic that you would like to use with children as a stimulus for their thinking. Using Bloom's Taxonomy create a series of questions to think about and discuss after you have shared the stimulus with them. List your questions under Bloom's six categories: knowledge, comprehension and application, analysis, synthesis and evaluation.

Why are thinking skills important?

Thinking skills are important because mastery of the 'basics' in education (literacy, maths, science etc.), however well taught, are not sufficient to fulfil human potential, or to meet the demands of the labour market or of active citizenship. Countries across the world are recognising that a broad range of competencies are needed to prepare children for an

unpredictable future. These 'higher order' thinking skills are required, in addition to basic skills, because individuals cannot 'store' sufficient knowledge in their memories for future use. Information is expanding at such a rate that individuals require transferable skills to enable them to address different problems in different contexts at different times throughout their lives. The complexity of modern jobs requires people who can comprehend, judge and participate in generating new knowledge and processes. Modern democratic societies require its citizens to assimilate information from multiple sources, determine its truth and use it to make sound judgements.

The challenge is to develop educational programmes that enable all individuals, not just an elite, to become effective thinkers because these competencies are now required of everyone. A 'thinking skills' approach suggests that learners must develop awareness of themselves as thinkers and learners, practise strategies for effective thinking and to develop the habits of intelligent behaviour that are needed for lifelong learning. As Paul, aged 10, put it: 'We need to think better if we are going to become better people.'

What does research tell us about thinking?

Research in cognitive science and psychology is providing a clearer picture of the brain and the processes associated with thinking (Smith 2002). This brain research has some important implications for teachers. For example we now know that most of the growth in the human brain occurs in early childhood: by the age of six, the brain in most children is approximately 90% of its adult size. This implies that intervention, while the brain is still growing, may be more effective than waiting until the brain is fully developed. Cognitive challenge is important at all stages, but especially in the early years of education.

Psychologists and philosophers have helped to extend our understanding of the term 'thinking', including the importance of **dispositions**, such as attention and motivation, commonly associated with thinking (Claxton 2002). This has prompted a move away from a simple model of 'thinking skills' as isolated cognitive capacities to a view of thinking as inextricably connected to emotions and dispositions, including 'emotional intelligence', which is our ability to understand our own emotions and the emotions of others (Goleman 1995).

There is also a growing realisation that we need to teach not only cognitive skills and strategies but also develop the higher 'metacognitive' functions involved in metacognition. This involves making learners aware of themselves as thinkers and how they process/create knowledge by 'learning how to learn' (see sections on 'Self Awareness' in the Primary National Strategy, DfES 2004).

Metacognition involves thinking about one's own thinking. Metacognition includes knowledge of oneself, for example of what one knows, what one has learnt, what one can and cannot do and ways to improve one's learning or achievement. Metacognition also involves skills of recognising problems, representing features of problems, planning what to do in trying to solve problems, monitoring progress and evaluating the outcomes of one's own thinking or problem-solving activity.

Metacognition is promoted by helping pupils to reflect on their thinking and decision-making processes. Metacognition is developed when pupils are helped to be strategic in organising their activities and are encouraged to reflect before, during and after problem-solving processes. The implication is that you need to plan time for debriefing and review in lessons to encourage children to think about their learning and how to improve it. This can be done through discussion in a plenary session, or by finding time for reflective writing in their own thinking or learning logs.

The human mind is made up of many faculties or capacities that enable learning to take place. Our general capacity for understanding or *intelligence* was once thought to be innate and unmodifiable. As a child once put it: 'Either you've got or you haven't.' The notion of inborn

intelligence which dominated educational practice until the mid-20 th century was challenged by Vygotsky, Piaget and others who developed a constructivist psychology based on a view of learners as active creators of their own knowledge. Some researchers argue that intelligence is not one generic capacity but is made up of multiple intelligences (Gardner 1993). Howard Gardner's theory of multiple intelligence has had a growing influence in recent years on educational theory and practice, although not all are convinced of its claims. Whether intelligence is viewed as one general capacity or many, what researchers are agreed upon is that it is modifiable and can be developed.

Key principles that emerge from this research include the need for teachers and carers to provide:

- *cognitive challenge* , challenging children's thinking from the earliest years
- *collaborative learning* , extending thinking through working with others
- *metacognitive discussion* , reviewing what they think and how they learn

This research and the pioneering work of Feuerstein, who created of a programme called Instrumental Enrichment, Matthew Lipman, who founded Philosophy for Children, and other leading figures such as Edward de Bono, creator of 'lateral thinking', have inspired a wide range of curriculum and programme developments (Fisher 1995). These include a range of teaching approaches that you could use, including 'cognitive acceleration', 'brain-based' approaches (such as 'accelerated learning') and 'philosophical' approaches that aim at developing the moral and emotional as well as intellectual aspects of thinking - caring and collaborative as well as critical and creative thinking. These are discussed below.

By the end of the twentieth century there was a widespread realisation that 'key' or 'core' skills of thinking, creativity and problem-solving lay at the heart of successful learning and should be embedded in primary and secondary school curricula. When the DfEE in England commissioned Carol McGuinness to review and evaluate research into thinking skills and related areas, key points that emerged from her study were that:

- pupils benefitted from being coached in thinking
- not one model, but many approaches proved effective
- success was due to pedagogy (teaching strategies) not specific materials
- strategies were needed to enable pupils to transfer thinking to other contexts
- teachers needed professional support and coaching to sustain success

McGuinness (1999) points out that the most successful interventions are associated with a 'strong theoretical underpinning, well-designed and contextualised materials, explicit pedagogy, teacher support and programme evaluation' (p13).

In England the revised National Curriculum (DfES 1999) included thinking skills in its rationale, stating that thinking skills are essential in 'learning how to learn' . The list of thinking skills identified in the English National Curriculum is similar to many such lists: information processing, reasoning, enquiry, creative thinking and evaluation. Any good lesson or learning conversation will show evidence of some or all of these elements. They focus on 'knowing how' as well as 'knowing what', not only on curriculum content but on learning how to learn. They can be related to Bloom's taxonomy in the following ways:

Thinking skills in the National Curriculum in England (1999)

- Information-processing
- Enquiry
- Reasoning
- Creative thinking
- Evaluation

The National Curriculum in England, as elsewhere, is no longer to be seen simply as subject knowledge but as being underpinned by the skills of lifelong learning. Good teaching is not just about the achieving particular curriculum objectives but also about developing general thinking skills and learning behaviours. Since the McGuiness review and the explicit inclusion of thinking skills in the National Curriculum, interest in the teaching of thinking has burgeoned in the UK. Research has shown that interventions work if they have a strong theoretical base and if teachers are enthusiastic and well trained in the use of a programme or strategy. Teachers are developing 'teaching for thinking' approaches in new directions, integrating them into everyday teaching to create 'thinking classrooms, and developing whole school policies to create 'thinking schools'.

TASK 2: Identifying thinking skills

Identify in a lesson plan, or observation of a classroom lesson, the thinking skills that are being developed as general learning objectives. Look for evidence that the children are engaged in information processing, reasoning, enquiry, creative thinking and evaluation.

A proforma could be used for recording the evidence, such as the one below.

Identifying thinking skills

What thinking skills are being used or developed in this lesson? Identify examples of:

Information processing

Finding relevant information

Organising information

Representing or communicating information

Reasoning

Giving reasons

Making inferences or deductions

Arguing or explaining a point of view

Enquiry

Asking questions

Planning research or study

Engaging in enquiry or process of finding out

Creative thinking

Generating ideas

Imagining or hypothesising

Designing innovative solutions

Evaluation

Developing evaluation criteria

Applying evaluation criteria

Judging the value of information and ideas

How do we teaching thinking in the classroom?

Researchers have identified a number of teaching strategies you can use to help stimulate children's thinking in the classroom. These approaches to teaching thinking can be summarised as:

- Cognitive acceleration approaches Brain-based approaches
- Philosophical approaches
- Teaching strategies across the curriculum

1. Cognitive acceleration approaches

CASE

Philip Adey and Michael Shayer developed the original Cognitive Acceleration Through Science Education (CASE) project in the 1980s and early 1990s for Key Stage 3 Science. Their work now extends into other subjects and age groups and has perhaps the best research and most robust evidence of the impact of thinking skills in the UK (for a summary see Shayer and Adey, 2002).

The following is a typical format of a CASE lesson for thinking format that builds in time for cognitive and metacognitive discussion:

1. Concrete preparation stimulus to thinking, introducing the terms of the problem

2. Cognitive conflict creates a challenge for the mind

3. Social construction dialogue with others, discussion that extends thinking

4. Metacognition reflection on how we tackled the problem

5. Bridging reviewing where else we can use this thinking and learning

CASE lessons have also been developed for young children, called 'Let's Think!' which aims to raise achievement by developing Year 1 pupils' general thinking patterns and teachers' understanding of children's thinking.

During 'Let's Think' lessons young children work with a teacher in groups of six and each activity takes about 30 minutes. The session is completely oral, with discussion based on a

range of objects. At the beginning of the session the teacher helps agree a common language to describe the objects being used. Having established the vocabulary and the concepts involved, the teacher sets the challenge of the activity. One popular activity in this schema is called the 'hoop game' when children are required to put orange toy dinosaurs in one hoop and T-Rex dinosaurs in another hoop. The challenge is that one of the dinosaurs is an orange T-Rex. This is very perplexing for our preoperational children because they have to utilize two pieces of information about the dinosaur and find a solution to the problem. The children work together as a group to come to a solution or a number of possible solutions to solve the task. They discuss their ideas and make suggestions. The teacher guides them, without being obvious, towards the idea of overlapping the hoops and putting the wayward dinosaur in the intersection.

As in other discussion-based approaches children are encouraged to state whether they agree or disagree with each other by giving a reason. For example, they are taught to say, 'I think… because' or 'I disagree with you because…' The activities are designed as problems to be solved thus creating a context for developing thinking . Children are given a challenge, are required to work collaboratively ; to plan and evaluate their own and others thinking strategies, and the teacher then gets the children to think about their thinking (metacognition) through asking such questions as 'What do you think we are going to have to think about?' and 'How did you get your answer?' rather than 'Is your answer correct?' Of course you do not need the 'Lets Think' materials to apply this teaching strategy to any area of the curriculum.

What the 'Let's Think!' approach aims to do is to accelerate cognitive development between two types of thinking. The first type of thought is what Piaget (1953) called 'pre-operational', when children still find it difficult to engage in what adults perceive as rational thought. The next stage, which Piaget described as 'concrete operational', involves manipulating at least two ideas in order to produce a third, new idea, which is what the sessions encourage the children to do. 'Let's Think' aims to accelerate the transition between the two types of thought in order to help pupils make better sense of their learning and improve general achievement. They do this, as you might, by ensuring their teaching includes cognitive challenge, collaborative activity and children thinking about how they think and learn.

'Thinking maths' lessons for primary children are part of a related project called CAME (Cognitive Acceleration of Mathematics Education). These lessons involve discussion-based tasks in maths that aim to develop children's conceptual thinking rather than the mechanics of doing the maths. They differ from open-ended investigations in that each lesson has a specific concept to develop. The activities are planned to generate group and whole class discussion rather than written work with an emphasis on how did you get your answer rather than what is the answer. As the CAME approach suggests if your emphasis in teaching is: 'How did you get your answer?' rather than 'Is your answer correct?' it is a far more productive way of generating children's thinking and learning.

2. 'Brain-based' approaches

Many educationalists are influenced by recent research into how the human brain works and draw on some of the implications of this research for teachers and schools. Accelerated Learning and Multiple Intelligence approaches all draw on these broad ideas together with research into learning styles. The common feature is the reliance on brain research to inspire teaching techniques in the classroom.

There are many theories of learning styles. They are rooted in a classification of psychological types and the fact that individuals tend to process information differently. Different researchers propose different sets of learning style characteristics, but many remain unconvinced by their claims children learn best through using one preferred style (Coffield 2004).

Accelerated learning

Accelerated learning' approaches include applying VAK - visual, auditory and kinaesthetic learning styles to teaching . VAK stands for:

- visual – learning best through pictures, charts, diagrams, video, ICT etc.
- auditory – learning best through listening
- kinaesthetic – learning best through being physically engaged in a task

For example in teaching her class to spell a word a teacher might show them how to chunk the word into three pieces, and emphasise this by using different colours for each section of the word and to visualise it in their heads. She might also ask them to write the word in the air with their fingers. 'Accelerated learning' emphasises the importance of including a range of learning experiences, visual, verbal and physical, in your teaching, so that children are challenged to think in different ways.

These and other 'brain-based' teaching strategies such as 'BrainGym' (which usesimple but challenging aerobic exercises to focus the mind and stimulate the brain) offer much scope for your own research in the classroom.

De Bono

According to Edward de Bono we tend to think in restricted and predictable ways. To become better thinkers we need to learn new habits. His teaching strategy known as 'thinking hats' helps learners try different approaches to thinking. Each 'thinking 'hat' represents a different way to think about a problem or issue. Children are encouraged to try on the different 'hats' or approaches to a problem to go beyond their usual thinking habits (de Bono 1999). The 'hats'or thinking approaches, together with questions you might ask, are as follows:

White hat = information *What do we know?*

Red hat = feelings *What do we feel?*

Purple hat = problems *What are the drawbacks?*

Yellow hat = positives *What are the benefits?*

Green hat = creativity *What ideas have we got?*

Blue hat = control *What are our aims?*

De Bono claims the technique is widely used in management but little research has been published on its use in education. Some teachers have found it a useful technique for encouraging children to look at a problem or topic from a variety of perspectives. It encourages us, and our children, to think creatively about any topic and to ask: 'Is there another way of thinking about this?'

3. Philosophical approaches

A pioneer of the 'critical thinking' movement in America is the philosopher Matthew Lipman. Originally a university philosophy professor, Lipman was unhappy at what he saw as poor thinking in his students. They seemed to have been encouraged to learn facts and to accept authoritative opinions, but not to think for themselves. He became convinced that something was wrong with the way they had been taught in school when they were younger. He therefore founded the Institute for the Advancement of Philosophy for Children (IAPC) and developed with colleagues a programme is called Philosophy for Children, used in more than 40 countries around the world.

Lipman believes that children are natural philosophers because they view the world with curiosity and wonder (Lipman 2003). Children's own questions form the starting-point for an enquiry or discussion, which can be termed 'philosophical'. The IAPC has produced a number of novels, into every page of which, strange and anomalous points are woven. As a class reads a page, with the teacher, the text encourages them to raise queries. These questions form the basis of guided discussions. The novels provide a model of philosophical enquiry, in that they involve fictional children engaging in argument, debate, discussion and exploratory thinking.

Stories for Thinking

Many resources have been developed in recent years to adapt Matthew Lipman's approach to Philosophy for Children to the needs of children and teachers in the UK, 'Stories for thinking' is one such approach (Fisher 1996). The aim, through using stories and other kinds of stimulus for philosophical discussion, is to create a **community of enquiry** in the classroom (see www.sapere.org.uk).

In a typical 'Stories for Thinking' lesson the teacher shares a 'thinking story' with the class. They have 'thinking time' when they are asked to think about anything in the story that they thought was strange, interesting or puzzling about the story. After some quiet thinking time the teacher asked for their comments or questions, and writes each child's questions on the board, adding their name after their question. The children then chose from the list of questions which one they would like to discuss. The teacher then invites the children to comment, and who agreed or disagreed with particular comments made. If children do not give reasons or evidence from the story for their opinions the teacher asked 'Why do you think that?' or 'Have you got a reason for that?'

When asked the value of a 'Stories for Thinking' lesson one child said: 'You have to ask questions and think hard about the answers.' Another said: 'Sometimes you change your mind and sometimes you don't. A third reply was: 'It is better than just doing reading or writing because you have to say what you really think.' Teachers note that in 'Stories for Thinking' lessons, in which they may also uses poems, pictures, objects or other texts for thinking, the children have become more thoughtful, better at speaking and listening to each other, at asking questioning and using the language of reasoning, more confident in posing creative ideas and in judging what they and others think and do and are more confident about applying their thinking to fresh challenges in learning and in life (Fisher 1999).

What stories or other forms of stimulus could you use to really engage your children in thinking? How could you create an enquiring classroom?

Task 3: Creating a thinking classroom

What would a thinking classroom look like?

1. Collect words to describe what a thinking classroom might look like. These might include some reference to the teacher's behaviour, children's behaviour, classroom environment or kinds of activity that help children to think and learn well.
2. Sort your ideas into small groups and give each group a heading that you think appropriate.
3. Choose one idea from each group and consider how you could develop this in your classroom.

4. Teaching strategies across the curriculum

A growing number of programmes and strategies aim to help teachers develop children's thinking and learning across the curriculum, such as the TASC (Thinking Actively in a Social Context) and ACTS (Activating Children's Thinking Skills). It is difficult to evaluate the success of these and other interventions because of the many variables involved in the teaching

situation. There is much scope here for your own research into teaching strategies in the classroom and for developing new strategies.

A number of specific teaching strategies have been identified to help stimulate children's thinking in different subject areas and many of these are included in the Primary National Strategy guidance for teachers (DfES 2004). For example 'Odd One Out' is a teaching technique to identify pupils' understanding of key concepts in different subjects. A teacher might in a numeracy lesson put three numbers on the board, such as 9, 5 and 10; or in science three materials; or in English three characters to compare and contrast - then ask the children to choose the 'odd one out' and to give a reason. Teachers who use this strategy claim it can reveal gaps in the knowledge that she has taught and the knowledge and vocabulary that the children are then able to use. The children think of it as a game and are used to thinking up examples and ideas which show their thinking in different curriculum subjects. This approach encourages creative thinking and reasoning (Higgins et al 2001). Can you think of three things and give reasons why one, two or each of them might be the odd one out?

Concept mapping

Many approaches include the use of thinking diagrams or 'graphic organisers' or 'concept maps' as an aid to making thinking visual and explicit.

Concept mapping is an information-processing technique with a long history. Tony Buzan developed this technique into a version he calls Mind Mapping (Buzan 1993). Concept maps are tools that help make thinking visible - and involves writing down, or more commonly drawing, a central idea and thinking up new and related ideas which radiate out from the centre. By focussing on key ideas written down in children's own words, and then looking for branches out and connections between the ideas, they are mapping knowledge in a manner which can help them understand and remember new information. A simple concept map might be used to map out the connections between characters in a story. Children might also draw maps from memory to test what they remember or know. Teachers have found concept maps helpful in finding out or revising what children know and the technique is especially popular when used in pairs or groups. Children can learn from the technique from an early age and many find it motivating. As one young child put it: 'Concept mapping gets you to think and try more.' Concept mapping is a useful teaching and revision technique for extending thinking and making it visually memorable (Caviglioni & Harris 2000).

When you are planning your next topic or activity with children think of ways of making your own or your children's thinking visible, for example by creating a 'mindmap' of a story, a process or collection of ideas.

Computers and thinking

Research shows that there are several ways in which ICT could particularly enhance the teaching and learning of thinking skills. There is evidence that the use of computers can lead to improved information-processing skills. ICT enables multiple and complex representations of information, allowing learners for example to think with a richer knowledge base. As James aged 8 said: 'I didn't know there was so much to know!' Educational software can act like a teacher to prompt and direct enquiry through asking questions, giving clues and suggesting avenues of investigation. It can also act as a resource while learners discuss and explore ideas, prompting reflection around a simulation for example. Networks via the internet and including video-conferencing, can allow children to engage directly in collaborative learning and knowledge sharing with others who are not physically present.

The main criticism of the computer as a tutor model is that directed computer teaching does not allow children to be creative learners, able to think and make connections for themselves, and so is unlikely to support the development of higher order thinking. This can be

transformed however by collaboration around ICT activities, which has been shown to have the potential to enhance the learning of transferable thinking skills.

Effective collaborative learning still needs to be structured. Learners should be taught how to reason and learn together before they are asked to work collaboratively with ICT, because having to articulate and explain strategies to others is more likely to lead to transfer than just doing things without thinking or talking them through. For example working with LOGO, is not just manipulating a screen turtle. It is about reasoning and developing effective problem solving strategies that can be achieved much better with a learning partner or small group through discussion. In the lesson plenary, by reflecting on this process of collaborative problem solving, the teacher can help children to 'bridge' their thinking from their experience with Logo or computer program to different areas of the curriculum.

Computers can help develop children's thinking skills when used as part of a larger dialogue about thinking and learning (Wegerif 2002) . The challenge for you as a teacher is to find ways to use the computer to encourage thinking with and discussion between children.

Recent test results show that standards in schools are rising – but slowly. Could the teaching of thinking provide a key to raising achievement? The experience of many teachers suggests that when pupils are taught the habits of effective thinking they grow in confidence, their learning is enriched and they are better prepared to face the challenges of the future. Children think so too – as Arran, aged 9, put it: 'When you get out in the real world you have to think for yourself, that's why we need to practise it in school.'

Good teaching is about helping children to think for themselves, which is why it is both a challenge and an adventure.

TASK 4: Planning for teaching thinking

- Choose a teaching strategy or approach from published materials which aims to develop children's thinking skills.
- Think how you might use this strategy or approach in a chosen area of the curriculum.
- Plan a lesson which incorporates this strategy, identifying a specific thinking or learning skill in your lesson objectives.
- Share your plan or teaching ideas with others.
- Teach and evaluate your lesson for thinking!

Summary

In recent years there has been much research into ways of developing children's thinking and learning skills. This has been informed by growing knowledge about how the brain works, how people learn and how teaching approaches can help improve children's ability to think and learn. 'Thinking skills' is a term often used to refer to the many capacities involved in thinking and learning. These skills are seen as fundamental to lifelong learning, active citizenship and emotional intelligence. Research shows that thinking is developed through cognitive challenge, and opportunities for collaborative work and metacognitive discussion. Successful approaches to teaching thinking include cognitive acceleration, brain-based and philosophical approaches. These and other teaching strategies can help raise standards of achievement and create thinking children, thinking classrooms and thinking schools.

References

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

Bloom, B. & Krathwohl, D.R. (1956) *Taxonomy of Educational Objectives, handbook 1: Cognitive Domain.* New York: David McKay

Buzan, T. (1974/1993) *Use your head* , London: BBC Publications. See also www.iMindMap.com

Caviglioni O. & Harris I. (2000) *Mapwise: accelerated learning through visible thinking*, Network Educational Press.

Claxton G. (2002) *Building Learning Power: helping young people become better learners*, TLO, Bristol

Coffield, F., Moseley, D., Hall, E. & Ecclestone, K. (2004) *Should we be using learning styles. What research has to say to practice*, London: Learning Skills and Development Agency

de Bono, E. (1999) *Six Thinking Hats*, London: Penguin;

DfEE (1999) *The National Curriculum: Handbook for primary teachers in England*, London: QCA (www.nc.uk.net)

DfES (2004) Primary National Strategy (www.standards.dfes.gov.uk)

Fisher R. *Stories for Thinking* (1996), *Games for Thinking* (1997) *Poems for Thinking* (1997)*First Stories for Thinking* (1999), *First Poems for Thinking* (2000) *Values for Thinking* (2001) Oxford: Nash Pollock;

Fisher R. (2003) *Teaching Thinking: Philosophical Enquiry in the Classroom*, London: Continuum

Fisher R. (2005) (2 nd ed) *Teaching Children to Think*, Cheltenham: Stanley Thornes

Fisher R. (2005) (2 nd ed) *Teaching Children to Learn*, Cheltenham: Stanley Thornes

Goleman D (1995) *Emotional Intelligence* New York: Bantam

Gardner H (1993); *Multiple Intelligences: The theory in practice* Basic Books New York;

Higgins, S. Baumfield, V. & Leat, D (2001) *Thinking Through Primary Teaching* Cambridge: Chris Kington.

Lipman, M. (2003) (2nd Ed.) *Thinking in Education* Cambridge: Cambridge University Press

McGuinness, C. (1999) *From Thinking Skills to thinking classrooms: a review and evaluation of approaches for developing pupils' thinking.* London: DfEE, (Research Report RR115).

Piaget J. (1953) *The Origins of Intelligence in Children* London: Routledge & Kegan Paul

Sm ith, A. (2002) *The Brain's Behind It*, Stafford: Network Education Press

Wegerif, R. (2002) *Literature review in thinking skills, technology and learning*www.nestafuturelab.org

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