Stripping away the mystery

Gail Edwards argues that teaching children *about* thinking skills helps them to become more effective learners

It seems to me peculiar that, despite having invested much time and resources into teaching children basic skills such as reading and writing, we teachers have allowed the skills of learning and thinking to remain a mystery. Perhaps we've assumed thinking skills come naturally. Certainly, I've often observed toddlers investigating their world like 'little scientists'. But then again, I've also often felt exasperated by the decline in motivation and curiosity of many children as they begin formal schooling. It seems to me that hypothesis-testing is a natural, survival-driven capacity, but that some students fail to exploit this adaptive instinct when faced with a classroom task.

I've long thought that one of the main causes of this decline is the unwillingness of the learners to test tentative ideas in a public context. But why is such 'trial and error' behaviour perceived *negatively*? All meaningful learning involves risk-taking and uncertainty because it involves subjecting knowledge claims, including one's own, to critical scrutiny. And despite we teachers having had highly influential researchers telling us that this is the nature of knowledge construction (Vygotsky, 1986; Piaget, 1978; Bruner, 1996), most of us have failed to share such insights *with children*. And as a result of failing to ask them such questions as: What happens when you learn? many children continue with strategies and attitudes that can impede learning.

I've recently spent a year researching the teaching of thinking skills in primary schools, working with teachers and children from nursery to Year 6. Making the thinking process explicit to children – in particular stressing the

necessity of assessing knowledge claims critically by requiring appropriate evidence – has been one of the most powerful pedagogical strategies I have encountered. Setting challenging problems and focussing on learning intentions are really important pedagogical strategies but I believe that, for many learners, they are ineffective without a shared, *explicit* understanding of what a learner does when they're being intelligent.

To explain why I believe this to be true, I need to describe the nature of my research. It arose out of a whole-school initiative to develop confident, curious learners who learn with understanding. The setting was a large inner-city primary school. Several teachers were interested in 'thinking skills strategies' (such as the work undertaken by Leat, 1998, Lipman, 1988 and Blagg et al, 1988) and wanted to try them out with their pupils. Some teachers supported me in gathering data during the research, which was carried out over a year and a half from March 2000 to July 2001. The interventions we used were numerous. We used thinking skills and problem-solving strategies, such as 'Mysteries' and the 'Community of Enquiry' (Figure 1) as well as introducing a more structured, problem-solving format to lessons, similar to that devised for cognitive acceleration programmes (Figure 2).

We wanted to know how these interventions affected children's learning outcomes and learning behaviours. I was particularly keen to know whether the children's understanding of the learning process changed over the year. Teachers were spending more time talking about thinking and learning processes with children during lessons, asking children not only what they'd learned but *how* they'd learned it. Did this explicit focus on thinking skills make children more effective learners?

The interventions had not been used in any of the classes before. Pre-test and post-test semi-structured interviews were undertaken with a minimum of four children per year group. Audio recordings of whole-class interactions during usual lessons were made at the outset. Video and audio recordings were made of one 'Community of Enquiry' and one 'Mystery' at the outset of the year and again at the end of the research period. During the year, recordings were made at monthly intervals, though not in all classrooms. The strategies were used at least once per week in a variety of curriculum contexts during the research period. The recorded lessons were transcribed, analysed and coded mainly by myself although I sought regular critical appraisal from the other teachers. Many teachers' sessions were also observed by colleagues who completed observation schedules.

When analysing the data, it was important for us to be able to identify exactly what sort of learning behaviours and outcomes we valued. We needed to be clear about what happens when children learn successfully. I believe that when learners genuinely search for meaning and understanding from their experience, they compare new empirical data to their prior knowledge store. Such comparison allows learners to categorise data on the basis of similarities and differences with previous experiences and, thus, ultimately provide guidance on how to act, or how to treat the new experience. Whether listening to a lecture or carrying out a scientific investigation, learners are continually testing ideas against their existing theories. Learners may have to revise their mental maps of the world when their current ideas are refuted by new experiences.

I wondered whether children could reflect on this process. The research data suggests that they could. We noted, for example, that the incidence of children providing justification for their reasoning increased over the year. If children gave a justification for an answer that was logically consistent with the evidence or with their existing knowledge, then this event was counted as a substantiated argument. What follows are representative extracts from the data:

(The class had been shown an image of Bangladesh on the overhead projector as an introduction to a mystery task.)

Teacher: Any ideas where it might be? England? Another country? Where? Robert?
Robert: India …
Julie: (Interrupting Robert) No, Indonesia.
Teacher: India? Indonesia? What makes you think it's Indonesia Julie?
Julie: We learnt about Indonesia last week and it looks like it might be 'cos the people are black and wearing the same kind of clothes as the Indonesians.

Julie gives three reasons for her inference, drawn from her previous experience. She reasons that the teacher may well be continuing with a study of Indonesia this week, that since the Indonesian people she studied last week were black then these people may too be Indonesian, and that since the people's clothing is also the 'same' then they could be Indonesian. Julie is learning *actively*, searching to make links with her mental framework to help her make sense of the photographic image.

In the next example, the children were learning about the influence of human activity on the environment. In this *mystery*, the aim was to study the evidence to discover the cause of a particular incidence of river pollution. Each group had to persuade the rest of the class that their conclusion was justified by the evidence.

Steven: Who do you think did it?
Jennifer: (Spokesperson for her group.) We thought it was the farm's fault 'cos they let the waste get into the river from the tank. (Chooses another question from a member of the class.) Simon?
Simon: How do you know it wasn't the factory's fault – letting the chemicals and that into the water?
Jennifer: The safety lady said she tested the water and it was safe enough – she said it was up to the standard – class two.

Simon: Ahh but she works for the factory – she could have been lying 'cos she might've wanted to make more money for the factory.

Jennifer: Yes but the river inspector said that as well – the water was worse next to the farm.

The children provided reasons that were mostly consistent with the evidence. Where it was not, other children were quick to point out their errors. Research evidence from the interviews suggested that children were spurred on to strengthen their arguments by working as a group, in the knowledge that their conclusions would be scrutinised by their peers. Over the year, the children tended to provide more justifications and explanations for their answers, and with less prompting.

Some children who, at the start of the year, were unaware of the need to justify their reasoning with evidence, understood and *wanted* to refer to evidence in evaluating both their own and others' reasoning at the end of the year. The evidence for this finding came mainly from the research interviews. I asked questions which were aimed at assessing how critical the children were when considering the validity of knowledge claims from various sources. The following example is representative of the data considered as an example of this metacognitive skill.

Alan: But some teachers, which I enjoy, just like working in pairs and you can agree or disagree with your partner but like you've got to come to a conclusion that you both agree on and that's what I enjoy about it.

Interviewer: Why? What do you feel helps you about doing it that way?

Alan: Well say somebody gives – your partner says a suggestion, you can agree or disagree but you've got to justify why you disagree and make your own suggestions and if you give a good enough reason they'll side with you, so that helps me.

Interviewer: That helps you learn?

Alan: Yeah.

I had not used the term 'justify' in the interview up to this point. In the pre-test interviews, none of the children demonstrated any awareness of the need to be critical of knowledge claims. In post-test interviews, however, some children's responses suggested an awareness of the need to do so.

Figure 1: Thinking skills strategies

Mysteries (Leat, 1998)

The 'mystery' activity is a group task in which children investigate the possible explanations for an event or outcome, given as a key question(s). For example: 'Who was to blame for the fire of London?' The story within the mystery provides a context for developing more abstract concepts related to the learning objectives of the task (whether mathematical, geographical or historical). Evidence is usually given as written information on slips of paper handed to each group inside an envelope. To solve the mystery the children worked as 'detectives' to produce a reasoned argument supported by evidence. Children sort, classify and synthesise the information in order to speculate, reason and test their hypotheses before agreeing upon a conclusion. It's important that 'red herrings' and irrelevant information are given to encourage a more critical treatment of the evidence by the children (Leat, 1998).

During groupwork, children group information into based on their own criteria. They discard any information they think is irrelevant. Leat (1998) describes a 'reworking' stage where children reconstruct the patterns and relationships in the data they have found. This may lead onto an 'abstract' stage as children form a theory or explanation for the mystery. Groupwork is supported by the teacher who uses contingent intervention to 'scaffold' the children's construction of meaning (Bruner, 1996).

Community of Enquiry (Lipman, 1988)

This is a philosophical strategy which can be used across the curriculum. The class sit in a circle, including the teacher, so that all can see each other. Rules such as 'one person speaks at a time' and 'every contribution must follow on from the last person with 'I agree' or 'I disagree' may be used.

A stimulus is shared. It may be a story, a picture, or another kind of artifact. The children are given time to generate questions (in pairs or groups) and these questions are recorded so that everyone can consider and choose a focus for enquiry. The class vote for a question to discuss. The discussion is supported by the teacher using contingent intervention to scaffold the thinking process. A community of enquiry can be more open ended than a mystery. The teacher will draw the discussion to an end by helping the children to summarise the discussion and crystallise and connect the ideas that have emerged from it.

Interviewer: Do you think it's right if a scientist says it is?
Alan: (Interrupting) Well I agree with some things that scientists say but you shouldn't believe entirely about it because you might think well that's incorrect and you can justify it. That's a good reason why not to believe it so you shouldn't.

Several children also commented on their brain's ability to use clues, as well as change ideas in the face of evidence.

Interviewer: What is it that your brain does?
Aby: When the teacher puts a picture on the overhead and then snatches it away, your brain sees a little clip and you think 'Oh I saw a fishing net so it must be something about fishing' or 'There were rocks on the ground – it must be somewhere rocky….'
Interviewer: So you're thinking 'Ahhh it must be…'?
Aby: Yes! It goes in straight away and your brain thinks 'Oh I saw rocks and I saw a fishing net so it must be that'.
Interviewer: So you're using clues to make predictions?
Aby: Yes – but if you thought it was dull and rocky and someone else said that they saw a sun you'd think 'Hmm, somewhere sunny and rocky – and you can go fishing.' So you might start thinking, 'maybe it's on a caravan site' or something like that.

Aby discusses the process of inferring from evidence and testing hypotheses, although she does not use a 'thinking vocabulary' to do so. But such awareness of how her mind makes associations may have helped her appreciate the significance of such thinking processes in the solving of problems and the construction of useful knowledge. During her interview, she told me she liked *mysteries* because she could make links.

Interviewer: What is it you like about the mysteries?
Aby: Like you've got to join a link between all the clues and you find out something that's happened.

There were many other examples of children talking explicitly about their minds making links between previously disconnected ideas and thus reaching new understandings. During a plenary phase of one lesson, a year four class was asked what their brains did with the information to solve the history *mystery*. David told the class:

David: Well, I thought about the question and then I thought about the clues and I made a-associations.

Whilst many children became more inclined to subject ideas to critical scrutiny over time, what became clear from the research data is that pupils needed to feel *psychologically safe in questioning and problematising information*, particularly if the data source was the teacher. Problem posing and questioning can make learners feel vulnerable. The Community of Enquiry strategy necessitates questioning – a good thing – but some sensitive children still found this difficult.

Interviewer: You know when we do philosophy and we read a story, you ask questions and we talk about it. What do you feel that's not very good about that?
Colin: When someone's reading the text to me I can't take it in – like if someone says what's the story about, I can't take it in when someone else reads it.
Interviewer: You can't take it in?
Colin: 'Cos I can only take it in if I'm reading it – some of the words I don't know what they mean.
Interviewer: If you didn't understand some words or some parts of the story would you not feel happy saying 'I don't understand that, can we explore it?'
Colin: (shakes head)
Interviewer: Why not?
Colin: Miss 'cos some people are like, not as good as some people, and they don't know as much as other people and they might put their hand up for a word that everybody in the class knows and you feel stupid.

What would give Colin the courage to explore the story with peers and ask questions such as 'What does that word mean?' I believe such courage comes only when children *truly believe* that intelligence involves asking questions, searching for problems, and detecting inconsistencies with prior understandings.

Conclusion

It seems that thinking skills strategies can only lead to real learning when pupils *talk* about the process of seeking problems, testing hypotheses and revising ideas is essential. Children who were absolutely clear about the value of subjecting ideas and knowledge to critical scrutiny were more likely to engage in authentic knowledge construction and reconstruction. Such pupils *expected* to feel discomfort and uncertainty and knew that a period of 'not understanding' was an essential precursor to learning something new. They must first 'know what they don't know' before they could go forward.

The provision of purposeful problem-solving contexts or 'thinking skills activities' was motivating but it was those children who were confident about publicly declaring their cognitive confusion who were prepared to face the challenges of knowledge reconstruction head on. Such children *expected* to find logical inconsistencies and viewed questioning and problematization as intelligent behaviour.

My research has taught me that young children are more capable than I first thought of reflecting on their own problem-solving processes. Metacognition – the ability to think about one's own thinking – seems to be a powerful way of overcoming the passivity and learned helplessness demonstrated by some children. Perhaps it is true that humans engage in problem-solving behaviours naturally but I do not think that that this means such behaviours do not need to be taught in the classroom. At the moment, many children are hiding their intelligence because they perceive intelligent behaviours such as questioning or revising ideas as demonstrating *weakness* not intelligence. Perhaps they are even using their intelligence to solve non-curricular problems such as 'How can I avoid exposing my ignorance to others?' I believe we must reconstruct intelligent, thoughtful behaviour in our classrooms. We must deconstruct the myth of intelligence as 'uncritically aligning one's ideas with the teachers' or peers' ideas'. We must help children to value their intelligence and if that means making explicit the process of how we humans seek understanding, then I think that the teaching of thinking skills is something we teachers must all do.

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Figure 2: The structure of a thinking skills lesson (adapted from Adey & Shayer, 1994).

PHASE	DESCRIPTION	THINKING SKILLS
ICE-BREAKER	Focus attention on the key question or problem. Draw on prior knowledge to make sense. Something intriguing/ puzzling to create disequilibrium.	Ask relevant questions Pose and define problems Predict outcomes and speculate using prior associations Compare and contrast
COGNITIVE CONFLICT	A challenge is set. The challenge must be one which requires tackling the disequilibrium.	Plan what to do
CONSTRUCTION & RECONSTRUCTION	Pupils collaborate to analyse data. They work to resolve the cognitive conflict. Teachers scaffold their mental effort to process data.	Locate relevant information Compare and contrast Sort, classify, sequence Analyse part-whole relationships Infer and deduce Make judgements and decisions Evaluate information
DEBRIEF	Articulate and show new understandings. Also discuss how they learnt. Transfer encouraged by bridging to other contexts and problems. New problems or questions may have arisen.	Give reasons for opinions and actions Use precise language Explain own thinking Transfer ideas, generalise