
Teaching Thinking and Problem-solving Skills

Belle Wallace

The essential ideas in this article have been drawn from:

'TASC: Thinking Actively in a Social Context' Wallace B, Adams HB. (1993)

AB Academic Publishers, Oxford

'Teaching the Very Able Child: Developing a Policy and Adopting Strategies for Provision' Wallace B (2000)

NACE/Fulton Publishers, London

The article presents a summary of a widely researched base for the systematic teaching of thinking and problem-solving skills across the curriculum (TASC: Thinking Actively in a Social Context).

The writer maintains that by extending the skills of all learners to think and solve problems, the 'slower' learners are given the necessary framework and support they need to progress; while the 'faster' learners develop and consolidate their skills for independent and extended learning.

The writer argues that a curriculum which systematically and coherently develops pupils' capacities to think raises the levels of achievement of all learners. 'When the tide of thinking flows, all ships rise'.

Introduction

Recently, there has been a surge of interest in the teaching of thinking and problem-solving skills and schools are being encouraged to target the development of these skills across the curriculum; but it is important to remember that teachers have always been concerned that their lessons provoked pupils' *thought*. Also, pupils are always *thinking* although, perhaps, not always about the immediate classroom topic! Therefore, it needs to be stated that the author is not discussing the *introduction* of thinking and problem-solving skills into classrooms as something that is new, rather she is referring to the need for the auditing, refinement and extension of current practice through which all reflective teachers seek to enhance their professional skills.

Hence, the purpose of this article is to suggest a coherent framework which can be used as the basis for reflection with regard to the development of a problem-solving and thinking skills pedagogy. The framework is known as TASC: Thinking Actively in a Social Context (Wallace & Adams 1993).

Theoretical Background to TASC

Robert Sternberg (1986, 1985, 1983) has led the way in making the case that intelligence is primarily the ability to use thinking and problem-solving skills in all aspects of life, and that all pupils can be taught to improve and extend their working repertoire of skills for planning, monitoring and reflecting on their progress, and transferring these skills into all other domains. He states that intelligent behaviour involves the processes of adapting to, the shaping of, and the selecting of real world environments. This implies that the

levels of all pupils' intellectual functioning can be raised through a thinking skills' based curriculum emanating from real-life issues although there will obviously still be differences in attainment stemming from the genetic traits of each individual.

There is widespread evidence (Brown & Campione 1994; Brown 1987) that learners need to use thinking skills consciously and consistently across the curriculum if such skills are to be transferred into a working repertoire of learning tools. An ad-hoc scattering of thinking skills across lessons or an add-on programme separate from the curriculum does not provide the learner with a comprehensive set of thinking tools that are automatized and transferred into life. It makes educational sense, then, to have a coherent, whole school policy for developing, implementing and monitoring a curriculum which systematically develops a range of thinking skills both within each subject area, across the curriculum and within real-life situations. Moreover, it is important to stress that developing a skills-based curriculum not only supports the less able in the development of their potential but maximises and extends the independent learning skills of the more able. However, working in a classroom which systematically promotes problem-solving and thinking skills inevitably encourages greater differentiation of pupil response, therefore, the ethos of the class, and the whole school, needs to establish an acceptable climate of individual difference.

Another leading thinker who has contributed greatly to the understanding of how children best learn is Lev Vygotsky (Cole 1985, Vygotsky 1978). He has affirmed the

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understanding that good, creative teachers have always had, that the development of language through guided classroom dialogue, pupil interaction and the democratic sharing of ideas is not only educationally sound but essential for successful learning. He has stressed that when a teacher-mentor supports and leads learners to negotiate their own meaning and understanding from the base of their own experiential knowledge, then learners are empowered to learn. He also stressed that the route to independent competence is through the initial and sensitive scaffolding by the teacher-mentor of the degree of support necessary for the apprentice learner to gradually become autonomous.

Bandura (1971, 1982, Bandura and Walter, 1963) has discussed the essential role played by senior learners and adults when they model the desired behaviour for the young learner. Therefore, it is vital for teachers to model and to verbalize thinking behaviour, otherwise, how can learners mirror the behaviour and make it their own? Moreover, Bandura has also drawn attention to the direct link between positive self-concept and self-esteem and the motivation to persevere with a learning task. All learners learn when they can build on success which raises the question of how teachers assess learners' work and how they provide feedback which supports and yet gives guidance for improvement.

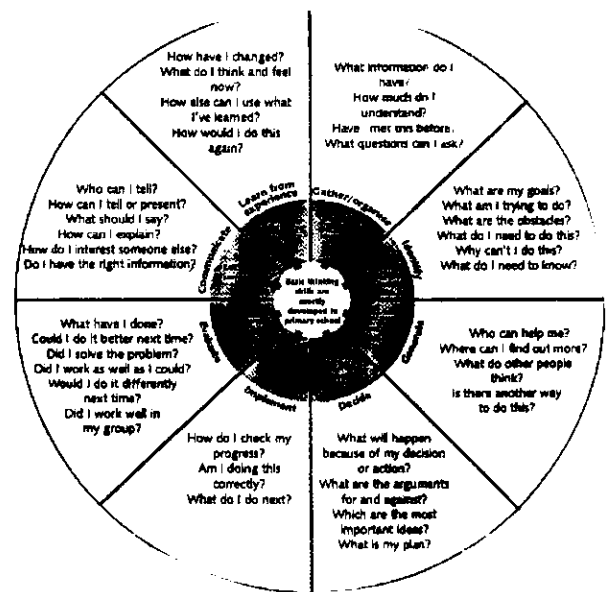
From a broad base of understanding deriving mainly from the work of Sternberg, Vygotsky and Bandura, throughout the eighties, Belle Wallace and Harvey Adams, surveyed the major, worldwide problem-solving and thinking skills initiatives and visited the key projects then currently operating. Adopting an eclectic approach which embraced the most successful elements of the range of projects they evaluated, they simultaneously conducted an intensive action research project with disadvantaged learners and their teachers. Problem-solving and thinking skills strategies and methodologies were trialled, evaluated and reflected upon by the researchers, the participating teachers and the pupils, and gradually a pragmatic working model emerged for the teaching and learning of thinking and problem-solving skills. This was called 'TASC: Thinking Actively in a Social Context' (Wallace & Adams 1993).

The TASC Problem-solving Wheel

It is only possible to give an outline of the major tenets of TASC in this article but there is sufficient detail for teachers to reflect on and then to make adjustments to their current practice. Adopting the TASC approach does not mean a major overhaul of teachers' practice since the skills can be developed incrementally, consolidated, and then extended. However, when adopting and developing the TASC approach in schools, it is more productive and beneficial to develop a whole school approach so that pupils are receiving a coherent message across the curriculum.

The overall TASC problem-solving wheel is given below and the stages are explicit. However, there are certain essential teaching and learning processes which underlie the classroom methodology.

Figure 1: TASC: Thinking Actively in a Social Context
Detail of the Problem-solving Framework



Wallace, B. (2000) *Teaching The Very Able Child: Developing a Policy and Adopting Strategies for Provision*. David Fulton Books.

General Methodology

*Learners need to understand that they can exercise and 'train the brain' like an athlete trains muscles. Learning and monitoring problem-solving skills, practising and improving them is just like coaching soccer or netball skills. Learners need to realise that they are not stuck at any set level of performance and talking about their thinking processes and ways of improving them leads to positive growth.

*Learners should be introduced to the whole problem-solving wheel which they can redesign and fasten into a thinking logbook so that they can refer to the specific strategy they are using. It is not always necessary to follow the stages of the problem-solving wheel consecutively; and sometimes it is necessary to go back to a stage to clarify the initial thinking. Learners also need to verbalize the stages of their thinking, so that they highlight and crystallize the skills they are practising.

*Group work should be used as often as possible so that learners can negotiate meaning and understanding amongst themselves. A very effective way of establishing peer coaching is to ask learners to explain to each other. However, group work skills need to be carefully trained and the purpose of the debate and discussion rigorously established and timed. At the beginning of the training, especially with a class prone to inattention, a few minutes of discussion is sufficient time for learners to work in pairs to think of a joint answer or a couple of ideas about an issue. Training in listening skills and taking turns is also important. When reflecting on the thinking process, learners also need to reflect on how well they worked as a team. Sadly, many of today's young people lack the skills of co-operative endeavour because individual 'wants' have been prioritized.

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*When the teacher is leading the learning interaction, s/he needs to verbalize the thinking processes, the thinking language and the stages of the problem-solving wheel, which are being used. This is essential modelling of thinking skills by a senior learner. Pupils acquire thinking strategies when the teacher first scaffolds the thinking behaviour by giving examples, then gives learners relevant guided practice and gradually withdraws the scaffolding as the learner gains competence.

Stages of the Problem-solving Wheel

***Gather and organise: What do I know about this?**

It is essential that a teacher first gathers from the class what the learners already know about a topic rather than assuming that they know nothing. A teacher does not need to start a topic and tell 'tell everything from the beginning'. All learners need to bring into their working memory the network of knowledge and ideas they already have. Often, the able learners can lead the others but equally often, a teacher can be surprised by an unexpected contribution from a supposedly 'less able' pupil. All the learners' contributions should be recorded quickly in key words or phrases on a large sheet of paper and then the teacher can encourage the class to make links and group ideas. This collective mindmap helps learners to organise ideas in a coherent way and the teacher can see the wholeness or fragmentation of the learners' knowledge framework then refine and extend it. Often, this collective mindmap can be followed by asking the pupils to frame questions to find out the missing knowledge or to extend the collective ideas. Groups can be given differentiated tasks which they research and present to the rest of the class. Obviously, this means that learners need to develop a repertoire of research skills and to be clear about the questions they are researching. This way of working can occur even within the confines of the National Curriculum since very able pupils are often repeating skills and knowledge they have mastered and need to be guided into extension activities.

***Identify: What is the task?**

Many learners lose sight of the task they are undertaking or get lost in detail or distracted by irrelevant issues, so it is important for them to keep the purpose of the task clearly in mind and to monitor this constantly. Also, many pupils get sidetracked by the finished product which is decorated and coloured as an end in itself rather than the means of clarifying and communicating ideas.

***Generate: How many ideas can I think of?**

Frequently, learners tend to fasten their effort on to the first idea they think of; many able learners expecting the fast and easy completion of a task while less able learners may cling to the security of the one right answer. So it is important to encourage all learners to stop and think again, or to consider several ideas before deciding on the best idea or course of action.

***Decide: Which is the best idea?**

When deciding, learners need to prioritize and to give reasons for their choice rather than deciding impulsively on a course of action. Then the course of action needs to be planned.

***Implement: Let's do it!**

Gradually and systematically, learners need to acquire a wide range of recording and communication techniques which they use across the curriculum and which range from graphs and diagrams, to drawing and painting, to ICT skills, to creative and performing skills.

***Evaluate: How well did I do?**

The skill of self-evaluation needs to be trained. Firstly, the teacher helps the learners to talk about the purpose of the task and demonstrates or displays examples of 'good work' eliciting reasons why it is 'good'. Gradually, learners themselves need to establish the criteria which they will use to evaluate their product, otherwise, learners perpetuate the common practice of 'pleasing teacher and providing what s/he wants'.

***Communicate: Let's tell someone!**

Most primary schools display children's work and many primary children give talks or performances to other classes. Good though this practice is, it can be extended, for example, if older children write poems, story books and reference books for younger children and for each other, or if learners give 'teach-backs' to other learners. Pupils need a real audience in order to feel the thrill of communicating and sharing their ideas and the results of their efforts. Unfortunately, too many secondary schools have long bare corridors with few examples of the pupils' work on display.

***Learn from Experience: What have I learned?**

The final stage of reflecting is a summative process which aims at consolidating and transferring what has been learned. This includes reflecting on the efficiency of the whole problem-solving process, which general and subject specific skills have been practised, and what important content has been covered. This 'thinking about thinking' or metacognitive stage is vital if learners are to consolidate and transfer skills across the curriculum. An essential question is 'How can we use what we have learned both in other subjects and in our everyday lives?' This is the stage that is usually omitted because teachers come to the end of the lesson and time runs out. And yet it is the most essential stage in bringing about consolidation and transfer of skills.

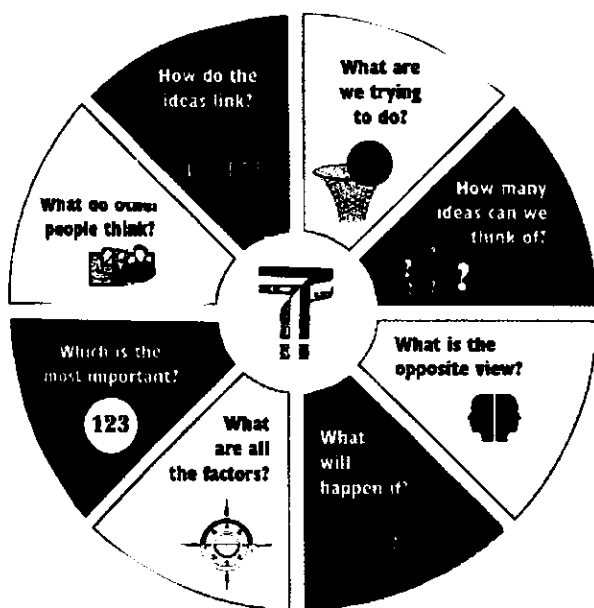
The reader may well comment that the demand of the National Curriculum does not allow time for a problem-solving, thinking skills approach to learning. And, indeed, the National Curriculum is overcrowded with content which has to be covered in a specified time. However, teachers commonly complain that most learners do not remember what they have been taught, so work has to be repeated - and this, incidentally, is a source of great frustration to more able pupils who do retain and remember. The author argues strongly that if learners were taught within a problem-solving, thinking skills paradigm, then they would consolidate and remember far more first time round and the time which is spent on repetition would be considerably reduced. Also, a problem-solving, thinking skills approach develops learners' abilities to learn more efficiently as they acquire and automatize a wide range of learning tools.

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The TASC Tools for Effective Thinking

The TASC paradigm incorporates a wide range of Tools for Effective Thinking, some of which are referred to above. The Tools for Effective thinking feed additional skills into the problem-solving wheel. However, in the initial stages of the TASC action research project, a commonly used core of basic Tools emerged and these are presented in the diagram below. Learners need to have a copy of this basic core of Tools which they can redesign and the teacher can introduce and train each Tool as the opportunity presents itself.

Figure 2: TASC: Thinking Actively in a Social Context
Detail of selected Tools for Effective Thinking



Conclusion

Although curriculum materials aiming to teach problem-solving and thinking skills will vary, this article outlines the essential processes which should be incorporated into any programme. Obviously, various disciplines will need to incorporate relevant subject specific skills and some subjects will emphasize different aspects of problem-solving more than others. But in all thinking-skills packages the following processes must be dominant, namely: gathering and organizing information, clearly identifying the task, evaluating the outcome according to specified criteria and reflecting on what has been learned and how efficient the learning process has been.

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Belle Wallace has been concerned with helping schools to meet the needs of 'very able' learners for 25 years. She worked in an advisory capacity for Essex LEA before concentrating on the needs of the very able in disadvantaged communities worldwide. Her major concern is to lift whole school achievement by providing curriculum opportunities for learners to demonstrate their interest and capacity. She maintains that an enriched curriculum for all with extension for those who demonstrate the need is fundamental to the identification and nurturing of pupil potential. Her publications include: 'TASC: Thinking Actively in a Social Context' (With Adams HB, 1993, AB Academic Publishers); 'Worldwide Perspectives on the Gifted Disadvantaged' (Ed with Adams HB, 1993, AB Academic Publishers); 'Teaching the Very Able Child: Developing a Policy and Adopting Strategies for Provision' (2000, David Fulton Publishers). Since 1982, she has edited the tri-annual Journal 'Gifted Education International' (AB Academic Publishers).