TASC: Thinking Actively in a Social Context

Introduction

This resource has been put together by the Hampshire Maths Team, inspired by the work of Belle Wallace and the TASC programme (Thinking Actively in a Social Context). We hope that your students will enjoy tackling the problems, and that the planning sheets and TASC links will make it easy for you to develop this further with your classes

What is problem solving?

"A problem is a question or a situation which, at the start, you have no idea how to solve." (Holten) Therefore, problem solving must be challenging and must involve real perseverance and struggle. A method of solution needs to be found, not just an answer. Reasoning is as important, if not more so, than "answer getting".

> **"Skills are to mathematics what scales are to music or spelling is to writing. The objective of learning is to write, play music or solve problems – not just master skills".**
>
> National Research Council, Australia. 1989

Many children learn mathematical facts and processes. However, unless they can use and apply these skills flexibly, creatively and effectively, drawing upon the relevant cognitive processes, can we really say they are becoming mathematicians? Mathematical problem solving enables children to practice, apply, refine and develop the skills they have, as well as helping them to develop "number sense". It requires them to reason at different levels, and therefore supports the development of higher order thinking skills – analytical, creative and evaluative thinking.

For children to be pro-active and enthusiastic mathematical problem solvers they need to be motivated, engaged, excited and intrigued. They need resilience and perseverance. They need to use, extend and develop their mathematical skills and knowledge; as well as developing and extending key, transferable skills that they can apply to all problem-solving. Having a systematic approach through which children develop and refine strategies to support them through the process is essential in order for "learners at every level to become excited about mathematics and about becoming mathematicians" (NCETM)

TASC

TASC (Thinking Actively in a Social Context) is a process model that comprehensively supports fluency, problem solving and reasoning, the three aims of the mathematics national curriculum . The essential premise is that all children's learning capacity can be improved through the systematic and coherent teaching of the processes underpinning problem solving and thinking. It is a universal approach that can support all problem solving – mathematical or otherwise. However, it also very effectively supports good models for mathematics teaching and learning, whereby learners are encouraged to:

- build upon prior knowledge
- consider different methods of solution
- justify decisions based on reasoning
- evaluate their work
- reflect on what they are taking away from the activity, (of mathematical value – and new knowledge about themselves as learners), that may be of use to them in the future.

(principles taken from Heibert et al / NCETM)

TASC stands for Thinking Actively in a Social Context:

Thinking: The essential message of TASC is that all children are capable of thinking and improving their performance. Children need to believe and know that they can think and are making positive progress in their thinking. Learners need to understand that they can exercise and "train their brain" like an athlete exercises and works on their muscles.

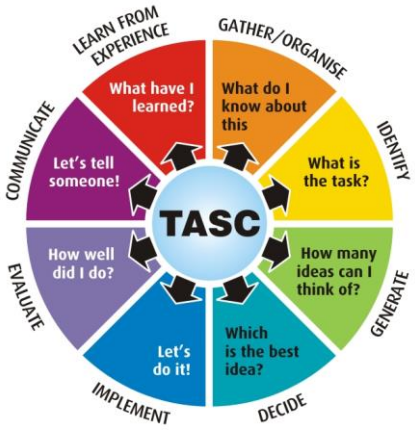
Actively: Children need to have a sense of ownership of their learning – they need to be actively involved in the decision-making. The brain thrives on active participation and involvement, and this generates motivation, high self-esteem and confidence. Also, real hands-on learning is dynamic in nature and the brain thrives on active, dynamic, relevant learning.

Social: Children need to work collaboratively and co-operatively, to practise their thinking and to share ideas with others. Interdependence – with rights and responsibilities within a community – is a universally recognised and desirable concept in all aspects of life. We need "rich classrooms:

communities of enquiry and collaboration, promoting communication and imagination" (Jennifer Piggott: *nrich*)

Context: Children's learning needs to be relevant to their lives. They need to see the "big picture" of their learning – to see how the different subjects and aspects interrelate to each other.

The TASC Wheel



The eight sections of the TASC wheel provide a process that can be worked through when solving problems. The potential of each section of the wheel needs to be fully explored and understood by teachers and pupils in order for the process to be used effectively. It recognises and celebrates the importance of the various steps throughout the process, each one requiring time for development in order for learning to be scaffolded. Sections of the wheel can be re-visited throughout the process.

Gather and Organise – What do I already know about this?

This stage of the process is often done as a whole class activity. Gathering together collective prior knowledge is a powerful way of helping children to see links with previous learning, and therefore

providing a route in to the problem for those who would otherwise find this problematic. Learners often find that they reassuringly know more already that will help them than they at first realized. All thoughts and ideas should be valued. Recording all contributions provides a starting point that can be returned to later on and added to.

Identify – What is the task?
Clarifying the task and establishing success criteria is an important aspect of Assessment for Learning. In mathematics, learners often lose sight of what the initial problem was. Clarifying it in this way – and having it to constantly refer back to – helps to maintain focus and ensure the task is adhered to. Success criteria can eventually be negotiated with and decided upon by the children themselves. This helps to move away from the concept of outcomes always needing to "please the teacher" ("What WE are looking for"….rather than "What I am looking for.")

Generate – How many ideas can I think of?
Learners have a tendency to stick with their first idea. Able learners expect a fast and easy solution, whilst less-able learners cling to the security of one right answer. All learners should be encouraged to stop and think again, and to consider several possibilities. This is high-level, creative thinking!

Decide – Which is the best idea?
Learners now need to prioritise and give reasons for their choices, rather than deciding impulsively. The course of action selected now needs to be planned and the possible solution trialled. This is analytical and evaluative thinking!

Implement – Let's do it!
Now much thinking and planning has been done, children should work independently through the problem, with adults acting as facilitators and observers.

Evaluate – how well did I do?
Children will need to be trained in the skill of self-evaluation. They should evaluate in relation to the success criteria. "Success" should be discussed in terms of how they worked through the process, and how they were able to work collaboratively, as well as in terms of outcomes. Children will become more analytical and constructive with experience.

Communicate – Let's tell someone!
Sharing outcomes and processes with another audience helps to clarify thinking. Children also learn to be constructively critical with each other and ask questions for themselves. "Communicating" could be talking your work through with another group, or it might be presenting it in an assembly, a presentation or a display. The process should be celebrated as well as the final outcomes.

Learn from Experience – What have I learned?
At this point, it is important to reflect on the major competences that have developed and think about the learning processes that were used. Consider which general and subject-specific skills have been practised, and, most importantly, how might what we have learned be useful to us in the future? Refer back to your "Gather and Organise" and extend it with new knowledge.

For TASC to be used effectively, the classroom culture should be one in which

- all ideas and methods are respected and valued
- pupils choose their methods and share them with others
- mistakes are an everyday part of mathematics and are viewed as learning sites
- correctness lies in the mathematical explanation – pupils can explain and justify their solution
- resources are readily available and accessible. Pupils are happy to use models, images, resources and jottings to help them
- mathematical talk and quality dialogue underpin all activity.
- Tasks are accessible to all learners, and all learners feel empowered.

Pedagogy

The most effective way to facilitate successful outcomes for pupils working on TASC activities is to work alongside them, rather than trying to teach skills and guide towards a particular outcome. To this end, TASC activities should be carried out by the teacher before presenting them to pupils. This enables the teacher to fully engage in the thinking and intellectual struggle that a pupil will encounter when first presented with the problem. It also allows the teacher to

be aware of a range of possible outcomes and avenues of enquiry in advance, so allowing for appropriate resources to be available and probing questions to be mentally prepared. TASC activities are not designed to be presented to a class without a teacher's prior engagement.

References

"Teaching with Rich Learning Tasks". Gary Flewelling with William Higginson. Published by The Australian Association of Mathematics Teachers 2005

"Mathematics Matters" NCETM 2008

"Teaching Problem Solving" Derek Holten 2000

"Rich Tasks and Contexts" Article on Nrich by Jennifer Piggott. September 2008 ~ http://nrich.maths.org

"Making sense – teaching and Learning Mathematics with understanding" James Heibert et al. 1997 Heinemann