Metacognition – a key to unlocking learning

Key insights and implications for teaching practice

This document aims to support the teaching of metacognition across all schooling stages. It draws on a larger evidence guide available on the Department's website. This paper, and the detailed review, outline what metacognition is, teaching strategies to support the development of metacognition in students, and the advantages this can have for both teachers and students.

For the full report, visit: www.education.nsw.gov.au/teaching-and-learning/ education-for-a-changing-world/thinking-skills/metacognition

Metacognition, commonly defined as 'thinking about thinking', is important for learning

Metacognition is the process of monitoring, managing and evaluating cognitive activities. Metacognitive ability is closely linked to motivational, social and behavioural factors, which are all aspects that make for a self-regulated learner. In effect, metacognition is about being aware of different thinking strategies that can be employed to support learning. Skilful metacognition involves knowing when, why and how to employ these different strategies. Metacognitive skilfulness is developed through personal experience and practice, and through explicit teacher instruction, such as describing, scaffolding and modelling strategies.

A metacognitive approach to instruction is about embedding a self-reflective style of thinking that enables students to be aware of and ultimately create learning goals, plan ways to achieve those goals, strategise how to deal with setbacks, and monitor their learning progress.

Metacognition is important for all learners to develop at all levels of schooling. Skilful metacognition allows a student to be constructively aware of their thought processes, and how this affects their ability to learn. Generally speaking, there is evidence that the highest performing students in a class are also the most adept metacognisers.

By learning how to monitor their thinking, students are able to identify strategies that enable them to learn effectively and stop using strategies that are less effective. In essence, metacognition enables students to 'learn how to learn'. Good metacognitive practice helps students identify which aspects of a learning task are causing them to get 'stuck'. This allows students to ask more specific questions, and help teachers to provide support that is tailored to individual student needs.

What the research tells us about metacognition

Metacognition can be developed during all stages of learning. Metacognition is closely linked to a range of thinking skills, in particular critical thinking ability. There is good evidence that metacognition is a predictor and facilitator of independent, life-long learning. The evidence is particularly strong when metacognition is developed alongside the motivational, social and behavioural factors that support effective self-regulation.

Research points to generally positive effects on a range of learning outcomes, and for different demographics of learners. Hattie (2018) measured the effect size of metacognitive strategy use as 0.6 (a moderate effect), though specific metacognitive strategies such as scaffolding (0.82) and planning (0.76) have even stronger effects on student achievement.

While the research base is more developed for the teaching and learning of literacy, science and mathematics, there is evidence that metacognitive strategies may be useful over all key learning areas (KLAs) in the curriculum.

The metacognitive knowledge and skill of teachers is very important for supporting students' metacognitive development. Teachers who are aware of their own metacognitive practices are more successful at implementing metacognitive approaches in their classroom.

Implications for teaching

In the Australian Curriculum, metacognition is a sub-element of the critical and creative thinking general capability learning continuum. The curriculum and the NSW syllabuses provide ample opportunity to develop students' metacognitive skill in all subjects and levels of learning.

Metacognition is best developed through explicit teaching and structured practice of metacognitive strategies. For specific KLAs, effective application of some metacognitive strategies requires students to have a reasonable level of content knowledge. However, many metacognitive strategies can also be outlined in broad terms. These classes of metacognitive strategies can be applied, and potentially transferred, across different subjects.

Generally, metacognitive strategies fall into three categories: planning, monitoring, and evaluating thinking. Planning strategies may include checklists, diagrams, mnemonics, and graphic organisers, and be aided through teacher-guided practice. Monitoring can include reflecting on the progress of planning strategies, as well as answer-checking. Evaluating strategies involve reflecting on the whole process, including self-testing of understanding, eventually leading to independent practice.

Embedding metacognition in the classroom may change the way teachers frame learning intentions and success criteria, ask questions of their students, and guide learning. Applying a metacognitive approach to teaching involves structuring content teaching around metacognitive strategies that help students monitor their learning. This may include:

Teaching Habits	What, when, why
Ask questions	• Asking **open-ended questions** to probe understanding and challenge thinking. These could be directly from the teacher, or in the form of **self-questioning prompts**.
	• Open-ended questions could be used at any point in the lesson, be aimed at groups or individuals, and cover a variety of themes. For instance, open-ended questions might aim to drive student **reflection**, **prediction** or **imagination**.
	• Questions could be specifically about content, skills, collaboration or goals, and aimed at **surface**, **deep** or **transfer** levels of understanding.
	• Asking similar questions of yourself may also generate insights into your teaching practice, for instance, "Did I encourage reflection? Have I modelled skills through thinking aloud? Did the learning activities encourage explicit thinking? What worked and how do I know?"
Be explicit	• Explicitly **planning** and clearly outlining **key learning intentions** for lessons, and **why** they are important, so that students can **evaluate** their current knowledge or ability to achieve those learning intentions. This can also be used as a time for **reflection** on learning intentions from previous lessons, in order to show the broader development of knowledge and skills, and the **links** between content and ideas, as well as returning to content that may need to be revisited or reinforced.
	• Describing different metacognitive strategies to students that could support the achievement of learning intentions.
	▪ For instance, describing and **modelling** the use of **concept maps** or **graphic organisers** to help students map their thinking.
Plan ahead	• Emphasise the importance of **planning** how to approach a problem, and **monitoring** the progress of the plan over time.
	▪ This may take the form of **graphic organisers** or **questions** that probe initial understanding and background knowledge at the start of a task, insights that have been gained during task performance, and reflections at the completion of the task.
Model your thinking	• **Teacher modelling** is ideal, but providing opportunities for students to witness others modelling their metacognitive practice, such as their **peers**, can also provide opportunities for learning.
	• An example of metacognitive **modelling** is the **think aloud** approach, where a teacher or student describes, for instance, their thoughts during the process of changing their mind, or identifying a point in their thinking when they got "stuck" and how they **planned** an approach to overcome this challenge.
Challenge students	• Once students feel confident in their subject knowledge, providing material that **challenges** their ability to use that knowledge and creates opportunities for them to **self-test** their metacognitive approaches to learning and solving problems, particularly in approaching novel tasks.

Teaching Habits	What, when, why

Evaluate progress	• Connected to **planning** and **monitoring**, evaluation may take the form of summative assessment, or it may be used as a tool for reflecting on learning progress.
	
	• Ask students to individually and collectively **reflect on learning intentions**, as well as the learning process, from previous and current lessons.
	
	   ▪ This may take the form of a **thinking process log-book**, where students may set goals in previous lessons and revisit them to evaluate success.
	
	   ▪ It may also take the form of **open-ended questions** such as "What do I think I have learned today? What are some skills I would like to learn in the future?
	
	• Take the opportunity to be **self-reflective** of your teaching practice, asking questions that prompt your own metacognition, such as those suggested in the 'Ask questions' teaching habit above.

Promote collabor- ation	• During group work, providing opportunities for students to **reflect on the effect of collaboration** on the way they think and solve problems. ▪ For instance, using an **'origami' graphic organiser** to support collaborative discussion, and **open-ended questions** to allow for reflection, such as "Are there common thoughts or themes that your group members share? Why do you think this is so or is not so? Why is it important to value the opinion of others?"

Keep practicing	• Providing opportunities for students to **practice** using different strategies, as well as providing feedback along the way.
	
	   ▪ For instance, by outlining a learning intention and a range of strategies that could be used to **plan**, **monitor** and **evaluate** progress.
	
	   ▪ These may include creating **lists** or **concept maps**, making **predictions**, or using **self-questioning** techniques.

Regularly check in	• There are different approaches to **assessing** metacognitive knowledge and metacognitive skills.
	
	• Metacognitive knowledge is often assessed through **self-report** or **teacher-reported** inventories.
	
	• There is growing consensus that the most accurate way to measure metacognitive skills is during task performance in natural environments.
	
	   ▪ There are a wide range of metacognitive skills assessments available to suit different purposes, including observational approaches and the **think aloud** protocol, where students verbalise their thoughts as they complete the task.
	
	   ▪ As with all assessments, selecting the right type will depend on the student, subject and purpose.

Conclusion

Creating metacognitive learning environments is as important for teachers as it is for students. Through developing awareness and skill as reflective thinkers, teaching and learning practices can improve. Metacognition is an inherently social practice; we can learn and understand a lot about our own thinking by engaging with the thought process of others, on a journey to improving our metacognition and becoming life-long learners.

Education for a Changing World

The NSW Department of Education is committed to preparing young people for rewarding lives as engaged citizens in a complex and dynamic society. Key to this purpose is creating opportunities for students to develop a strong foundation in literacy and numeracy, deep content knowledge, and to be engaged and challenged in their learning.

This practical guide to metacognition and its related evidence review are part of the Department's Education for a Changing World project. For more information and resources please visit our website: https://education.nsw.gov.au/teaching-and-learning/education-for-a-changing-world