Metacognition describes the processes involved when learners plan, monitor, evaluate, and make changes to their own learning behaviours.

What does metacognition mean?
The 'meta' refers to higher-order cognition about cognition, or ‘thinking about one’s thinking’. It is often considered to have two dimensions: metacognitive knowledge and metacognitive regulation.

• **Metacognitive knowledge** includes the learner’s knowledge of their own cognitive abilities (e.g., I have trouble remembering people’s names), the learner’s knowledge of particular tasks (e.g., the ideas in this article are complex), and the learner’s knowledge of different strategies including when to use these strategies (e.g., if I break telephone numbers into chunks I will remember them) (Brown, 1987; Flavell, 1979).

• **Metacognitive regulation** describes how learners monitor and control their cognitive processes. For example, realising that the strategy you are using to solve a maths problem is not working and trying another approach (Nelson and Narens, 1990). Monitoring and control are described in more detail in the following section.

What is the theory behind metacognition?
A theory of metacognitive regulation that is widely cited in the research literature is Nelson and Narens’ (1990) Model of Metacognition. This consists of two levels: the **object level** and the **meta level** (see Figure 1 opposite).

• **The object level** is where cognitive processes or ‘one’s thinking’ occurs. One example is decoding text when reading. At the object level, cognitive strategies (e.g., decoding) are used to help the learner achieve a particular goal (understanding the meaning of the text).

• **The meta level** is where your ‘thinking about thinking’ takes place. At this higher-order level, metacognitive strategies are used to ensure the learner reaches the goal they have set. To continue with the reading example, this would begin with the learner thinking about how well they have understood the paragraph they have just read. This is termed monitoring. If they are happy with their comprehension level they will continue reading. If not, they will perhaps re-read the paragraph, or decide to use a dictionary to help their understanding. These actions are called **control** processes, as they are changing the learner’s cognitive processes or related behaviours, based on the monitoring feedback.
Perkins (1992) defined four categories of metacognitive learners: tacit; aware; strategic; reflective.

'Tacit' learners are unaware of their metacognitive knowledge. They do not think about any particular strategies for learning and merely accept if they know something or not.

'Aware' learners know about some of the kinds of thinking that they do – generating ideas, finding evidence, etc. – but thinking is not necessarily deliberate or planned.

'Strategic' learners organise their thinking by using problem solving, grouping and classifying, evidence seeking, decision making, etc. They know and apply the strategies that help them learn.

'Reflective' learners are not only strategic about their thinking but they also reflect upon their learning whilst it is happening, considering the success or not of any strategies they’re using and then revising them as appropriate. For an example of this categorisation in action, see the work of Harvey and Goudvis (2007).

What other terms are associated with metacognition?

- **Self-regulation** and metacognition are sometimes used interchangeably. However, Whitebread and Pino Pasternak (2010) state that a consensus is now emerging in the research literature “that metacognition refers specifically to the monitoring and control of cognition, while self-regulation refers to the monitoring and control of all aspects of human functioning, including emotional, social, and motivational aspects” (p. 693).

- **Self-regulated learning** is a term which describes self-regulation in academic settings.

- **Executive functioning** describes a variety of cognitive processes that are required to attain a goal. This includes working memory, inhibitory control, attention control, and attention shifting. Metacognition can be seen as the behavioural output for these executive functions. For example, a learner monitoring how well they are remembering a string of numbers (an example of metacognitive regulation) is the behavioural output of the executive function of working memory (Jansiewicz, 2008).

What are the benefits of metacognition?

- Metacognitive practices help learners to monitor their own progress and take control of their learning as they read, write, and solve problems in the classroom.

- Research indicates that metacognition is a powerful predictor of learning. Metacognitive practices make a unique contribution to learning over and above the influence of intellectual ability. The implication of this research is that improving a learner’s metacognitive practices may compensate for any cognitive limitations they may have (Veenman, Wilhelm, & Beishuizen, 2004; Wang, Haertel, & Walberg 1990).

- Metacognitive practices have been shown to improve academic achievement across a range of ages, cognitive abilities, and learning domains. This includes reading and text comprehension, writing, mathematics, reasoning and problem solving, and memory (Dignath & Büttner, 2008; Dignath, Buettner, & Langfeldt, 2008).

- Metacognitive skills help students to transfer what they have learnt from one context to the next, or from a previous task to a new task.
What are the challenges of metacognition?

One of the challenges of metacognition is the imprecision of the term. Some of this is due to the difficulties distinguishing between cognition and metacognition. Further issues with the construct are discussed below:

• There is debate over whether metacognition is domain specific or more general by nature, crossing subject domains. A number of studies have shown the benefit of using metacognitive skills in specific domains such as reading or maths problem solving. However, it is unclear how skills learnt in one domain or task transfer to another. Veenman and Spaans (2005) maintain that metacognitive skills initially develop within separate domains and later transfer and generalise across domains. More research is needed to determine how these skills generalise across domains and how this process can be supported in the classroom.

• Many metacognition researchers highlight the conscious, deliberate nature of metacognition. Others believe that less conscious, automatic processes are also metacognitive. For example, a learner checking work for errors as they write, out of habit, with little awareness that they are doing so until an error is identified. The notion of automatic or implicit metacognition may cause further difficulties in distinguishing cognitive from metacognitive processes. However, it has led to more sophisticated models of metacognition, particularly in the area of metacognition in young children (Whitebread et al., 2009).

• In contrast to the view that metacognitive skills emerge at the age of 8 to 10 years old (e.g., Veenman and Spaans, 2005), Whitebread and Pino Pasternak (2010) document a number of studies which indicate evidence of young children’s metacognitive abilities. Findings include children as young as 18 months demonstrating error correction strategies, 5-year-old children showing an awareness of forgetting, and 3 to 5-year-olds exhibiting a wide range of verbal and non-verbal indicators of metacognitive processes in nursery and reception classrooms. These studies demonstrate that although young children may not be able to describe the metacognitive processes they are exhibiting, it does not mean that these processes are not occurring.

Practical tips:

How can schools make the best use of metacognition?

• Ensure professional development in metacognition is prioritised: ongoing, evidence-informed professional development which focuses on practical strategies for teachers to use in the classroom to foster metacognitive practices across the curriculum areas. There should be a focus on both explicit cognitive and metacognitive instruction, and how to create a learning environment that supports the development of metacognitive skills.

• Encourage teachers to work together and share practice that promotes the development of metacognitive abilities in the classroom.

• Support teachers in encouraging metacognitive practices at school. For example, providing templates for exam wrappers (sometimes called cognitive wrappers). Exam wrappers are worksheets that learners complete before and after they receive their test feedback. Before learners receive the test feedback the worksheets may prompt them to reflect on how they prepared for the exam, including the study strategies they used. After receiving the test feedback, the learner may be asked to categorise any errors made and discuss how they might prepare differently for the next assessment.

• Involve the whole school community in promoting metacognitive talk. Monitoring and evaluating performance, and using learning strategies effectively is not only helpful in the classroom, but also in the wider school and beyond. All staff members can emphasise this idea.

How can teachers make the best use of metacognition?

• Make learning goals explicit and help students to plan strategies and ways of monitoring their progress towards achieving these goals.

• Encourage cooperative group work where set tasks require children to discuss their understanding, evaluate their own work and the work of the group, and reflect on their learning.
• **Use self-assessment** in the classroom to promote metacognitive skills. Learners can assess the quality of their work based on learning goals, and make adjustments accordingly.

• **Try reciprocal teaching** in reading. This is one of the most well-known reading interventions that uses a metacognitive approach (Palincsar and Brown, 1984). This involves teachers working with small groups of learners and modelling the use of four key strategies: summarising, questioning, clarifying, and predicting. The students are then asked to teach these strategies to other students.

• **Use teacher- and peer-scaffolded interactions** to support metacognitive development, and gradually encourage the transition from this external, supported monitoring and control, to more internalised metacognitive processes.

• **Focus on developing learners' awareness** of the strategies they use by encouraging the discussion of strategies in class. This could include when to use certain strategies, how they impact on their learning, and why the strategies work.

• Encourage the transfer of strategies across different domains of the school curriculum. For example, which strategies from the previous learning task could you also use for this task?

• **Model** as teachers the use of metacognitive strategies by thinking aloud. This could be related to metacognitive knowledge, e.g., What do I know about this task? Have I done a task like this before? Which strategies worked in the past on a task like this? Or, **metacognitive talk** could be related to metacognitive regulation, e.g., the teacher talking aloud while monitoring and evaluating what they are doing.

• **Support the learners' autonomy** by allowing them to make choices on the level of difficulty of certain tasks. Avoid giving answers where possible and instead prompt the students to think for themselves and choose an appropriate strategy for the task.

### How is Cambridge supporting schools with metacognition?

- **Cambridge Professional Development Qualifications** have been designed to encourage and support metacognitive practices in Programme Leaders and candidates.

- **Online resources** such as *Getting Started with Metacognition* provide teachers with new ideas and approaches that link theoretical understanding with practical classroom application, and face-to-face enrichment workshops provide the opportunity for teachers to develop these practices further.

- **Syllabus design and development** is informed by research evidence about metacognition and its impact on teaching, learning and assessment. Our suite of Cambridge Global Perspectives courses have been designed with tools to support learners in the process towards metacognition.
Where can you find more information?


You can find information on Cambridge Professional Development Qualifications on our website at: www.cambridgeinternational.org/pdq

**Acknowledgement:** Matthew P. Somerville

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