

Education brief

Metacognition

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

What does metacognition mean?

The prefix 'meta' means 'about' the thing itself. So, metacognition is '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 dates), the learner's knowledge of the nature 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 they are using to solve a mathematical problem is not working and trying another approach (Nelson & 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 below).

- 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). This is **cognition**.
- The **meta level** is where 'thinking about thinking' takes place. At this higher-order level, metacognitive strategies are used to make sure 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. This is **metacognition**.

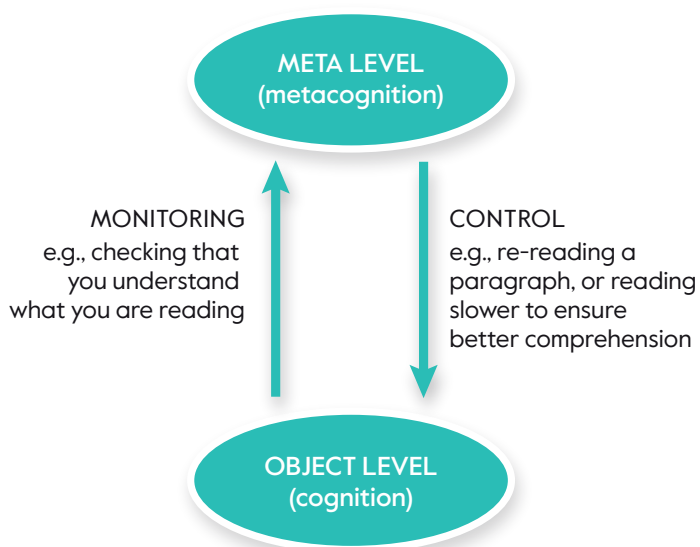


Figure 1. Nelson and Narens' (1990) Model of Metacognition

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Perkins (1992) defined four levels 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 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 while it is happening, monitoring the success of any strategies they are using and then changing them as appropriate.

What other terms are associated with metacognition?

- **Self-regulated learning** is a broader term, encompassing cognition, metacognitive knowledge, metacognitive regulation and the motivation necessary to employ these strategies successfully (EEF, 2019).
- **Metamemory** – the metacognitive aspects of learning and memory (Nelson & Narens, 1990).

What are the benefits of metacognition?

- Metacognitive practices help learners to plan, monitor and evaluate 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 cognitive 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 & Buttner, 2008; EEF, 2019; Hattie, 2009).
- Metacognitive skills can help students to **transfer** what they have learnt from one context to the next, or from a previous task to a new task. The teacher can support this by explaining how what has been learnt from one task can be applied to the next.

What are the misconceptions of metacognition?

- **Metacognition is always deliberate**. Many metacognition researchers highlight the **conscious, deliberate** nature of metacognition. An alternative approach is to say that less conscious, automatic processes are also metacognitive. For example, a learner may check 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).
- **Metacognition is for older students**. In contrast to the view that metacognitive skills emerge at the age of 8 to 10 years old, Veenman & Spaans (2005), Whitebread & Pino-Pasternak (2010) and Larkin (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 to 6-year-old children showing understanding of memory processes, 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?

- Prioritise **professional development** in metacognition. There should be an explicit focus on teaching both cognitive and metacognitive techniques, and how to create a learning environment that supports the development of metacognitive skills and motivation. Encourage teachers to work together and **share practice** that promotes the development of metacognitive abilities in the classroom. For example, a group could meet regularly to reflect on a reading about metacognition or to share their experiences of implementing a new strategy.
- Support teachers in **encouraging metacognitive practices** at school. For example, exam wrappers are worksheets that learners complete before and/or after they receive test feedback. These include questions to help learners to reflect on the processes of planning, monitoring and evaluation when preparing for and sitting the test.



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- Embed metacognitive strategies in **high-quality subject teaching** rather than as decontextualised generic skills training (EEF, 2019).
- 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.
- **Evaluate the impact** of new strategies that are implemented, whether these are tried across the whole school or by individual teachers or departments (see **Getting Started with Evaluating Impact**).

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. For example, encourage **self-assessment** against learning goals and redrafting of work as necessary to reach these goals.
- Help students to understand their mid- and long-term goals. As well as metacognitive knowledge and regulation, learners need to employ motivation strategies such as **deferred gratification** to make sure they learn successfully (EEF, 2019).
- Plan for **progression** in the teaching of new metacognitive strategies, starting with activating prior knowledge and explicit strategy instruction, and ending with independent practice and structured reflection (EEF, 2019). Try to keep learners within their zone of proximal development (ZPD) – see **Education Brief: Active learning**. Scaffolding should be gradually reduced so that eventually learners are able to employ the metacognitive strategy independently. Learners should also be able to choose which strategy to employ in a new context, or when another strategy is not working.

- **Model** 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. Similarly, model the **transfer** of strategies across different domains of the school curriculum. For example, what strategy have I learnt in mathematics that would help me with this problem in geography?
- Try **reciprocal teaching** in reading. This is one of the most well-known reading interventions that uses a metacognitive approach (Palincsar & 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 **artefacts or visual resources** to support younger children in planning, monitoring and evaluating their learning. For example, involve learners in creating 'photo-cues' – photographs of learners undertaking different learning processes – and discuss what is happening and why (Tarrant & Holt, 2016).
- Teach the **language of metacognition** by using word walls or banks (Tarrant & Holt, 2016). Make sure that the language is embedded in high-quality subject teaching.
- When **debriefing** a cognitive activity, also seek opportunities to encourage reflection and evaluation about the metacognitive strategies used.

How is Cambridge supporting schools with metacognition?

- **Syllabus design and development** is informed by research evidence about metacognition and its impact on teaching, learning and assessment. We always aspire to make sure our exams require learners to use their metacognitive skills and to apply their thinking to new contexts. As such, the synoptic nature of our syllabuses and assessment requires students to understand the whole subject rather than simply individual modules. For example, our suite of Global Perspectives courses have been designed with tools to support learners in the process towards metacognition.
- **Online resources** such as **Getting Started with Metacognition** provide teachers with new ideas and approaches that link theoretical understanding with practical classroom application.
- **Training** such as our Enrichment face-to-face and online workshops on metacognition provide the opportunity for teachers to develop their metacognitive practices further.
- **Cambridge Professional Development Qualifications (PDQs)** have been designed to encourage and support metacognitive practices in Programme Leaders and candidates.

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Where can you find more information?

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- Information on Cambridge Professional Development Qualifications can be found at: www.cambridgeinternational.org/pdq
- Getting Started with Metacognition and Getting Started with Evaluating Impact are available on our website at: www.cambridgeinternational.org/getting-started

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