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Metacognitive Theory

Learning Objectives

In this chapter we will:

- Understand what metacognition is not
- Understand what metacognition *actually* is
- Explore the literature which shows the positive impact of metacognitive teaching
- Review reports from significant education bodies, such as the Education Endowment Foundation and the Office for Standards in Education.

Introduction

Metacognition is a historic theory, rather than a newly developed or refined pedagogy of the twenty-first century. Ideas around metacognition can be traced back to at least the early twentieth century, but were initially collected together by the superb academic Brown and DeLoache in 1978. This brilliant work was carried further by other important theorists, including Schraw (1998) and Flavell (2002). Therefore, it would be of no surprise if you have heard of metacognition before, seeing as it has been around in the (relative) mainstream of educational theory for close to half a century. For those involved in education over the previous two decades, you may have even been exposed to metacognitive changes in schools previously, perhaps under the guise of learning to learn. The aim of this chapter will be to develop a clear understanding of the nuts and bolts of metacognitive theory to ensure successful application of the strategies that come later in this book, but without overloading you or turning this into a difficult-to-digest and theory-heavy chapter! The chapter will begin with understanding what metacognition is *not*, before exploring potential definitions of metacognition, how the theory works and, finally, considering why metacognition is so important and worth your (and your school's) time and energy to implement.

What Metacognition Is Not

Before understanding what metacognition *is*, I really believe in the importance of understanding what it is *not*. Often, metacognition and self-regulation are seen as synonyms.

However, this is incorrect. Self-regulation is a greater idea, or theory, than metacognition. As you will read in a few paragraphs' time, metacognition has a very narrow focus, whereas self-regulation is the more general, or less specific, idea of how students control their emotions, monitor their motivations and show resilience with difficult problems. Though metacognition would fall under this umbrella, it would be incorrect to suggest that metacognition covers all of these areas.

What Metacognition Is

Through my years of research on metacognition, the definition that I have come across the most is that of 'thinking about thinking'. Though this definition begins to push us in the correct direction of understanding what metacognition is, it again is not hugely accurate or specific in understanding what metacognition *truly* is. The best definition that I have come across in literature is that from Flavell (1976), who wrote:

> I am being metacognitive if I notice that I am having more trouble learning A than B; if it strikes me that I should double check C before accepting it as fact.

This definition is perhaps still a little unclear, though – or at least it is until we begin to explore metacognitive theory in a bit more depth. When you have an understanding of the theory, this definition makes sense. But, really, a definition should make sense without a need to know the ins and outs of the theory. This led me to produce my own definition of metacognition, which is:

> The little voice inside your head that constantly evaluates and informs your actions.

What this definition is attempting to suggest is that metacognition is that consistent internal monologue that says, 'Do it like this, not like that', or 'That did not go as well as planned, I will do it like that next time'.

This, therefore, begins to bring us on to what metacognition truly is. The word itself can be broken down into two. First is meta, or the idea of 'higher order'. The second is cognition, or the idea of how we acquire and utilise knowledge. Therefore, metacognition is actually referring to the higher-order thinking around how we acquire and utilise our own knowledge. This allows us to reconsider the definitions that we have above, where metacognition is the consistent and repeated evaluation and review of our own learning, and how we are going about applying and utilising the knowledge that we have.

We are several paragraphs into this chapter, and you may be lost. Let us therefore consider some less abstract definitions, and settle on a fixed, concrete example that we will all have gone through in our lives – the drive to work.

Driving to work

Before: What is the quickest route to school? What might the impact of new traffic lights be? Do I need to change my route because of this? What time do I need to set off to ensure I am there on time?

During: How does this diversion impact on me? How will I correct my taking of the wrong road? Can I amend my route to make up for the traffic that I have just hit?

After: The traffic at this time of day is too bad to take route x. The new roadworks mean I will need to travel on route y. The corners on route z are quite tight, and so I need to take them slower next time.

The cognition of driving are the skills we have to drive and our abilities to adapt to the road conditions that we have in front of us. The metacognitive thinking is the review of the actions we take, including how we are driving and the routes we take.

It is perhaps no surprise that metacognition is so difficult to understand. If we consider the prerequisites of metacognition, which are cognition (as you cannot have higher-order consideration of cognition without cognition actually occurring) and motivation (as without this, cognition would not be used), these are both themselves visible. For example, cognition could be seen in the mirror of a dance studio or the videoing of a golf swing. Meanwhile, motivation becomes visible through witnessing the completion of a task, such as the handing in of a homework task or a student asking for a challenge worksheet. However, metacognition does not allow this visibility, which is even shown within the driving example given above. This is where the first key demand of this book comes. In order to develop our own metacognition, and the metacognitive abilities of our students, we need to make metacognition explicit, through active, conscious consideration of metacognitive practices, as well as through explicit reference within our teaching.

Knowledge of Cognition vs Regulation of Cognition

Now that we have an understanding (or the beginning of an understanding) of what metacognition is, it is time to explore the deep dark depths of the theory. Metacognition itself is split into two areas – knowledge of cognition and regulation of cognition.

- **Knowledge of cognition:** this refers to what we, as individuals, understand of our own cognition. This includes what we know about our levels of knowledge, including facts and strategies with which we have to approach tasks and problems. In short, this is what we know.
- **Regulation of cognition:** this refers to the ways in which we control and monitor our own thinking and learning. This would include evaluation of strategies and tasks that we have completed. In short, this is our ability to evaluate.

Once metacognition has been split down into these two areas, they are actually split down into three further areas. This is hugely important, as this provides us with something called the metacognitive processes. These processes are so important that they demand their own chapter of strategies later on in this book. In essence, these metacognitive processes are the engine room of metacognition. It is here where the proper metacognitive thinking will be occurring for ourselves and our students, and where we can make the biggest impacts on student metacognitive developments.

Let us first explore how knowledge of cognition is broken down:

Knowledge of self

- This refers to the factors which will impact on an individual's performance during a task, and is specifically in relation to the cognition that we can draw on to complete the task, including the knowledge that we have that is required by the task.
- Examples of knowledge of self can include:
  - 'I do not know any key dates in relation to the Second World War.'
  - 'I am confident about the stages of waterfall formation.'
  - 'I can recall only two alternative shading techniques, but I know that there are more that I should be aware of in order to complete this task successfully.'

Knowledge of strategies

- This refers to our knowledge of alternative strategies that could be used to attempt and/or complete a task or problem, as well as a firm understanding of the correct stages to work through to successfully utilise a strategy.
- Examples of knowledge of strategies include:
  - 'The first step is x, the second step is y.'
  - 'I am going to use strategy w for this task, because …'
  - 'I do not think that strategy y would be appropriate for this task, because …'

Knowledge of task

- This refers to our comprehension of the task that has been given to us, including what must be included in any answer.
- Examples of knowledge of task include:
  - 'The task requires me to include …'
  - 'The questions suggest that I need to provide an answer in format x.'

Now, let us consider how regulation of cognition is broken down:

Planning

- This refers to the approaches that can be taken to plan for a task.
- Examples of this include:
    o What is the task requiring of me?
    o What strategies do I have available to me to attempt this task?
    o What content do I need to include within any answer or solution?
    o What layout does my answer need to take?

Monitoring

- This refers to the consistent evaluation of a solution or answer during its completion, to ensure that it is still in line with the plan produced and the task criteria laid out. The purpose of monitoring is to ensure that any changes to approach or changes to content already included within the answer are made before the final solution or answer is produced.
- Examples of this include:
    o 'How long do I have left to complete this task?'
    o 'Have I met all of the task criteria in my answer so far?'
    o 'Is the strategy or approach that I am taking to this task working? Am I moving towards a sensible answer or solution?'

Evaluation

- This refers to the conclusions drawn once an activity has been completed in order to review performance against the success criteria of the said activity.
- Examples of this include:
    o 'Did I successfully meet the task criteria that were outlined?'
    o 'Did the approach that I used for this activity work successfully? How do I know?'
    o 'How would I go about this task if I were to repeat it now?'

Translating Metacognitive Abilities

Though the metacognitive theory and how this is broken down into different areas should now be clear, it is important to understand how metacognitive abilities reside within us and get developed. The first crucial point here is on our ability to translate metacognitive abilities from one area to another.

In short, metacognitive abilities cannot be transferred from one area to another. Let us reconsider the definition of metacognition, which is the higher-order thinking of a cognitive action. Therefore, the 'meta' is linked to the 'cognition'. Where the cognition

varies, so does the 'meta' aspect. Not only does this mean that the metacognitive skills that a student may have mastered within, for example, English may not transfer to mathematics, it also means that they may not transfer from one topic to another topic, for example from poem interpretations to persuasive writing. This is because cognition is not just subject specific, but it is also topic specific.

Unfortunately, this raises a huge issue for us. This means that we cannot ever presume that a student's previous metacognitive strengths will be translated from one topic to the next, and therefore we would need to assess these abilities once again. However, there is a light at the end of the tunnel. Though the meta varies on the cognition, many of the metacognitive approaches that we need students to be aware of and utilise do not vary by cognition, and so, although these metacognitive skills may not always be at the same level for all topics, they will still be there. In effect, students will not be resetting to 'zero' metacognitive skill at the beginning of each topic. Let us take the example of evaluation. A strong metacognitive practitioner will be aware that they need to review their practice at the end of each task or activity that they complete. This may involve analysing the effectiveness and speed of the strategy used, reviewing their comprehension of the task versus a mark scheme and the reconsideration of knowledge of self. These are approaches that this strong metacognitive practitioner would take regardless of the cognition. Yes, there may be more specific and alternative questions that need to be asked that vary with the cognition, but there will always be a base level of effective 'meta' practice that can be drawn upon regardless of the topic area. So, how does this impact on us? We need to train students up metacognitively, so that they hold strong metacognitive approaches regardless. However, with each new topic, we need to assess and develop each student's metacognition within that topic area specifically, to ensure that students have both the general and specific metacognitive approaches that they require to be successful.

Metacognitive Levels

When reviewing metacognitive abilities of either ourselves or our learners, it is useful to have a framework within which to judge. In-depth assessments of student metacognitive abilities are highly complex things, which are not required for successful metacognitive implementation at a teacher level. However, it is useful for us to be able to provide a snapshot of where students are with their metacognitive abilities, which is where Perkins' (1992) 'levels of metacognition' provide us with the perfect framework. Perkins defines four levels – tacit, aware, strategic and reflective – which can be defined as below:

Tacit – students are going through the cognitive processes, but they are not aware/conscious of this and no metacognitive thought is being actively considered.

Aware – students begin to become aware of their cognitive evaluation, but this is still fairly muddled and disorganised (i.e. there is not a strategic metacognitive approach occurring, merely the beginnings of metacognitive thought).

Strategic – students are considering their metacognition on a more regular basis, in a more organised manner, using implicit strategies.

Reflective – students are consistently reflecting upon their own practice, not just following the completion of a cognitive action, but also during (monitoring). Metacognitive thoughts are conscious, organised and frequent.

Unfortunately, most students will be towards the tacit side of this scale (or sometimes it seems like they are not even here, where cognitive actions are not taking place). Though this may seem a depressing thought – students are so metacognitively poor generally – it does of course mean that there is more opportunity for us to add positive impact to students' learning and development. The more that they need to improve their metacognition, the more that we will be able to help them.

The Rationale for Metacognition

The purpose of this section is to present to you the best evidence and research that is out there on metacognition to prove to you that it is just as beneficial as I believe it is. Hopefully, the evidence that is shown below will give you the confidence that this really is something that is worth investing in, rather than some new dud that will disappear within a few years, or a wishy-washy theory which does not really apply to the classroom and should be ignored.
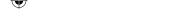
In order to make this evidence as clear as possible, findings from different research papers will be summarised, presenting you with the key headlines from some of the most significant papers on metacognition over the previous century. There will also be summaries of comments from the Education Endowment Foundation (EEF) and the Office for Standards in Education (Ofsted), both of whom are very supportive of the benefits of developing teachers' and schools' metacognitive practices.

EEF

The EEF is the go-to place for high-quality summaries on educational theories, including that on metacognition. In 2018, the EEF published a superbly accessible report on metacognition, produced after years of literature reviews by academics far cleverer than me! What you may already know about EEF reports is that they provide a numerical value for the impact of implementing a certain policy or pedagogical practices, in terms of months. Though I take these values with a pinch of salt (quite how a new pedagogical approach will lead to 'x' months improvements, I am not sure), this measure of months does provide us with a way to compare the relative impact of different interventions. At the time of writing, the EEF does not have a pedagogical approach or intervention that is *more* effective than metacognition, which has an improvement rating of seven months.

Furthermore, the EEF consider this judgement to be 'four padlocks', which in layman's terms means that the evidence is sound. This is later backed up by a 2020 evidence report, again by the EEF, which goes through the literature over the course of 60-plus pages, again concluding that the benefits of metacognitive practice are significant.

Ofsted

Over recent years, Ofsted have made the move towards being more evidence informed. Therefore, it is unsurprising to find out that they consider metacognitive practice as something that teaching professionals should be aware of and be developing. In their 2019 overview of research document, which details different high-quality and research-proven pedagogies staff should be encountering and developing during staff training, metacognition is one of those areas. Of course, we should not just do things in our school because they are what Ofsted say we should do. However, when we have a teaching and learning strategy that has such strong evidence on its positive impacts, *and* Ofsted details how metacognition should be a pedagogy covered by a successful continuous professional development (CPD) programme, then it really is a win–win situation.

Kuhn (1989)

Kuhn has completed significant quantities of research around the development of metacognition, including particularly interesting research around the ages that students can acquire metacognitive skills. Her 1989 research reached the conclusion that the metacognitive development of individuals between their early teenage years and adulthood is either only very slightly improved, or no change has been recorded. Equally, this research found that individuals who were in educational settings developed their own metacognitive abilities at a faster rate than those who were not in educational settings (or even that those in educational settings improved their metacognitive skills whilst those not in educational did not improve their metacognitive skills at all). Two clear conclusions can be drawn out here. Firstly, education is the gateway to drive metacognitive development – i.e. it is our job. Secondly, this research shows that were we just to leave metacognition to develop on its own, this development is either very slow or non-existent. This, therefore, is more evidence that points towards us, at the coal-face of education, as being the ones who need to support student metacognitive development.

Callan et al. (2016)

The paper explored the implications of social groupings, and how this can contribute to levels of metacognitive skill. Within this research, it was found that white British students used metacognitive strategies fewer than *any* other grouping of students based upon their ethnicity. Of course, not all UK secondary schools are majority white British; however, the majority of UK secondary school students *are* white British.

This therefore provides a situation where the majority of schools contain a majority of students from a grouping where metacognitive strategies are used more infrequently than any other group of students. If we consider the silver lining on this, however, it is once again that this provides us with the opportunity to provide more 'added value' for each student.

Willingham (2011)

In his summary on metacognition, Willingham provides an extremely compelling case for the use of the theory in schools. Willingham details in this research that students who have higher self-regulatory abilities (recalling that metacognition is a part of self-regulation) have improved school readiness, have higher predicted reading and maths proficiency, and also have a reduced likelihood of expulsion (probably due to the other factors detailed). So, in short, those with metacognition skills will be better at the two gateway skills required for all subjects – reading and mathematics.

Teong (2003)

In this study, the ability of students to problem solve (including tackling and completing problem solving) was assessed. Teong found that 'novice' problem solvers lacked metacognitive skills including the ability to monitor their work, assess the work that they had completed and review the cognitive strategies that they had utilised to attempt the problem. Within the study, students were trained up with only *one* metacognitive strategy. Following the cementing of this strategy in student practice, students were reassessed, and were shown to have outperformed students who did not receive the metacognitive training (i.e. it was the metacognitive training that supported the students' improved outcomes). Equally, and importantly for our own classroom practice, the research showed that low prior attainment (LPA) students also improved their own metacognitive abilities within this training, leading to more regulated answers. This provides crucial evidence in showing that metacognition can be utilised with all students, and not just the more able or 'cognitively advanced'.

Toth et al. (2000); Zohar and Ben-David (2008); Ben-David and Zohar (2009)

These three separate studies all provided similar impacts to each other, and similarly positive outcomes to the work by Teong (2003). In each of these studies, students developed a metacognitive area, in these scenarios named meta-strategic knowledge (MSK). The focus of MSK is to choose the most appropriate strategy for a given task or problem. This intervention led to superb outcomes, with students significantly improving their strategic and meta-strategic thinking. These findings were also true for LPA students, as well as high prior attaining (HPA) students.

Mevarech and Kramarski (1997); Mevarech (1999); Kramarski et al. (2002); Mevarech and Amrany (2008)

You will begin to notice a certain theme with the references within this book. Many references are in relation to work done by the remarkable academic Mevarech. The work, often complemented by Kramarski, provides further insights into the benefits of metacognitive instruction. Focusing on problem solving, in particular in the field of mathematics, each of these studies concluded that (mathematical) problem solving was significantly improved following the roll-out of tweaked teacher delivery. This tweaked teacher delivery included a focus on a metacognition, unsurprisingly, and had wonderful impacts on students. These studies found that LPA, HPA and middle prior attainers (MPA) all made progress due to this type of metacognitive teaching. Moreover, these findings were repeated by Onu et al. (2012), showing they work for academics other than Mevarech, too.

The rationale for metacognition – real-life practice

As well as the academia providing the evidence we need to implement metacognition in our schools, there are also real-life case studies that provide us with evidence, too. Below, Rachel Cliffe describes the metacognitive project that she ran and the positive outcomes it achieved:

> As part of the Chartered Teacher qualification, I undertook a research project in 2021 which evaluated the use of a metacognitive exam question grid with GCSE History students. The aim was to evaluate the impact of the grid on Year 9 students' assessment performance and perceptions of performance using a sample from a research and control group. The data was measured using a baseline and end of project assessment and a questionnaire to examine perceptions. The sample students were chosen using a ratified random sample approach which matched their ability across the research and control group. The decision to use a sample was due to the ability of the groups – a direct comparison would not have been effective as one group had a greater number of higher-prior attaining (HPA) students. It must be noted that both groups are taught by myself and the only difference in lessons across the project was the metacognitive grid (and a fire drill).

> The project found that across the sample of 12 students, the HPA students in the research group using the grid made greater progress between the baseline and end of project assessment than the HPA students in the control group. Furthermore, the Likert quantitative data suggested that the metacognition grid in the research group had a positive impact on students' perceptions of their exam performance and that they felt more confident with structuring exam questions, their progress with GCSE exam questions and were more aware of

their areas to improve for each exam question style. The most significant gap was an awareness of how to improve 10-mark exam questions with the average research group sample (6 students) score of 4.2 compared to the control group sample (6 students) of 3.5 – with 5 being the highest rating. Although the sample was small, the results of the project suggest that the metacognitive exam question grid had a positive impact on the students' perceptions of performance and progress across a short period of time. The next steps are to embed the grid over a longer period of time across both groups and examine the articulation of metacognition and the impact of socioeconomic status on metacognition.

Julie Copping has also conducted metacognitive research, in particular looking at students' increased progress following effective metacognitive questioning (see case study below).

Metacognitive questioning in religious education (RE)

At my college, we have formed a dynamic learning community. Teachers are provided with the right support, time and training in small coaching groups to complete a research project which will develop their practice. This year our focus has been *feedback and metacognition*.

Over the last academic year, I have been researching how effective metacognitive questioning can improve students' ability to self-regulate their learning and make better progress.

Throughout the year I have prompted students to think more deeply about their work. The results have been very rewarding. A poster of key questions was produced. It has been reviewed and adapted throughout the year following a continuous cycle of formative feedback, summative assessments and student feedback.

Students have focussed on the skills of describe, explain and evaluate in every unit. This is to develop their application of the skills and understand how they are transferable across each unit. The skills ladder outlines how they can progress the skills from Years 7–9.

Below is an example from a Year 7 'explain' task:

Baseline autumn term 'explain' answer

Q: 'Explain how the Church unites the Christian community and the five pillars unite the Muslim community.'

A: 'The five pillars unite Muslims because it is a way to show that they are all Muslims and they all go through the same thing. The five pillars are made to show that they all follow Allah. The Church unites Christians because they all believe in the same god and pray to the same person. The thing that makes them all Christians is the god they believe in. All of Christians pray and worship and change their lifestyles to be a Christian. All Muslims worship Allah and Muhammad is his messenger. The five pillars are rules to follow that they all do.'

The answer demonstrates some surface-level knowledge but lacks depth and does not follow the expected structure of an 'explain' answer. When she received her feedback and looked again at her answer, she made the following reflections:

> I would have liked to achieve higher than skill 5, I was hoping for a 7 or 8. I needed to stop going on and get to the point. I know how to do this now. I can see how to improve. I should have included more facts and key words in my answer too.

Summative assessment spring term 'explain' answer

Q: 'Explain how a Hindu may perform their dharma.'

A: 'Dharma means duty and it is a Hindu's duty to fulfil their dharma throughout their life. To follow dharma, a Hindu must live out and follow the dharma that matches the lives they are given. For example, in the caste system, you start off low down; if you follow your duties, you will be reincarnated higher up the caste system. If you are in the Sudra caste you will do a hard-working manual job. If you are born into the warrior caste you will fight to protect others.

'Doing your dharma is important to a Hindu because if you do your dharma, you will get good karma and escape samsara (the circle of life and death). Hindus follow dharma in the same way that Muslims follow the five pillars of Islam. Hindus work towards escaping samsara and achieving Moksha.'

As you can see, there has been clear progress. She is attempting to make a point, provide examples and explain their importance. She is also using more key words. Overall, her answer shows more depth of knowledge. She was able to reflect on her work and explain what she would need to do to move up the skills ladder. What was particularly pleasing was the way she was referring to the skills ladder throughout the assessment, ticking off skills and editing her work as she went. It was great to see this level of awareness, self-regulation, and motivation.

Julie Copping – Lead Practitioner for Teaching and Learning

Further Reading

The following weblinks will provide you with blogs and booklets that provide further readings on metacognitive theory:

Beach, P. T., Anderson, R.C., Jacovidis, J. N. and Chadwick, K. K. (2020). 'Making the Abstract Explicit: The Role of Metacognition in Teaching and Learning', Inflexion – Policy Paper, available at: https://www.inflexion.org/making-the-abstract-explicit-the-role-of-metacognition-in-teaching-and-learning/ (accessed 4 May 2022)

Bromley, M. (2018). 'In the Classroom: Metacognition Explained', SecEd, available at: www.sec-ed.co.uk/best-practice/in-the-classroom-metacognition-explained/ (accessed 4 May 2022)

Cambridge Assessment International Education (2019). 'Metacognition', Teaching & Learning Team, Cambridge International, available at: https://cambridge-community. org.uk/professional-development/gswmeta/index.html (accessed 4 May 2022)

EEF (2021). 'Metacognition and Self-Regulated Learning', Educational Endowment Foundation, available at: https://educationendowmentfoundation.org.uk/tools/ guidance-reports/metacognition-and-self-regulated-learning/ (accessed 4 May 2022)

EEF (2021). 'Metacognition and Self-Regulation', Educational Endowment Foundation, available at: https://educationendowmentfoundation.org.uk/evidence-summaries/ teaching-learning-toolkit/meta-cognition-and-self-regulation/ (accessed 4 May 2022)