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Metacognition and Self-Regulated Learning – Recent Perspectives for an International Context

Introduction

The UK, more specifically England, has been going through a 'cognitive learning revolution' in school-based pedagogy over the past ten years. Increasingly, the knowledge from cognitive psychology and neuroscience is altering the landscape in the English classroom. Like in anthropology and linguistics dating back to the 1960s, pedagogy in England has experienced a cognitive turn. At the heart of this turn has been the growing implementation of a substantial body of research from cognitive psychology and neuroscience in the role of learning. One significant area is a growing understanding of the application in learning about the uses of theories of metacognition and self-regulated learning. Put briefly, learning how to learn.

Understanding the concepts of metacognition and self-regulated learning is vital for teachers. However, how implementing effective metacognitive and self-regulation strategies for learners in the classroom is just as important. In this paper, I set out some of the most important practical applications in this area based on research-based guidance from the UK and cognitive neuroscience findings on metacognition and self-regulated learning. Much of this research is now finding its way into the classroom in England, and it is hoped to be implemented globally as well.

What is metacognition and/or self-regulated learning?

Often these two terms are seen as labels for the same thing, and definitions of both are incredibly similar. For example, both terms are often captured in the phrases 'learning to learn', 'thinking about thinking', and, sometimes, 'critical thinking'. This is not a modern phenomenon and goes right back to the earliest philosophers who tackled the complexities of thinking about thinking. However, it is important to delineate between the two, and the most common way that is used is to use self-regulated learning as the 'umbrella term' for these concepts of learning how to learn. As such, a definition is given in the EEF guidance report on metacognition, and self-regulated learning (SRL) states that it is essentially "about the learners' ability to monitor, direct and review their learning" (Introduction, p.4).

For further clarification, the EEF guidance report defines self-regulated learning as:

Self-regulation is about the extent to which learners ...are aware of their strengths and weaknesses and the strategies they use to learn. It describes how they (learners) can motivate themselves to engage in learning and develop strategies to enhance their learning and improve. It will look different for learners of different ages and tasks, but teachers will recognize these characteristics in their most effective learners (EEF Report, 2018, 8).

This umbrella term of SRL is broken down into three core categories in the guidance report.

- Cognition
- Metacognition
- Motivation

These three components interact in significant and complex ways during the learning process. For metacognition to happen, a learner must possess cognitive abilities and strategies and the motivation to tackle problems that will be faced in the learning process. It is a 3-way process, with cognition at the core.

In *How We Learn*, Stanislas Dehaene also focuses closely on the concept of metacognition in his exploration of how humans learn. He explains metacognition as:

cognition over cognition: the set of higher-order cognitive systems that monitor our mental processes. According to the gap theory of curiosity, metacognitive systems must constantly supervise our learning, evaluating what we know and do not know, whether we are wrong or not and whether we are fast or slow. So on and so forth – metacognition encompasses everything we know about our minds. (my italics) (Dehaene, 2019, 193).

These are the basic theoretical concepts involved in the theory of self-regulated learning. However, it is the application of this knowledge about SRL and metacognition that is most important for teachers, and it is to this application that I will now turn.

Application in the classroom

The EEF Guidance Report outlines seven recommendations for implementing SRL in the classroom. The first sections of the guidance report clarified the understanding of the concept of metacognition. It is defined in the introduction of the guidance report as being "about the ways learners monitor and purposefully direct their learning" (EEF report, 2018, p.9). This is then illustrated by the use of a 'metacognitive cycle' diagram (p10), showing the dynamic links between planning, monitoring, and evaluation.

In the second section of the guidance report, the authors turn to the implementation of metacognitive strategies and propose a seven-step model for explicitly teaching metacognitive strategies, as illustrated below (EEF Guidance Report, 2018, 14):

- Activating prior knowledge
- Explicit strategy instruction
- Modelling of learned strategy
- Memorisation of strategy
- Guided practice
- Independent practice
- Structured reflection

At the end of the report's second section, there is an essential addition regarding a common misconception. Here the authors identify the misconception as "metacognition is a general skill that can be separated from subject knowledge" (EEF Report, 2018, 15). This is a crucial section of the report that is commonly overlooked or disregarded. The authors state in this section, "The clue is in the word: without cognition, there is no metacognition" (p.15, my italics).

The third section of the guidance report turns to the critical concept of modeling your thinking to help learners develop their metacognitive and cognitive skills. In this section, an instrumental concept is used to illustrate this approach, namely the idea of 'the master and the apprentice'. The authors state in the introduction to this section:

All teachers use modelling to some extent. The most effective teachers – like master artisans working with their novice apprentices – are aware of their expertise and how to reveal their skills to learners and assess whether their pupils have understood them; they are metacognitive about their teaching. (my italics, EEF Report, 2018, 16). In the 4th section, the concept of the challenge as key to developing self-regulation is detailed. The author's state:

A successful pupil will regularly engage in metacognitive reflection, asking self-reflective questions such as (EEF Report, 2018, 18):

- Knowledge of task questions
- Knowledge of self questions
- Knowledge of strategies questions

This section then details the importance of motivation as one of the essential components of SRL. Recognition of self-efficacy and individual motivation is seen as essential when setting suitably challenging work as stated:

In motivating learners to persevere at challenging tasks, it is essential to reward effort rather than absolute levels of achievement, give feedback about personal progress, and avoid social comparison (EEF Report, 2018, p18).

This section then proceeds to address the critical link between self-regulation and cognitive load theory developed by John Sweller (1988). The report summarises Sweller's cognitive load theory as:

Cognitive Load Theory is the amount of information our working memory can hold at any time. Unfortunately, the capacity for working memory is limited. We can, however, support learners to maximize their working memory with a range of metacognitive strategies. (EEF Report, 2018, 19).

The final section of this overall section has some significant guidance about understanding the consequences of cognitive load on self-regulation and metacognition. Two consequences are highlighted:

Where we can draw on existing knowledge from the long-term memory, we increase (cognitive) capacity- this is one reason why knowledge matters and why learners need to be taught first to try and activate prior knowledge.

Second, we must ensure that learning activities do not overburden working memory. (EEF Report, 2018, 19).

In the fifth section, the report refers to research by Robin Alexander (2017) and his work on dialogic teaching, where the importance of 'learning talk' and 'teaching talk' is highlighted as the two most relevant repertoires for developing metacognitive skills.' (EEF Report, 2018, p21).

The sixth section focuses on the explicit teaching of pupils how to organize and manage their learning independently. Here the report refers to research by Zimmerman (2010) that looked at how "effective learners use a number of strategies to help them learn well independently." (Zimmerman, 2010, 23). They then detail these as including:

- Setting specific short-term goals
- Adopting powerful strategies for attaining the goals
- Monitoring performance for signs of progress
- Restructuring one's physical and social context to make it compatible with one's goals
- Managing time-use efficiently
- Self-evaluating one's methods

Attributing causation to results and adapting future methods (EEF Report, 2018, 23).

The final section of the guidance report looks at the more strategic level of how to support schools with how they can implement metacognition and self-regulated learning successfully. Four key recommendations are made (EEF Report, 2018, 26):

- Sufficient time...to train teachers and allow them to practice and embed new methods.
- High-quality professional development...with the particular challenge of integrating metacognition into subject-specific domains
- Teachers must be provided with high-quality tools (textbooks and resources) and support such as ongoing coaching and mentoring.
- Support from school senior leadership.

Active engagement – the findings of neuroscience

Stanislas Dehaene in *How We Learn* is also profoundly concerned with the practical application of the research into metacognition with what can be transferred to the classroom. One of his central 'pillars of learning' is active engagement. At the heart of this notion of active engagement is the human capacity for curiosity. Dehaene links metacognition with curiosity. He states, "...in order for children to

be curious, they must be aware of what they do not yet know." (Dehaene, 2109, 193). He refers to the research of infants (aged one and even earlier) who understand that there are things that they do not know and comes to a conclusion that "this is the early manifestation of epistemic curiosity: the irresistible desire to know." (Dehaene, 2019, 193).

Dehaene applies this fundamental desire to know as having essential considerations in the classroom by proposing several vital hypotheses. His first hypothesis is that "children may lose their curiosity because they lack cognitive stimulation tailored to their needs." (Dehaene, 2019, 194). He explains that at both the upper and lower ends of the academic spectrum, "schools must continually provide children's supercomputing brains with stimulants that match their intelligence." (Dehaene, 2019, 194). He warns that advanced students often "lack stimulation: after a few months, their curiosity fades, and they no longer expect much from school, because their metacognition system has learned that, unfortunately, they are unlikely to learn much more." (Dehaene, 2019, 194). This is equally the case, he explains, for students at the other end of the intelligence spectrum. He states, "Metacognition remains the culprit: after a while they (lower attaining students) no longer have any reason to be curious, because they have learned...that they do not succeed in learning." (Dehaene, 2019, 194).

Dehaene's second hypothesis linked to metacognition is that "A child's appetite for discovery can be ruined by an overly rigid pedagogical strategy." (Dehaene, 2019, 195). He details the dangers of punishing any attempt at exploration by a student and concludes that "Repeated punishment leads to learned helplessness, a kind of physical and mental paralysis associated with stress and anxiety, which has been shown to inhibit learning in animals." (Dehaene, 2019, 195).

Dehaene's work on learning and metacognition is essential because he moves beyond theory to provide solutions for the classroom. For example, his solution to the problem of the loss of curiosity in learning is admirably clear and expressed:

The solution? Most teachers already know it. It is simply a matter of rewarding curiosity instead of punishing it: encouraging questions (however imperfect they may be), asking children to give presentations on subjects they love, and rewarding them for taking the initiative. (Dehaene, 2019, 195).

Dehaene warns that "there is a danger that this solution can fall into the older pedagogical methods of encouraging purely discovery-based learning." (Dehaene, 2019, 197). However, he is apparently in his concluding remarks about the link between metacognition and active engagement, stating that "The ideal scenario is to offer the guidance of a structured pedagogy while encouraging children's creativity by letting them know that there are still a thousand things to discover." (Dehaene, 2019, 197).

Conclusions

There has been considerable research undertaken in the field of metacognition/self-regulated learning, as is shown clearly in the EEF report and through the work of Stanislas Dehaene outlined here. Moving the research into the application in the classroom is a challenge many teachers and schools currently undertake in England. It can be further shared and developed globally. Research findings appear favorable for the role of metacognition and self-regulated learning in improving learning. A critical point that is made explicit by Tom Sherrington, a leading figure in international education and pedagogy, in his discussion of the EEF guidance report, and with which I agree, is that "all of this (metacognition/SRL) is located in subject specific content. It is not generic at any stage. Metacognition is something you model while teaching maths, science, English, art or French." (Sherrington, 2017). This is hugely significant.

The whole area and concept of SRL can seem extremely overwhelming to already overworked teachers. However, learning about and starting to apply the findings of cognitive neuroscience, as detailed by cognitive neuroscientists such as Stanislas Dehaene, and research-informed guidance such as that published by the EEF, can only help in the pursuit of knowledge about how we learn.

In appreciating these important core areas related to self-regulated learning and metacognition, and with adequately supported teacher development and resourcing, teachers across the globe and all pedagogic domains will have a more significant opportunity to develop successful approaches in this fundamental approach to learning. As L Rafael Reif, president of MIT stated so well, "If we don't know how we learn, how on earth do we know how to teach?" (March 23, 2017, in Dehaene, 2019, foreword).

References

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