Why Didn't I Think of That? Teachers' Influence on Students' Metcognitive Knowledge of How to Help Students Acquire Metacognitive Abilities

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PREFACE

As I sit here thinking about how to articulate just how important metacognition is, I am engaging in metacognition. My intention is to share metacognitive theory in a useful way to guide and inform educational practice. I invite the reader to ask reflective questions such as "What is the author trying to say?", or "How does this connect to what I already know?", and to consider the content in terms of how to build connections to personal practice. The challenge for teachers is to understand how metacognition can be assessed and developed in our classrooms. Teachers need to identify and implement what works well in developing students' metacognitive skills. We cannot assume that students have the skills and strategies for effective thinking or that they use these skills in their learning. This article makes explicit how teachers can help develop students' metacognitive skills.

ABSTRACT

In this study, qualitative evidence is collected – through classroom observations and teacher and student interviews – to study the effect of metacognition and the interaction between students' observable cognitive behaviour and the instructional task. This qualitative data is analysed to identify what factors support and improve students' metacognition. The evidence is then used to determine how teachers can help students acquire metacognitive abilities. The evidence suggests that explicit teaching is required for students to acquire and apply metacognitive processes.

Several methods for enhancing metacognition are recommended. Among these is the use of student learning/thinking logs (Calkins, 1986), as they provide information about how students are learning and provide a focus for teaching practice. The pedagogical implications of this research suggest that explicitly teaching metacognitive strategies to students should improve instructional effectiveness.

This study also explores the literature regarding metacognitive teaching and learning and the effects of increased knowledge on this subject.

It focuses on the complex mechanisms by which teaching and learning occur, specifically examining the relationship between research about metacognitive practice and the processes of learning and cognition that improve students' performance.

Research paper

INTRODUCTION

This study developed in response to classroom observations where teachers were observed using a variety of thinking tools but not often encouraging students to engage in metacognitive thinking to support further learning. When students fail to differentiate what they know and do not know in a particular academic domain, they are not engaged in more advanced metacognition: they are not evaluating their own learning or employing more efficient learning and studying techniques.

This study highlights the importance of knowledge about metacognition, and demonstrates how teachers can improve student learning through focused attention and training. Metacognition typically has been assessed by observations of students' performance, interviews with students and teachers, or observational protocols (Metcalfe & Shimamura, 1994; Hacker, Dunlosky & Graesser, 1998). It is difficult to assess the validity of these methods to assess metacognition (Schraw & Impara, 2000) and this study acknowledges this.

THEORY AND RESEARCH: METACOGNITION IN EDUCATION

The New Zealand Curriculum (2007) highlights thinking and using metacognitive processes as one of the five key competencies that should be woven into every learning area. Effective teachers support student learning by teaching content as well as strategies for systematic and accurate processing of information.

There are a range of constructs and definitions of metacognition. Metacognition is widely considered to be the ability to understand and monitor one's

own thoughts; having knowledge and awareness of cognitive processes, and control of cognitive processes (Flavell, 1979; Brown,1980; Winnie & Hadwin, 1998; Williams & Atkins, 2009). Metacognition is simply 'thinking about thinking' and is a key element in the transfer of learning. However, there is some confusion about the meaning of metacognition and how metacognitive strategies can assist teachers teach successfully. It is the self-awareness teachers and students use to think, to evaluate their teaching and learning needs, to generate strategies to meet their needs, and to implement those strategies as agents of their own thinking (Kluwe, 1982).

Metacognition is prone to errors (Thiede, Anderson & Therriault, 2003) with several factors influencing metacognitive accuracy. The instructional practice of metacognition is part of effective teaching, the basis of which should be an understanding of cognitive theory. There are both biological and social determinants of cognitive development that influence and alter learning. The importance of biology as a determinant of thinking, learning and performance is more likely to be apparent when something goes wrong. By observing classroom behaviour, the various social determinants of learning can be identified (Bandura, 1989). Many different types of experiences and input are necessary during the development of cognitive skills. These include opportunities to discover skills required for learning, as well as applying those skills. Teachers must identify *what* skills need to be taught and *how* to teach them; students need to self-regulate their learning (Butler & Winnie, 1995) by understanding *which* strategies to use and *when*.

In order to teach thinking skills, teachers need to have a broad understanding of these processes, and how they can be developed in students. There is currently little evidence that teachers are explicitly or consistently metacognitive (Duffy et al., 1987). Rogoff, Matusov, and White (1996) suggest the theoretical bases for teaching approaches are often under-articulated, and inconsistent in their application.

THE STUDY

This study focused on two key areas relating to what classroom-based approaches to developing metacognitive skills currently exist and what metacognitive skills students were able to identify at the Year 9 level. The study was conducted in two co-educational secondary schools in North London. The eight teachers involved in the study were interviewed; ten students from each class were randomly selected and interviewed.

What classroom-based approaches to developing metacognitive skills currently exist for students in Year 9?

A minimum of three observations was carried out in each of the core curriculum classes of English, Mathematics, Geography and History in two Year 9 secondary schools. Classroom observations indicated that many students did not carry out higher-level thinking processes independently. It was sometimes difficult to understand exactly what teachers were doing to engage student thinking and why. In the classes where students were given greater support to think and understand, they did significantly better.

Other research studies (Beck, Omanson & McKeown, 1982; Williams & Atkins, 2009) report similar findings, confirming that it can be very difficult to access teacher thinking. Teachers must be skilful and strategic in their instruction, responding flexibly to students' needs through metacognition. However, this type of teaching is not always easy. Developing the metacognitive thought of teachers does not happen automatically in complex learning environments. As teachers become better at developing metacognition, they realise that it can be as simple as thinking about what the lesson needs to include to be effective. Deciding how to alter teaching and learning in ways that shift student understandings and skills (Lin, Schwartz & Hatano, 2005) has been described as "thinking on one's feet", teachers' complex mental activity and "adaptive metacognition" (Carter, 1990).

The following approaches for developing metacognitive thinking were evident in some classes. However, it is sometimes difficult to discern exactly what makes a particular strategy effective, or what activities best support a particular strategy (Beck, Omanson & McKeown, 1982).

- Planning and describing the learning objective explicitly.
- Articulating what students are expected to learn and be able to do independently in relation to the academic content.
- Explicitly stating the cognitive processing and skills that are necessary to complete the task.
- Clarifying learning goals and skills the students are practising.
- Making links to prior learning through questioning - "can someone explain what we did when....".
- Rhetorical questioning.

- Scaffolding understanding -breaking the learning into parts.
- 'What went well' and 'even better if….'.

While teacher comments demonstrated their knowledge of metacognition and of explicit instructional activities that promote understanding and monitor students' thinking, there was little evidence of these strategies being used consistently during lessons. A sample of teacher interview responses to develop metacognition included:

- 'Teasing thinking out of students' through questioning, getting students to clarify, predict and summarise.
- Modelling how to think, 'thinking out loud'.
- Having background knowledge of students.
- Using assessment information as well as self- and peer-assessment.
- Guiding students with less teacher involvement.
- Use of acronyms and mnemonics.
- Graphic organisers such as a spidergram.
- Making links to prior knowledge.

When teachers focus on modelling and teaching metacognition, it has a positive effect on student achievement. An example of this was when a teacher engaged the students to think about the previous day's learning to 'explore Macbeth's feelings in Act 2, Scene 1 soliloquy'. The teacher asked the students to think about what they had done to help themselves achieve this objective. The teacher used an acronym PEE (Point, Evidence, Explanation) to document students' understanding of the task. The students were asked to explain their self- and peer-assessment against set criteria, providing them with the opportunity to think about the self- and the learning-task - in a social context. Meyer and Turner (2006) identified three theories that highlight the links between emotions and learning: academic risk-taking, flow, and goals. The development of a supportive social environment is essential for metacognition, as we develop students' knowledge about the self as a learner. Reflective learning journals with prompts such as 'What skills did I practice?' 'What helped me to understand?' 'What do I need to do next time?' can be useful. Reflective journals can be combined with a schedule in their diary with a 'traffic light' code: green, if the target level was achieved; amber, if the explanation was missing, and red, if both evidence and explanation were missing. The thoughtful actions of the teacher impacted positively on student achievement.

Other aspects of effective teaching were observed when teachers work to develop and enhance metacognitive thinking. Highly structured activities, explicit goals of improving performance, and scaffolding understanding through thoughtful questioning and clarifying all appeared to motivate the students to practise.

When teachers knew the topic well and connected positively with students by using a firm, fair, friendly approach to the teaching, maintained high expectations, and catered to the diversity of abilities in the classroom, then students responded positively in their learning, achievement and behaviour. These connections between learning and affective knowledge have received increasing attention in psychology and education (Carver, 2004; Meyer & Turner, 2006). The emotional state of the learner impacts their metacognitive state: for example, if the student perceives the work as too difficult, it can bring out a negative emotion such as frustration or a positive emotion if the task is perceived as a challenge.

Although teachers explained that 'thinking aloud' was an effective strategy, the application of this was not always evident in classroom observations. 'Thinking aloud,' as discussed by Vygotsky (1978), promotes self-regulated learning and encourages students to internalise information. This process encourages students to think about their own knowledge, beliefs, motivation and cognitive processing to develop and sustain successful learning (Butler & Winnie, 1995). The expectation is that students think about what and how they learn and how this is applied to new learning, constantly asking, "How am I going?" and "What do I need to do to improve this?"(Schofield, 2004).

What are the metacognitive skills that students' are able to identify at Year 9?

Students were interviewed in pairs, small groups and also with class-wide question sheets about declarative knowledge (knowing what), procedural knowledge (knowing how they think about how they learn), and conditional knowledge (knowing when and why). When interviewed, several students stated that they often completed a task without really knowing if they had understood it and without being able to do anything about that.

Engaging in successful learning requires metacognitive capabilities; it is about knowing what you know and don't know. Several students were unaware of, or could not express, what they needed to do or what gaps might exist in their knowledge. Building metacognitive knowledge of oneself as a positive learner develops self-efficacy. There is extensive research on the significant

positive correlations between students' academic achievement and self-efficacy beliefs (Pajares, 1996; Schunk,1984). Self-efficacy develops the knowledge and capabilities needed to understand and regulate the processes related to effective metacognition.

Students made comments such as:

> "The hardest kind of thinking was evaluating my own or other peoples' work because I don't know what I'm actually evaluating."

> "We couldn't spot mistakes in each others' work because we didn't know what we were looking for."

> "I don't know what I could do to improve my understanding."

These comments exemplify the importance of checking for student understanding of the task as well as the thinking required to achieve the task. Several students commented that when the teacher asks "Do you all understand?" or "Anyone need any help?", and people say "Yeah" and they don't even understand.

These types of questions are best avoided, as they do not provide information on true understanding of a task. A more effective strategy is having students paraphrase what the task is, the thinking required to complete the task, and their understanding in their own words.

Students commented on what teachers do, that helps them to think. They focused on the teaching principles that support improved outcomes for students, such as:

- Good teachers listen to you and explain what to do rather than just hand out sheets or tell you what to do.
- Teachers earn respect by listening to your opinion.
- When the teacher structures the lesson, for instance PowerPoint, two questions, review one question from last time.
- Giving us time to think about what we are learning; not five minutes at the end, at least 10 minutes.
- Giving us feedback about what we need to do rather than 'Good work'.
- When the teacher writes what we need to improve on rather than write 'Well done'. I'm doing the work right but it doesn't tell me what I need to do - it's lazy writing. 'Well done' means nothing.
- Being flexible, making the lesson fun, and the teacher is enthusiastic.

- Showing us that they like us, teachers that say "Hi" in corridors makes a difference.
- Talking in a quiet voice.

Students commented about their independent use of thinking strategies:

- Asking themselves questions about the topic/task.
- Thinking about what they already know about the learning objective.
- Using mnemonics and applying acronyms.

The true extent of metacognition is difficult to determine in this study; students may have knowledge and strategies they are unable to express in interviews. Students may also struggle to recognise thinking processes they engage in automatically, for example, students may apply spelling conventions to spelling words without realising what they are doing. As tasks become more difficult, students become more conscious of what they are doing and what they need to do using a metacognitive strategy.

The interviews with students identified that they had knowledge of metacognitive strategies and that their explanations were guided by metacognition. The extent to which they understood when and why to use the strategies was less apparent. Several previous studies have also failed to establish that metacognition has a strong relationship with strategy use or understanding (McNamara, 2007).

IMPLICATIONS OF THE STUDY AND STRATEGIES FOR PRACTICE

This study underscores the need for intensive, targeted research into the significance of metacognition. Investigating the impact of metacognitive strategy instruction would further determine how students apply problem-solving skills to learning tasks. Studies could explore how teachers become adept at, committed to, and supported in, strategy instruction; filtering this approach into schools could test whether cognitive processes are transferred to other more difficult or untried tasks.

Improving practice involves changing habits, not adding knowledge. Additionally, the hardest part is not getting new ideas into teacher's heads: it's getting the old ideas out. Future research could consider how to reduce demands on teachers while developing metacognitive skills. This requires teachers to balance the teaching of key

curriculum content with teaching students how to think (Mitchell, 2008).

No one strategy is always effective. Only by learning several strategies - some of which may be curriculum-specific - can teachers help students to become effective in using specific metacognitive strategies in specific situations (Baker, 2002). Teachers must also construct learning environments that support all students' metacognitive thinking through systems and strategies that help learners to implement strategies independently. Research on learning demonstrates that many students, particularly low-achieving students, have weak metacognitive processes and their learning is affected accordingly (Brown & Campione, 1996; Zohar & Dori, 2003).

Students need to plan for learning, think about the learning process as it is taking place, monitor, understand, and evaluate learning after an activity. Teaching metacognitive skills supports students to define the ways they learn. Learning procedures, such as using learning logs to record learning steps, provides opportunities for students to think about the purpose of learning, and what needs to happen in order to improve. Calkins (1986) stated 'No matter what the subject area, learning logs provide a forum and an occasion for learning' (p. 264). Learning logs support learning experiences: students think about what worked and what did not work, what their own role in the learning process was. Together, these reflections provide a framework for internalising thinking.

Teachers need to assess students' learning processes and a learning log is a tool to understand the mental processes students engage in as they read, write and problem solve (Carr 2002). The information provided in the log can be used for goal setting and monitoring understanding (Vaughn et al., 1998). Additionally, the use of a log supports student self-reflection and provides opportunities for students to become active in their own learning (Carr, 2002).

Within the processes mentioned, thinkers employ strategies such as identifying their goal, monitoring their progress and evaluating the evidence (Calkins, 1986). Supporting students to become more reflective about their own learning can be achieved within the cooperative learning model, when teachers structure classroom opportunities to optimise discussion amongst peers to assess their learning, such as discussing and recording 'what I did', 'how I did it', 'how the teacher helped me to think' and 'what I learnt'. Peer assessment of learning can provide an alternative strategy to more traditional learning frameworks.

Teachers who model metacognitive thinking in action, such as prompting students to do a metacognitive task (e.g. evaluating all the possible outcomes of an experiment that develops reflective thinking) also facilitate students to become more metacognitive (Schoenfeld, 1987).

Teaching students to monitor their performance as they are learning by thinking aloud can enhance students' learning about how to explore and inquire (Duffy et al, 1987; Mitchell, 2008) and assess their comprehension while they are on-task. Thinking aloud promotes active processing by way of bringing processes to conscious awareness (McKeown, Beck & Blake, 2009).

CONCLUSION

I hope that what I have observed and written about in this study has resonated with you and provided some new perspectives, approaches and practices in metacognitive teaching which can be used to think ahead, think during, and think retrospectively when developing positive habits of the mind.

Supporting students to think metacognitively is part of effective instruction, modelling, motivation, scaffolding and providing feedback. Teachers must be reflective about what they are doing as they teach, so that they can better evaluate how their instruction is affecting their students.

If we wish to influence educational policy, it will be necessary to establish that teachers' metacognitive actions positively impact student performance on national tests as well as on measures of higher order thinking more typically associated with metacognition (Duffy et al., 2009).

This study has implications for the role of the RTLB assisting teachers, through collaboration, to develop educational environments which improve outcomes for students by facilitating changes in teacher behaviour, empowering, and upskilling them with effective metacognitive teaching practices. RTLB should assist teachers to identify the degree of match between student behaviour, student learning needs and the instructional environment. A collaborative approach gives teachers more influence over change.

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DEDICATION

I dedicate this to Dr Don Brown, my mentor throughout my RTLB training and Masters degree. He has paved a great legacy in education and has been the most important influence in my teaching. I am grateful and privileged for the opportunity I had as a student to have been guided by Don, for his amazing skills and the way he challenged my thinking.

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Linda Schofield is an RTLB in the Oamaru area. Her extensive teaching background spans over 30 years. She conducted this research after the completion of her Master of Arts in Education and has a particular passion for improving the educational outcomes for students. Linda's work focuses on strengthening professional practice drawing from the best evidence available.

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