

An Overview: Metacognition in Education

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Abstract

Metacognition refers to “thinking about thinking” or our ability to know what we know, what we don’t know and how to regulate as well as control such thinking. This article seeks to give an overview of some issues related to metacognition, a construct which received a considerable attention on the part of teaching theoreticians and researchers. It starts with a brief introduction of metacognition and then gives an account of its various definitions and components. The differences between cognition and metacognition are also mentioned. It concludes with some ideas and research findings on the teachability of this construct in different fields of study, especially language education.

Keywords: *Metacognition, Metacognitive knowledge, Metacognitive regulation, Self-regulation, Learner autonomy*

1. Introduction

It is by no means easy to talk about metacognition, an apparently unproblematic thirteen-letter term, and its education, both due to the richness and heterogeneity of theoretical and methodological approaches and due to the vague and slippery nature of the metacognition construct. “Hardly does anyone question the reality or the importance of metacognition” (Schraw & Moshman, 1995, p. 351). Tobias et al. (1999 & 2009) argued that metacognition very probably is the most dynamically and actively researched cognitive process in areas of current developmental, instructional, and educational psychology. To put it simply, metacognition refers to “thinking about thinking” or our ability to know what we know and what we don’t know (Costa & Kallick, 2009; Livingston, 1997). In actuality, offering a definition of metacognition is much more complex than that and is not that simple. There are considerable debates over what exactly this umbrella term is. It has been considered as a fuzzy concept of multifarious definitions by many researchers (Flavell, 1981).

Beyond dispute, the seeds for research programs and development in metacognition were planted and begun to germinate by John Flavell, the pioneer of the field, who deserves great credit for highlighting the depth of his knowledge on metacognition in his landmark pioneering publications on the subject. Metacognition was characterized by Flavell as a “promising new area of investigation” (1979, p. 906). Thereafter, a multitude of empirical and theoretical researches have pursued an agenda on which metacognition was high. Although the term ‘metacognition’ has not been part of educational

psychologists’ lexicon and did not come into common use until the 1970s when it was introduced by the aforementioned psychologist. The concept has been around for as long as humans have been able to reflect on their own thinking.

Legitimate grounds exist to heartily endorse a large body of research undertaken on the subject in order to bring unchallenged supremacy of metacognition and give momentum to it as one of the bare essentials to successful learning. To start with, metacognition nurtures independent thinkers and lifelong learners who are able to grapple with new situations and learn how to learn and continue to learn throughout their lifespan in this hectic pace of life (Eggen & Kauchak, 1995; El-Koumy, 2004; Papaleontiou-Louca, 2003 & 2008; Pilling-Cormick & Garrison, 2007). In the second place, incorporation of metacognition into language teaching can instill a sense of duty and confidence into learners which enables them to self-direct their own learning (Garb, 2000). A necessary step is metacognitive awareness in moving towards learning to regulate learning (Williams & Burden, 1997). The last reason is that metacognition was validated to be central to effective language learning. It is worth emphasizing the point that there is continuing evidence that well-developed metacognitive strategies are the distinguishing quality between good and poor language learners (O’Malley et al., 1989; Gillette, 1990; Rubin, 2005). In the similar vein, Macaro (2001) adds:

Although it is the range and combinations of all strategies that ineffective learners lack, it is the metacognitive ... strategies which seem to be the strategy types most lacking in the arsenal of less successful learners.” (p. 269) Needless to say, sitting there cross-

legged and comfortably waiting hopefully and expecting confidently for learners to automatically “go meta” and self-regulate their own learning seems quite impossible and unrealistic. In a metaphorical sense, “Going meta” connotes becoming an audience for your own performance, that is to say, stepping back to see what you are doing, as though you were someone else actually witnessing it. Learning how to be mindful and manager of one’s own learning is not inherited, nor does it happen naturally and overnight, yet it necessitates specific instruction of basic metacognitive skills and strategies. The good news is that metacognitive skills are teachable and learnable as well to build up support for learners to better regulate their cognitive activities (Livingston, 1997; Shannon, 2008; Baer et al., 1994; Brown et al., 1983; Flavell, 1979a; Garner & Alexander, 1989; Borkowski et al., 1987; Bransford et al., 1986; Garner, 1990; Hascher & Oser, 1995). Needed is a big challenge in the howness of instilling and developing metacognition into students in order for helping students learn how to “go meta” concerning mental processes that are not visible directly to create virtuoso performance as learners in their learning experience. Sternberg (2009) contends that:

In the early days, metacognition was more of a curiosity and some psychologists wondered whether it was even a viable construct. Today, I think the question is not whether it is a viable construct, but rather, how it best can be understood, assessed, and developed [taught]. (P. ix)

Metacognition currently carves a unique and successful niche in the self-regulatory phylum and its instruction is a highly flexible and an indispensable approach to language education in that more proficient language learners are more metacognitive than less proficient language learners.

2. Origins and Development

Unquestionably, John Flavell, a developmental psychologist who is now considered to be as the father of the field, was the first one who introduced the term *metacognition* in the 1970s (1971, 1976, 1979). It is defined as “a critical analysis of thought,” or simply “thinking about thinking” or “cognition about cognition” (Wellman, 1985; Anderson, 2008; Livingston, 1997). Metacognition can concentrate on any facet of cognition, even metacognition itself (Dunlosky, et al, 2005; Nelson & Narens, 1994). Veenman et al. (2006) regard metacognition as “... a higher-order agent overlooking and governing the cognitive system, while simultaneously being part of it” (p. 5). In his model of cognitive monitoring, Flavell himself offers an early definition of ‘metacognition’ as:

One’s knowledge concerning one’s own cognitive processes and products or anything related to them (...) [and] refers, among other things, to the active monitoring and consequent regulation and orchestration of these

processes (...), usually in the service of some concrete goal or objective. (Flavell, 1976, p. 232)

What is clear from Flavell’s above account, the main constituents of metacognition are “*metacognitive knowledge* and *metacognitive experience or regulation*”. In addition, he established a link between metacognition and self-regulated learning by making use of the phrase “cognitive monitoring” (Griffith & Ruan, 2005, p. 3). According to Burke (2007), metacognitive skills are sometimes called “self-direction skills” (p. 151).

Based on the proposed model of cognitive monitoring, Flavell held a belief that a wide range of intellectual activities will be monitored by means of the actions and interactions among four basic elements: a) metacognitive knowledge, b) metacognitive experience, c) goals (or tasks), and d) actions (or strategies). *Metacognitive knowledge* refers to one’s knowledge or beliefs about person, task, and strategy variables. He has affirmed that metacognitive knowledge is not basically different from other kinds of knowledge in the long-term memory. *Metacognitive experiences* are the segments of this stored knowledge, metacognitive knowledge, that have entered to consciousness, that is, “any conscious cognitive or affective experiences that accompany and pertain to any intellectual enterprise” (Flavell, 1979, p. 906). Metacognitive experiences are very likely to take place in circumstances which requires a great deal of careful, highly ‘conscious thinking’. Metacognitive knowledge can be added, deleted, or revised through metacognitive experiences. The *goals or tasks* have to do with the actual objectives of a cognitive endeavor. And finally *actions or strategies*, as the name indicates, are some ways and techniques that may assist in reaching those goals. According to Flavell (1979), acquiring metacognitive strategies as well as cognitive ones is viable. To illustrate the point, Flavell makes some helpful cases of metacognition in real-life experiences

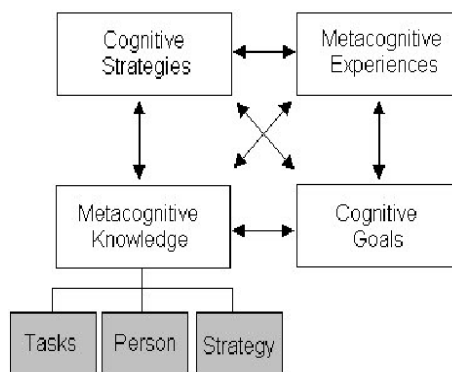


Figure 1: Flavell’s model of metacognition (1981, p. 40)

I am engaging in metacognition 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 a fact; (...) if I become aware that I am not sure what the experimenter really wants me to do; if I sense I had better make a note

of D because I may forget it; if I think to ask someone about E to see if I have it right. (Flavell, 1976, p. 232)

Most researchers have now conceptualized metacognition as including two fundamental elements or components referred to as *knowledge of cognition* and *regulation of cognition* (Jacobs & Paris, 1987; Schraw & Moshman, 1995; Schraw, 1998; Brown, 1987; McCormick, 2003; Harris et al., 2010; Williams & Atkins, 2009). Knowledge of cognition refers to knowledge and awareness of one's own cognition. Metacognitive knowledge is "potentially conscious and controllable" (Pressley et al., 1985, p. 4). Moreover, knowledge of cognition or metacognitive knowledge can be stable, usually stable, often fallible, and often late developing information which human as an independent thinker has about his own cognitive process (Baker & Brown, 1984; Garner, 1987; Brown, 1987).

Metacognitive knowledge has been presumably comprised of three distinct, but closely related, facets of knowledge: *declarative*, *procedural*, and *conditional* knowledge (McCormick, 2003; Paris et al., 1983; Harris et al., 2010). Successful coordination and application of these three types of metacognitive knowledge will surely leave its mark on academic development and performance which is heavily contingent upon metacognition (Alexander, 1997; Pressley & Harris, 2006).

Declarative knowledge involves knowledge, skills, and strategies essential for accomplishing a task successfully under various conditions (Hacker, 1998; Pressley & Harris, 2006; Zimmerman & Risemberg, 1997). In other words, it refers to knowing "about things" or "knowing what". Schraw and Moshman (1995) define it as "knowledge about oneself as a learner and about what factors influence one's performance" (p. 352). Flavell (1979) discriminated between kinds of declarative knowledge along the aspects of self or person, task, and strategies or actions.

Procedural knowledge refers to knowledge of how to apply procedures such as learning strategies or actions to make use of declarative knowledge and achieve goals (Harris et al, 2009; Harris et al, 2010; Schraw & Moshman, 1995; Schraw, 1998; McCormick, 2003). It pertains to knowing "how to do things" and "procedures" such as learning strategies. Skilled learners possess more automatic, accurate, and effective procedural knowledge than unskilled learners.

Finally, *conditional knowledge* is referred to as knowledge of when and why to apply various procedures, skills, and cognitive actions or strategies (McCormick, 2003; Schraw & Moshman, 1995; Schraw, 1998; Garner, 1990). Harris et al. (2010) define it as "knowing when, where, and why to use declarative knowledge as well as particular procedures or strategies (procedural knowledge), and is critical to effective use of strategies" (Harris et al., 2009, p.133). In the same way, Garner (1990) held that conditional knowledge is related to knowing when and why to use declarative and procedural

knowledge. It is appropriate to add that "[t]he conditional knowledge of successful learners makes them very facile and flexible in their strategy use" (McCormick, 2003, P. 80).

Regulation of cognition or *metacognitive control* is the second major element of metacognition, sometimes also is referred to as executive control, is a sequence of actions taken by students to control their own thinking or learning. It encompasses at least three basic components or essential skills of *planning*, *monitoring*, and *evaluation* (Jacobs & Paris, 1987; Schraw & Moshman, 1995; Schraw, 1998).

Planning includes the selection of proper strategies and the provision of resources effective for reaching goals, for instance, making predictions before reading. It includes goal setting, activating prior knowledge, and budgeting time.

Monitoring includes the self-testing skills essential to regulate learning. It refers to the critical analysis of the effectiveness of the strategies or plans being implemented. Schraw (1998) has treated it as "one's on-line awareness of comprehension and task performance" (p.115). Engaging in periodic self-testing in the course of learning would be a particular case of monitoring.

Evaluation refers to the examination of progress being made toward goals which can trigger further planning, monitoring, and evaluation. A typical example might be re-evaluating one's goals and conclusions. To put a fitting end to the discussion on components of metacognition two crucial points are required to be taken into consideration with regard to metacognitive knowledge and metacognitive regulation. Firstly, metacognitive knowledge and experience are related to each other and form partially overlapping sets. Furthermore, they complement and enrich each other. Next, metacognitive knowledge and metacognitive regulation are domain-general in nature and both components appear to embrace a wide spectrum of subject areas and domains.

Gradually, the concept of metacognition underwent some changes and modifications to embrace anything psychological, rather than just anything cognitive (Papaleontiou-Louca, 2003 & 2008). Albeit, when making the first genuine attempt to clearly define the construct of metacognition, Flavell (1979) personally makes reference to the concept as to all those conscious *cognitive* and *affective* experiences that associated with a cognitive enterprise. Flavell (1987) expands the concept of metacognition in a more explicit way to include not only cognitive variables, but rather, anything affective.

In fact, the current literature available on metacognition brings the term to completion by including not only 'thoughts about thoughts', its former definition, but also the following notions: knowledge of one's knowledge, processes, and cognitive and affective states, and the ability to consciously and deliberately monitor and regulate one's knowledge, processes, and cognitive and affective states (Papaleontiou-Louca, 2008).

An important issue which warrants consideration and mention is that the application of knowledge of one's own cognitive and affective processes and the regulation of these processes do not take place in a vacuum, yet, as many theorists and models of metacognition suggest, are highly influenced by one's goals, motivations, perceptions of ability, attributions, and beliefs, as well as context, such as social and cultural norms (Borkowski, et al., 1992; Paris & Winograd, 1990a; Schunk, 1989). Obtaining a full better understanding of metacognition is contingent upon taking these major factors into due consideration as they constitute influences on metacognition as well as being influenced by metacognition (see Borkowski et al., 2000; Pintrich & Zusho, 2002; Zimmerman, 2002).

3. Metacognition versus Cognition

One noteworthy discrimination for fathoming out the true character of the concept of metacognition is to elucidate the distinction between metacognition and cognition (Nelson, 1999; Nelson & Narens, 1994). Nelson (1999) refers to metacognition as "the scientific study of an individual's cognitions about his or her own cognitions" (p. 625). Therefore, metacognition can be considered as a subset of cognition, better to say, a certain kind of cognition. Broadly defined, cognition is a general term for thinking, while metacognition is thinking about thinking.

According to Flavell (1979), metacognition and cognition differ in terms of their content and function, not in their form and quality, i.e., both can be acquired and forgotten, be either correct or incorrect, and so forth. It is safe to say that the aforementioned idea seems an ideal point of departure to draw a sharp distinction between metacognition and cognition. From such a view, the *contents* of metacognition are the knowledge, skills, strategies, and information about cognition, a portion of mental world, while cognition has to do with things in both external and mental world (Amado Gama, 2005). Hacker (1998) articulates that

Metacognitive thoughts do not spring from a person's immediate external reality; rather, their source is tied to the person's own internal mental representations of that reality, which can include what one knows about that internal representation, how it works, and how one feels about it. (Hacker, 1998, p. 3)

From *function* side, cognition acts to resolve problems and bring cognitive activity to a desirable outcome, while metacognitive function is the monitoring and regulation of an individual's cognitive effort in solving a problem and executing a task (Vos, 2001). Cognitive strategies are those strategies which assist a person in accomplishing a particular goal (e.g., comprehending a text), while metacognitive strategies refer to control or regulatory processes such as planning, monitoring, and evaluation, which individuals use to ensure that the particular goal has been met (Livingston, 1997; Rubin, 2005; Garner;

1987). That is to say, "cognitive skills facilitate task achievement, and metacognitive skills help to regulate task achievement" (McCormick, 2003, p. 81).

4. Metacognition, Instruction and Learning

"In teaching me independence of thought, they had given me the greatest gift an adult can give to a child besides love, and they had given me that also." (Courtenacy, 1989, p. 326, cited from Paris & Winograd, 1990a, p. 7)

Although much remains to be learned about metacognition, a topic with an honorable history in psychology and education, without question, the fundamental question "Can metacognition or metacognitive strategies be taught or developed?" which has exercised the minds of researchers for quite a long time is no longer an unanswered question drawing on the strong legacy of the research on the topic, but rather a legitimate question with a satisfactory and definite answer, an *emphatic 'yes'* (Bandura, 1986; Hofer & Yu, 2003; Sperling et al., 2004; Borkowski et al., 1987; Bransford et al., 1986; Garner, 1990; Cromley, 2000; Kuhn et al., 1997; Daley, 2002; Schunk, 1990; Israel, 2007). In instilling metacognitive strategies into students, however, one needs to be cautious and aware that metacognition develops slowly and is difficult to teach (Vos, 2001).

Following the coinage of the term 'metacognition', Flavell (1979) claimed that "increasing the quantity and quality of children's metacognitive knowledge and monitoring skills through systematic training may be feasible as well as desirable" (p. 910). Furthermore, Flavell takes a broad vision regarding metacognitive development and offers a beacon of hope that:

It is at least conceivable that the ideas currently brewing in this area could someday be parlayed into a method of teaching children (and adults) to make wise and thoughtful life decisions as well as to comprehend and learn better in formal educational setting. (Flavell 1979, p. 910)

With regard to the centrality of metacognition to learning, Flavell (1979) contends, though with little empirical evidence, that metacognition plays an important role in varying areas of learning such as oral communication of information, oral persuasion, oral comprehension, reading comprehension, writing, language acquisition, attention, memory, problem solving, social cognition, and various types of self-control and self-instruction (p. 906). According to Sternberg (2009), viability and attainment of metacognition is beyond question, yet the question is how it best can be conceptualized, evaluated, and enhanced. Likewise, Kuhn (2000) asserts that what is perhaps the most significant question which necessitates more investigation is "How can metacognitive development be facilitated?" (p. 180).

The potentiality of increasing meaningfulness of students' learning in various fields has been

demonstrated by an enormous body of research (e.g. Biggs, 1986; Hartman, 2001a; Pressley & Ghatala, 1990; Paris & Winograd, 1990b; Brown & Palinscar, 1982). Metacognition “has the potential to empower students to take charge of their own learning and to increase the meaningfulness of students’ learning” (Amado Gama, 2005, p. 21), it also encourages learners to ‘learn what to do when they don’t know what to do’ (Wade, 1990; Claxton, 2002). Similarly, Chamot et al. (1999) stated that “metacognition or reflecting on one’s own thinking and learning is the hallmark of the successful learner” (p. 2). With regard to metacognitive strategies, with the wisdom of a multitude of research, it is safe to say that the more metacognitive one is, the more strategic and successful one is to be in learning; to be more exact, an individual can pull himself up by his bootstraps in his own lifelong learning (Borkowski et al., 1987; Garner & Alexander, 1989; Pressley & Ghatala, 1990; Schraw & Dennison, 1994). On the value of metacognition, Kuhn (2000) rightly puts that

There would seem few more important accomplishments than people become aware of and reflective about their own thinking and able to monitor and manage the ways in which it is influenced by external sources, in both academic, work, and personal life setting. Metacognitive development is a construct that helps to frame this goal. (p. 181)

Concerning to the instruction and development of metacognition, Papaleontiou-Louca (2003) asserts that “[m]etacognition, like everything else, undoubtedly develops with practice” (p. 17). It is believed that metacognition includes *strategies* for planning, monitoring, and evaluating of language use and language learning which are considered as key elements in developing autonomy (Harris, 2003). If education aimed at helping learners to take charge of their own learning, they have to be able to plan, monitor, and evaluate their learning processes. To do so, they need to be metacognitively aware (Hacker et al., 2009). Ariel (1992) suggests that the aim of metacognitive instruction is to ... develop the sensitivity of students to learning situations, to heighten students’ awareness of their own cognitive repertoire and the factors that affect the learning process and contribute to successful learning, to teach strategies for learning, and to develop students’ capacity to regulate and monitor their activities. (p. 82).

Just like giving a sick person a useless placebo injection, simply providing learners with answers may enable them to resolve the immediate learning problem. Though, it is not a panacea, just a partial remedy that causes definitely as many problems as it solves. Yet, extolling the virtues of metacognition, many researchers take the view that it has the potential to be seen as a kind of panacea for most learning problems learners may encounter through germination of strategies empowering them to manage their own learning and find out the answers by themselves. “Metacognition can provide

students with knowledge and confidence that enables them to manage their own learning and empowers them to be inquisitive and persistent in their pursuits” (Paris & Winograd, 1990a, p. 11).

As pertains to metacognitive development, simply providing learners with highly regimented and structured instruction in metacognitive knowledge without metacognitive experience or quite reverse seems to be insufficient for and does not guarantee the development of metacognitive control and self-regulation (Livingston, 1996 & 1997). Thereby, in fostering a culture of metacognition in learners and classroom settings, the most efficacious approach, though there are several approaches, is the one into which both components of metacognition, namely metacognitive knowledge, and metacognitive regulation are incorporated. One which provides the learners with both knowledge of cognitive processes as well as strategies and together with experience or practice in deploying both cognitive and metacognitive strategies and self-evaluation of the outcomes of their learning.

Anderson (2008) suggested that metacognition in language learning can be divided into five primary and intersecting components: 1. Preparing and planning for learning, 2. Selecting and using strategies, 3. Monitoring learning, 4. Orchestrating strategies, and 5. Evaluating learning. It merits a mention that each of these five components of metacognition is engaged in an interactive process which is not of a linear nature, moving from preparation and planning to evaluation, rather a cyclic one.

McCormick (2003) articulated that “[s]ince it has become clear that metacognitive awareness and skills are a central part of many academic tasks, a critical question for educators is how we foster the development of metacognition in students” (p. 90). Incontrovertibly, a great deal more research is required before one can answer this question with any authority. As a grand finale and conclusion to the discussion in this part, a verbatim quote of Anderson (2008) is worth mentioning.

While learning from a good teacher in a well-structured language program is very important, it is perhaps even more important for these learners to have meaningful learning experiences on their own. Good teachers and well-structured language learning programs cannot possibly teach learners everything they need to know. Getting good results from a study depends on learners’ going beyond what teachers and programs provide and developing the kind of metacognitive behavior which will enable them to *regulate their own learning*. (Emphasis added, p. 108)

5. Conclusion

This paper made an attempt to provide a brief overview of metacognition by examining its background and summarizing the relevant literature. It has also outlined

some basic features and different components of Metacognition. A summary of research findings on metacognitive strategy training in some areas of education have also been included. Metacognition is a powerful construct in today's educational setting, and its principled teaching can instill a sense of independence and autonomy into learners.

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