Principle 4

Students Engage in Metacognitive Activity to Increase Understanding of and Responsibility for Their Own Learning

Metacognition is a foundational cognitive process for effective learning in all disciplines. At its most basic, it is "thinking about thinking" (Flavell, 1979). It includes knowledge people have about themselves as learners and an awareness of factors that might impact their performance in various tasks. Educational psychologists and researchers have long believed in the importance of metacognition in learning, in part, because of its supportive role in other aspects of cognition (Ennis, 1985; Facione, 1990; Halpern, 1998; Paul, 2006; Schraw, Crippen, & Hartley, 2006). Metacognition is considered to have two components: metacognitive knowledge and metacognitive regulation (Flavell, 1979).

Metacognitive Knowledge

Metacognitive knowledge includes knowledge of factors that might impact performance, knowledge of learning strategies, knowledge about oneself as a learner, awareness and management of personal cognition, and knowledge of others. Knowledge of performance factors and of oneself-as-learner work together to advance a variety of important learning attributes, including self-appraisal ability, person and task knowledge, declarative knowledge, and epistemological understanding (Cross & Paris, 1988; Schraw et al., 2006; Schraw & Moshman, 1995).

Metacognitive knowledge incorporates knowledge about learning strategies, including why to use strategies, when to use strategies, and how to use strategies (Kuhn & Dean, 2004; Schraw et al., 2006). Use of metacognitive strategies can: 1) improve persistence and motivation in the face of challenging tasks; 2) facilitate an understanding of when use of a particular strategy should be appropriately continued, terminated, or modified based on strategy consequences (Davis, 1983; Levelt, 1983); and 3) perhaps most importantly, have permanent effects on learning ability (Pressley et al., 2010). Appropriate strategy use can be improved with increased metacognitive regulation.

Metacognitive Regulation

Metacognitive regulation refers to the act of monitoring one's own cognition (Flavell, 1979).Through this monitoring, one can become aware of one's own strengths and weaknesses and take responsive action based on that evaluation (Paris & Winograd, 1990; Schraw et al., 2006; Schraw & Moshman, 1995; Whitebread, Coltman, Pasternak, Sangster, Grau, et al., 2009).

Students who monitor their own thinking and take action are more successful than their peers in academic activities (Bransford et al., 1982; Slife, Weiss, & Bell, 1985; Zimmerman & Martinez-Pons, 1992; Zimmerman & Schunk, 1989). This success is related to a variety of factors, including playing a more active role in learning, processing new information more effectively, relating new information to previous information, using elaboration techniques to better understand new material, setting goals, planning one's learning strategies, seeking assistance when needed, and monitoring one's own performance (Bandura, 1986; Bransford et al., 1982; Puntambekar, 1995; Slife et al., 1985; Zimmerman & Martinez-Pons, 1992).

Metacognitive regulation also includes the evaluation of monitoring processes and strategies and assessing one's learning, and revisiting and revising learning goals. These attributes of metacognitive regulation all promote effective planning of future learning (Cross & Paris, 1988; Paris & Winograd, 1990; Schraw et al., 2006; Schraw & Moshman, 1995; Whitebread et al., 2009). Effectively planning future learning steps involves goal setting, activating background knowledge, and budgeting time (Chi, Glaser, & Rees, 1981; Pressley et al., 2010).

As metacognitive regulation becomes more fully developed in learners, it incorporates the evaluation of their monitoring processes and gauging the success of various learning strategies in increasing learning (McLeod, 1997; Schneider & Lockl, 2002). Researchers have also demonstrated that affective self-regulation (the ability to properly regulate one's emotions) is related to academic success through motivation, a state supported by metacognition (Eisenberg, Valiente, & Eggum, 2010; Ray & Smith,2010). Metacognitive regulation, along with other aspects of metacognition, can improve with instruction (Baker & Brown, 1984; Markman & Gorin, 1981). Motivation is also closely related to metacognition.

Motivation

Motivation, an affective state, is, "the attribute that moves us to do or not do something" (Lai, 2011, p. 4), and includes the enjoyment of school learning (Gottfried,1990). Motivation is highly correlated with self-efficacy, the confidence in one's ability to perform a specific task. It is also closely connected to attribution tendencies and effortful control (Bandura, 1986; Eisenberg et al., 2010; Ray & Smith, 2010). Attribution tendencies refers to the causal links a person makes to create sense out of their success (e.g., "I won the race because I trained in a new way.") and effortful control is the ability to regulate responses to external stimuli (e.g., resisting shouting out answers in class).

Motivation is also greatly influenced by students' and teachers' goal orientation (Ames, 1992; Ames & Archer, 1988; Dweck & Elliott, 1983).[2] A learning goal orientation supports adaptive motivational patterns that promote the establishment, maintenance, and attainment of personally challenging and valued learning goals (Dweck & Leggett, 1988; Elliott & Dweck, 1988). This adaptive pattern is characterized by challenge seeking, persistence in the face of setbacks, enjoyment in putting forth effort, risk taking, (for example, being willing to risk making mistakes in front of others in order to learn), having a sense of "belonging," and being better able to transfer one's skills/knowledge to novel activities or problems (Elliott & Dweck, 1988; Weiner, 1972).[3]

Metacognition in the Classroom Context

Metacognition can be supported in the classroom through the provision of learning tasks that are designed to have novelty, variety, and diversity (Ames, 1992; Corno & Mandinach, 1983; Corno & Rohrkemper, 1985; Marshall & Weinstein, 1984). Such tasks facilitate interest in learning and a learning orientation while reducing social comparisons (Ames, 1992; Nicholls, Cheung, Lauer, & Patashnick, 1989; Rosenholtz & Simpson, 1984). Using these task structures can foster students' self-regulation in learning and affective self-control (Paris & Winograd, 1990). To further support students' self-regulation, students should be enabled to participate in decision-making processes where they make choices about activities or actions based on considerations of the effort they will need to exert (e.g., if the task is manageable) and not on evaluations of their abilities (Ames, 1992; Bandura, 1986; Brophy, 1987; Brophy, Rohrkemper, Rashid, & Goldberger, 1983; Garner, 1990; McCombs, 1984; Paris & Winograd, 1990). In this situation, students are given opportunities to develop responsibility and independence, which are necessary 21st century skills.

Tasks should also have personal relevance to students. Personal relevance includes a meaningful reason to engage in the activity, an appropriate level of challenge, and specific, short-term, and self-referenced goals (Ames, 1992; Schunk, 1989; Zimmerman, Bandura, & Martinez-Pons, 1992). Within this task context, students frequently perceive

[2]Having a learning goal orientation, which promotes motivation, is characterized by seeking to increase one's abilities for the sake of learning versus trying to gain positive judgments by others and/or trying to avoid other's negative judgments.

[3]Additionally, motivation is greatly influenced by beliefs about intelligence (Dweck, 1986; Meyer, Folkes, & Weiner, 1976; Nicholls, 1984). Children and adults who believe intelligence is a fixed trait tend to have a performance goal orientation. People who believe intelligence is a malleable quality, which is called a growth model, tend to orient toward developing that quality in themselves and in others, e.g., teachers (Bandura & Schunk, 1981; Schunk & Zimmerman, 1998). These findings have been often misinterpreted to mean that frequent praise for small units of behavior promotes motivation. Praise can instead decrease intrinsic motivation and the pursuit of longer-term challenges (Brown, Palincsar, & Purcell, 1986; Dweck, 1986).

that they have more control over the learning processes they engage in and in the products they produce. Students also tend to have a greater sense that they can accomplish tasks with reasonable effort (Schunk & Zimmerman, 1998). It is likely that students within these contexts will be more willing to apply effort and plan, organize, and monitor strategies (Ames & Archer, 1988; Corno & Mandinach, 1983; Corno & Rohrkemper, 1985). Metacognitive instruction in these areas can lead to a greater capacity for students in successfully meeting task-learning goals (Ames, 1984; Ames, Ames, & Felker, 1977; Covington, 1984; Covington & Omelich, 1984).[4]

Instructional strategies for teaching metacognition and encouraging motivation to use metacognitive strategies need to occur at a meta-level instead of performance level (Kuhn, 2000). They should be aimed at increasing awareness and control of a meta- task, rather than completing procedures. This type of instruction can best promote self-efficacy, learning attribution, and a learning goal orientation. Without these characteristics, students may have the necessary strategy knowledge to solve problems and other challenges they come across in their learning processes, yet still not use this knowledge appropriately (Schraw, 1998). Additionally, explicit instruction in metacognition can lead students to more actively process information, for example, by decontextualizing, abstracting and restructuring it (Delclos & Harrington, 1991; Lodico, Ghatala, Levin, Pressley, & Bell, 1983; Palincsar et al., 1998; Puntambekar, 1995; Sawyer, Graham, & Harris, 1992). These skills are also linked to greater achievement (Corno & Mandinach, 1983; Lodico et al., 1983; Pressley, 1986).

Another important aspect of effective metacognitive instruction is that it is part of the larger process of making students' reasoning, concepts, and beliefs visible (Hennessey, 1999). This is accomplished by assisting students to construct conceptual or mental models, which can be represented verbally, visually, or through other representations (see Principle 3 for more information). The construction of mental models can facilitate conceptual changes for students holding inappropriate conceptions, especially if the process of defining and refining models produces cognitive disequilibrium or conflict (Schraw et al., 2006).

In summary, metacognition is critical in learning. Metacognition is the cognitive mechanism in which learners monitor and regulate their learning. Students can be supported to develop metacognitive skills through effective instructional strategies.

[4]Positive reinforcement for students should be geared towards celebrating effort rather than any innate intelligence, and should focus on individual improvement. Feedback to students should provide information about ways in which student work did or did not meet the learning goal and criteria for success and encourage a view of mistakes as part of learning. Evaluations are best made in private and not public in order to avoid comparisons. They should provide opportunities for improvement for students (Ames, 1984.)