

How Far Have We Moved Toward the Integration of Theory and Practice in Self-Regulation?

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Abstract In this article, we address four main questions, including: What is self-regulated learning for? What key strategies do students need to guide and direct their own learning process? What cues in the learning environment trigger self-regulation strategies? What can teachers do to help student to self-regulate their learning, motivation, and effort in the classroom? We illustrate that answers to these questions have changed over time and that changing conceptualizations of the self-regulation process have influenced the assessment tools that were used. We also point to changing classroom conditions as a factor that has affected the assessment of self-regulation. Finally, we formulate some questions that need to be tackled in research on self-regulation and introduce the articles and commentaries in the special issue that provide some cutting-edge work on the use of assessment to register self-regulation over time.

Keywords Self-regulated learning · Motivation strategies · Choice of goals · Emotion regulation · Assessment of self-regulation · Zone of proximal development

Self-Regulation of Learning, Motivation, and Effort

In recent years self-regulated learning has become a key construct in education. There is little doubt that it plays a central role in influencing learning and achievement in school and beyond. There are multiple conceptualisations of the construct of self-regulation, however, most researchers agree that self-regulation refers to multi-component, iterative, self-steering processes that target one's own cognitions, feelings, and actions, as well as features of the environment for modulation in the service of one's own goals (Boekaerts, Maes, & Karoly, 2005).

In the last few decades, researchers in educational psychology have asked the question: "What is self-regulated learning and what is it for?" In asking this question, researchers automatically assume that self-regulated learning (SRL) is a specific form of learning that can be distinguished from learning that is externally regulated. Moreover, the most salient

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feature attributed to SRL is that the learner actually has control over his own learning, steering and directing cognitive and motivation processes to achieve the learning goal. Important to note is that by defining SRL in such a way, researchers automatically assume that SRL is intentional and by implication conscious. In accordance with this assumption, they have addressed questions, such as “What key strategies do students need to guide and direct their own learning process? Why do some students self-regulate the learning process and other do not? What cues in the learning environment trigger self-regulation strategies? What can teachers do to help students self-regulate their learning, motivation, and effort in the classroom? In the next few pages, we will address these questions in an attempt to provide a progress report on where we currently are in our thinking about self-regulation in the classroom. Next, we will address two related questions: “Do we have a clear description of the self-regulation strategies that are necessary and sufficient for students to steer and direct their own learning and problem solving in a domain of learning, given their current state of skill development?” and, more importantly, “Do we have access to valid assessment instruments to assess the ease with which students make use of different types of self-regulation strategies?”

What Key Strategies Do Students Need to Guide and Direct their Own Learning Process?

Self-Regulation Involves Multiple Strategies

To-date, researchers agree that SRL is not an all-or-none process or property of the system, but that it consists of multiple processes and components. They have described the self-regulation strategies that successful students use and refer to these strategies as “adaptive” (e.g., Winne, 1995). These self-regulation strategies are usually contrasted to the strategies that researchers label “maladaptive” (Zimmerman, 2000). We would like to point out that self-regulation strategies may be observed from different vantage points. A strategy that teachers might deem “maladaptive for learning” may be perceived by peers as highly adaptive for social bonding. The point we are making here is that—in the past—teachers and researchers considered the learning process as the primary objective of self-regulation. Clearly, the main focus of past research on self-regulated learning has been on the description of the learning strategies that students need to have access to in order to guide and direct their learning, independent of the teacher.

(Meta) Cognitive and Motivation Strategies

Various *metacognitive strategies* have been outlined and training programs have been set up to train these strategies (e.g., Pressley, 1995; Weinstein, Husman, & Dierking, 2000). Examples of such self-regulation strategies are orienting oneself before starting on an assignment, collecting relevant resource material, integrating different theoretical viewpoints, monitoring for comprehension, and assessing one’s progress. The main conclusion of these interventions are that the use of learning strategies is domain-specific and that students can be trained to extend their metacognitive knowledge base and make it more coherent (Boekaerts & Corno, 2005). Hattie, Biggs, and Purdie (1996) and Rosenshine, Meister, and Chapman (1996) concluded from their respective meta-analyses that the training of learning skills is effective to the extent that it makes students metacognitively aware of the self-regulation strategies that are in order in specific learning contexts. In

addition, success of these interventions critically depends on the teachers' efforts to help students bring newly learned self-regulatory strategies on automatic control (Winne, 1995).

Motivation researchers (e.g., Boekaerts, 1993; Corno, 1994; Pintrich, 2000) argued that by restricting self-regulated learning to the cognitive and metacognitive strategies that students use to move their learning process along, important steering processes are left out of the picture. They highlighted that students also need to self-regulate their motivation for learning and their effort investment. For example, they must initiate activities that set the scene for learning, assign value to the learning activity, and they must motivate themselves to actually get started on learning tasks and assignments and sustain effort till the task is completed. In other words, students need to make use of *motivation strategies* (Ryan & Deci, 2000; Sansone & Harackiewicz, 1996). In addition, they must also have access to *volitional strategies* (Corno, 2001; Wolters & Rosenthal, 2000) to comply with social expectations and rules (e.g., being a responsible learner, being a friendly and broad minded group member; living up to the teacher's expectations) and deal with obstacles en route to the learning goal (e.g., increased difficulty level, drawbacks, and distractions).

Social Origins of Student' Actions

Students must make many choices, some choices reflect personal preferences, values, and interests whereas other choices take their origin in interpersonal behaviour and perceptions of aspects of the social environment. Kuhl and his colleagues (e.g., Kuhl, 2000) pointed out that complying with task and social demands often involves imposing restrictions on one's own wishes, interests, and expectations (e.g., refraining from engaging in interesting activities, from doing things one's own way, and from taking initiative). Ryan and Deci (2000) reported in this respect that students, who comply with the teacher's demands because they want to obtain a certificate, are not intrinsically motivated. They might easily disengage from the task or activity when obstacles and distracters interrupt their actions. Observing (social) learning conditions that one considers unfavourable for learning (e.g., negative peer comments, teacher control) affects the decision making process. So do obstacles and drawbacks during task accomplishment. These observations are viewed as unwanted interruptions of ongoing behaviour that necessitate adjustment of one's actions to fit (somebody else's) expectations. Boekaerts (1993, 1998) argued that conscious and unconscious decision making processes associated with such interruptions often trigger negative affect, which calls for the use of *coping strategies* to reduce the level of arousal (e.g., taking a deep breath, avoiding eye contact, telling somebody off, or seeking social support) as well as *volitional strategies* to re-focus on the task (e.g., putting distracting material aside while working, terminating ruminating thoughts, and buckling down to work). Training programs to use motivation, volition, and coping strategies have been set up to help students with motivation, concentration, attribution and emotion control problems (e.g., Meichelbaum, 1977; Dweck, 1991). Similar to what was said in relation to the training of learning skills, intervention programs should do more than make students aware of the motivation, volition, and coping strategies that are in order in specific learning environments. Simply being aware of such strategies degrades performance until the strategies have become automatic.

Adopting a System Approach to the Study of Self-Regulation

Distinct (meta) cognitive and motivation strategies have been the object of study in different bodies of related literature and it has proved difficult to integrate this information into a comprehensive framework of self-regulation. Nevertheless, it is impossible to describe how

successful students self-regulate their learning and motivation in the classroom or why unsuccessful students fail to self-regulate their learning or motivation processes unless one adopts a systems approach to the study of self-regulated learning. Boekaerts and Corno (2005) argued that the field of self-regulation would be most effectively served when researchers and teachers look at students' attempts at self-regulation in the classroom in close connection to their salient goals and their perception and interpretation of favourable and unfavourable cues in the learning environment. Both students' goals and their perception of the learning environment are represented in their mental representation of the learning activity and affect their conscious and unconscious choices in the classroom. How can teachers accommodate the different mental representations that different students undoubtedly make? In order to answer this and related questions it is essential to adopt an approach to self-regulated learning that allows researchers and teachers to focus simultaneously on the students' self-regulation of the learning and motivation process as well as on the environmental triggers that affect these processes.

Boekaerts' dual processing self-regulation model (Boekaerts & Niemivirta, 2000; Boekaerts & Corno, 2005) is an attempt to help researchers and teachers conceptualise when, why, and how students self-regulate their learning in the classroom. It helps them understand why some students' self-regulation system works coherently in some content domains and not in other domains and why it tends to break down under specific (social) learning conditions. In short, the dual processing self-regulation model distinguishes between two main pathways; the growth and the well-being pathway. Students who want to reach a goal (e.g., increasing their competence in a domain, making new friends, or helping others) initiate activity in the growth pathway because they value that goal and are prepared to put energy in its pursuit (i.e., self-regulation is energized from the top down). By contrast, students who are primarily concerned with their well-being, initiate activity in the well-being pathway; they focus on cues in the learning environment that signal unfavourable learning conditions, obstacles and drawbacks. At such a point, they use energy to prevent (further) negative events from occurring (cue-driven or bottom up self-regulation). It is assumed that students can switch back from the well-being pathway to the growth pathway by using volitional strategies (For more details, see Boekaerts, 2006).

In the following section, we will show why it is important for researchers and teachers to take the students' current goals into account when observing their attempts at self-regulation (top-down self-regulation). Next, we will discuss the importance of cues in the learning environment that impede and facilitate self-regulation (cue-driven self-regulation).

Why Do Some Students Self-Regulate the Learning Process and Others Do Not?

Self-Regulation Implies Choice of Goals

Understanding students' capacity to direct their own learning in the classroom in function of the attainment of their salient goals has been a central topic in research on self-regulation. Sheldon and Elliot (1998) argued that self-regulation implies choice and consistency, and that it critically depends on having access to a well-integrated goal hierarchy. Boekaerts, De Koning, and Vedder (2006) made an attempt to describe the pattern of goals that students strive for in modern classrooms. For example, they want to develop their competencies, increase their sense of belonging, assist and empower others, and protect their own well-being and self-esteem and that of others at the same time. In order to achieve these multiple higher-order goals, students must have access to the

necessary action programs and scripts (behavioural sequence of steps) and use them strategically to align and achieve their salient higher-order goals. Examples of action programs that can be used to attain learning or mastery goals are: generating meaning, setting up a search strategy, building up an argument, and writing it up coherently. Examples of action programs that students might activate to achieve social goals are: making friends, helping each other, negotiating, reaching consensus. Example of action programs that students use to pursue affective or well-being goals are: sharing joy, excitement, pride but also anger, worry, and disappointment, resolving conflict, minimizing harm, threat, and loss to oneself and to others. It is evident that striving for multiple higher order goals simultaneously, making use of different action programs, might be incompatible. Therefore, students need to pay close attention to the alignment of their multiple goals (action programs and scripts) in order to maintain their performance and well-being. Little research is currently available on the way students prioritize their goals and how they balance competing and complementary goals.

What we do know is that students, who are *aware* of their goal preferences—which Elliot and Sheldon (1997) defined as personally meaningful objectives that students pursue in their daily lives—and of how their goal system functions, are in a better position to self-regulate their motivation and effort. Ryan and Connell (1989), Ryan and Deci (2000) and Sheldon and Elliot (1998) found that in relation to *single* goals, initial effort intentions that were based on external encouragements or social pressure (i.e., controlled motivation) were not sustained two to four weeks later and did not affect goal attainment measured at the end of the learning period. By contrast, initial effort intentions in relation to self-concordant goals (i.e., goals consistent with the students' own needs, values, and interests) were sustained during goal pursuit and positively affected goal accomplishment. Sheldon and Elliot (1998) also reported that the attainment of self-concordant goals produced greater well-being benefits from their attainment.

Students' Goal Preferences Provide a Window on the Why's of Self-Regulation

Hijzen, Boekaerts, and Vedder (2006) examined adolescents' *multiple* goals in a cooperative learning setting. They showed that higher levels of engagement were associated with vocational students' goal preferences. Having a preference for social support goals predicted engagement in cooperative learning settings best, followed by belongingness and mastery goals. In a further study, using observations and stimulated recall, these researchers (Hijzen *et al.*, 2006) found that students' engagement in cooperative learning settings was associated with their goal preferences profile and their perception of contextual aspects. Hijzen *et al.*, made a distinction between effective and ineffective cooperative learning teams. They reported that—although learning for a certificate was an equally important goal in both effective and ineffective teams, preference for his type of goal was connected with a preference for mastery and social support goals in effective teams and with a preference for belongingness, and entertainment goals in ineffective teams.

Clearly, the self-regulation processes of these students will diverge because ineffective teams target their cognitions, feelings, and actions in the service of learning for a certificate goals in combination with entertainment and belongingness goals, suggesting that they monitor for cues that tell them whether learning tasks are fun and whether they are welcome. It stands to reason that when these students detect cues that inform them that their salient goals cannot be reached in the present learning environment, they experience negative affect (initiating activity in the well-being pathway), which may prompt them to

restore their well-being. Members of effective teams also target cognitions, feelings and actions in the service of learning for a certificate goals, but these goals were combined with mastery goals, suggesting that they tend to monitor for cues that inform them how best to attain their learning goals (i.e., activity is initiated in the growth pathway).

What Cues in the Learning Environment Trigger Self-Regulation Strategies?

Favourable and Unfavourable Representations of Learning in a Domain

It is important to realize that the learning experiences that students have had in the past trigger expectancies and beliefs, which might have a profound effect on their current perceptions as well as on the choices they make and the effort they are prepared to invest. Several researchers have shown that students who do not feel well integrated in their social environment are at risk to obtain poor results (e.g., Wentzel, 1991). Boekaerts et al. (2006) summarized research on the classroom practices that facilitate and undermine the quality of students' engagement in the classroom. The following aspects of instruction and teacher behaviour have an effect on the way students' self-regulate their learning: clarity and pace of instruction, the amount of structure provided, autonomy granted, teacher enthusiasm, humor, fairness, and teacher expectations about students' capacity.

In the course of their learning history, students have had positive and negative experiences with respect to learning in a domain. They have defined specific aspects of the learning environment as favourable or unfavourable for learning and these positive and negative experiences have been encoded in an extended network of representations involving the Self. When triggered, these internal representations direct the students' attention toward learning tasks or activities or away from them, thus setting the scene for action. Frijda (1988) argued that activated expectations and beliefs may, quasi automatically, trigger positive or negative emotions that have become associated with the task or activity (e.g., boredom, hopelessness, anger, joy) in the past.

Students Use Highly Sophisticated Non-Conscious Decision Making

Nowadays it has become clear from the field of implicit learning and consciousness that our cognitive system has limited access to the decision making processes that occur during learning. Bargh and Chartrand (1999) argued that many goals become pre-consciously activated, provided they have been encoded in a highly accessible knowledge structure. Bargh and Gollwitzer (1994) clarified the situation–action plan link as follows: “It is assumed that the habitual serving of a goal within a given situation not only connects the goal with the situation but also those goal-directed behaviours that have been effective in satisfying the goal in the past”(p.78). Referring to parallel-holistic processing, Kuhl (2000) explained that individuals who are confronted with a new situation find—within milliseconds—a script that is in accordance with a variety of self-aspects. There is no need to check explicitly and sequentially each particular self-aspect because decision making is based on right-hemisphere, superior detection of holistic and configurational relationships between a pattern of objects perceived. Students often have an intuitive feeling. They might say: “I cannot explain why or how it happened. It just did and I feel it is right.” In contrast to traditional views in personality and social psychology—which describe the Self in terms of the explicit beliefs the individual has about the Self—Kuhl postulated that high-level, intuitive-holistic processing forms the basis of implicit self-

representations. This is a highly sophisticated, non-conscious system that integrates an extended network of past representations involving the self, including personal preferences, needs, somatic feelings, and non-conscious options for action in particular situation.

Emotion Regulation is an Important Aspect of Self-Regulation

Some students may be able to reduce their emotions swiftly whereas others may find it hard to reduce their level of arousal and to concentrate on the task at hand. Several researchers (e.g., Fredrickson, 2001) pointed out that perception of unfavorable environmental cues raises the level of arousal in all students (e.g., an upcoming summative assessment, unfair behaviour of fellow-students or the teacher, and having to speak in public). Nevertheless, it is the students' *interpretation* of the raised arousal level that leads to a characteristic emotion. Pekrun, Goetz, Titz, and Perry (2002) showed that negative emotions do not have a direct effect on learning outcomes; their effect is mediated by the self-regulatory strategies that the emotions activate. More specifically, Pekrun *et al.*, showed that over time, negative emotions (e.g., anxiety, hopelessness, anger, boredom) experienced while doing mathematics increase the students' ruminating thoughts and decrease their self-regulation, which in turn decrease mathematics achievement. By contrast, positive emotions triggered in the mathematics classroom (e.g., joy, feeling relieved and relaxed) decreased rumination and increased self-regulation, thus affecting mathematics achievement positively.

Interestingly, Hijzen *et al.* (2006) found that both the effective and the ineffective collaborative learning teams in their study pointed spontaneously to contextual aspects for explaining their engagement in cooperative learning. Effective teams referred to the current group composition, size of the team, and types of relationships with team members and the teacher as beneficial to their engagement. In other words, they focused on desirable aspects of the learning environment. Ineffective teams, on the other hand, explained their low engagement in terms of concerns about task characteristics (e.g., boring, non-supportive for a future career), ineffective teacher behaviour (boring teaching methods, chaotic lessons, little support and coaching), and absence of rewards. As predicted by the dual processing self-regulation model, ineffective teams (recall that they gave preference to entertainment and belongingness goals as well as learning for a certificate goals) focused on undesirable cues in the learning environment whereas effective teams, who gave preference to certificate, mastery, and social support goals, focused on desirable cues.

What Can Teachers Do to Help Students Self-Regulate their Learning, Motivation, and Effort in the Classroom?

Currently, most researchers agree that self-regulation is closely intertwined with competence development in a content domain. It develops through active and constructive interaction with the fundamental concepts and structure of that content domain. The interaction that students have with their teachers and peers plays a crucial role in the development of their self-regulatory skills. Accordingly, researchers have set up intervention programs with teachers as partners in research. These collaboration teams have started to describe students' attempts at self-regulation in close connection to the contextual cues that trigger—or hamper—the use of different self-regulation strategies in the service of skill development in that domain (see Boekaerts, 2006; Perry, 2002).

Modern classrooms divert from traditional classroom arrangements in which teachers retain control over learning in many ways. With the advent of situated learning and

anchored instruction, researchers introduced the concept of “powerful learning environments” in education and they advised teachers on how to improve their classroom practices to help students self-regulate their learning. Teachers who set up their classroom according to the principles of situated learning invite their students to collaborate in small groups on authentic problems and they expect group members to share information and engage in knowledge building discourse. It is important to realize that this collaborative meaning generation and knowledge construction process has legitimized the multiple content goals described previously; mastery goals are pursued alongside belongingness goals, resource provision and acquisition goals, self-determination goals, performance goals, and well-being goals.

In fact, researchers in self-regulation have profited from doing research in social constructivist learning environments, mainly because in these learning environments most students wrestle with complex and challenging group assignments and this allows researchers to examine the relationships between the processes needed to learn meaningfully in a content domain and the self-regulation strategies that are necessary and sufficient to steer and direct learning in that domain.

Several researchers (e.g., Boekaerts *et al.*, 2006; Hickey & Granade, 2004) pointed out that students’ values, motives, expectancies and needs as well as the action programs they use to navigate the social learning environment are gradually shifting by being exposed to learning situations that have been set up consistently according to the principles of social constructivism and community of learners. In these new learning environments, students participate in socially relevant learning activities and they need to direct their behavior with multiple content goals in mind, paying close attention to *contextual cues*.

Assessment of SRL as a Process

Changing Instruction Implies Changing Assessment Tools

At this point, we would like to shift attention to assessment of self-regulation. Boekaerts and Corno (2005) revised this literature and pointed out that shifting definitions of self-regulation resulted in changing assessment tools. Initially, researchers viewed self-regulation as a relatively stable individual inclination to respond to learning situations, independent of the context. This conceptualisation led to trait-like measures to describe the strategies that students typically used in the classroom. Later, trait-like measures were replaced by domain-specific measures, when it became clear that students’ self-regulatory processes differed per domain. When the new trend in instructional design gained in momentum (situated learning), researchers welcomed the possibility to assess self-regulation while it is being generated. They expanded their definition of self-regulation, including what students are thinking, feeling, and doing while pursuing a learning goal. Collaborative teams of researchers and teachers began to design the curriculum in such a way that instruction and assessment were closely intertwined activities. More specifically, they discussed the best way to assess students’ progress in a developing skill (e.g., their skill to decide what to write about and how to put their ideas on paper) and reflected about how to create a window on the students’ perception of cues in the learning environment that help them to self-regulate skill development, as well as their motivation to improve that skill.

Boekaerts and Corno (2005) made an inventory of the assessment instruments that are currently used to assess various aspects of self-regulation in action. These include self-report questionnaires, observations of overt behaviour, interview evidence, traces of mental

events and processes, situational manipulations, recording student motivation strategies as they work, keeping diaries. They argued that no one single instrument is sufficient to register students' progress in self-regulation. A combination of instruments is essential to tap the various aspects of students' developing skills in self-regulating their learning and motivation process. A combination of different assessment tools allows researchers and teachers to capture what students think, feel, and undertake in order to steer and direct their learning and motivation in a domain. It also provides insight into how students' attempts at self-regulation change over time in function of (1) their own perception of progress in skill development (2) their changing beliefs about learning and self-regulation in a domain, and (3) their changing psychological needs.

Notably, students have their own self-regulation routines in a domain which they might align with their beliefs about learning and self-regulation in that domain. It is assumed that with skill development, students' psychological needs might change, as well as the degree of automaticity of their self-regulatory processes and their dependency on external regulation and scaffolding. Teachers need to gain insight into the students' changing self-regulation routines and in the processes underlying these changes. By discussing the students' response to various new forms of assessment in a specific domain of study, teachers and researchers gain better insight into the types of self-regulation strategies that students have used over time and whether the students themselves thought these strategies to be (in)effective, given the perceived conditions. This type of reflection allows researchers and teachers to become aware of the interplay between students' perception of the learning conditions in close relation to their perception of their developing competence in a domain.

Using Assessment Tools to Determine the Zone of Proximal Development

Applied psychologists have tackled questions such as “What type of self-regulation strategies do students need to acquire in order to self-regulate the acquisition of knowledge and the problem solving process in different domains?” They have also explored how they might assess students' use of these self-regulation strategies. Two important questions that need to be answered in this respect are: “Do we have a clear description of the self-regulation strategies that are necessary and sufficient for students to steer and direct their own learning and problem solving in a domain of learning, given their current state of skill development?” and, more importantly, “Do we have access to valid assessment instruments to assess the ease with which students make use of different types of self-regulation strategies?” This information is essential for teachers to determine how much external regulation and scaffolding is still necessary at a particular moment in time for an individual student or a group of students. Equally essential is accurate information about the students' degree of awareness of the self-regulation strategies that they are currently using. Our argument is that in order to determine the zone of proximal development with respect to metacognitive, motivational, and volitional self-regulation in a domain it is crucial that teachers have access to valid assessment tools that inform them on the degree of automaticity with which students use various self-regulation strategies in that domain.

We have argued that—up until recently—researchers have studied the different aspects of self-regulation using students' self-reports at different time points in a course. They asked students to complete one or more questionnaires after they completed classroom tasks and activities, tests and exams, as well as homework activities, indicating on Likert-scales what they thought, felt, and had done during their pursuit of the learning goal. Self-reports were often supplemented by interviews, stimulated recall sessions, and observations at

various measurement points during a course or semester. Such data collections allow researchers to describe variations in student use of self-regulation strategies over time, as well as changing patterns among their thoughts, feelings and actions during the learning trajectory.

About this Special Issue

Recently, researchers in self-regulation have argued that self-regulated learning is a dynamic process that causes performance differences to occur both within and between students and that self-regulation in the classroom is heavily influenced by students' perceptions of environmental cues that trigger emotions, beliefs, and needs. Therefore, researchers should design their assessment instruments in such a way that they provide insight into how students' attempts at self-regulation change over time in function of their own perception of goal salience, goal conflict, and progress in skill development. The three lead articles in this special issue provide some cutting edge work on the use of assessment instruments to register self-regulated learning over time. In the first lead article, Nancy Perry and Phil Winne describe the learning from learning kits approach as a way to look at SRL across multiple episodes. Their g-study collects detailed traces about how young students interact with multiple-media content. They use trace data to map SRL and its effect on learning. Susan Nolen and Peter Nenninger have written a commentary on this manuscript.

In the second lead article, Regina Vollmeyer and Falko Rheinberg present their cognitive motivational process model and report on a series of studies in which they assessed students' self-regulation processes as they try and solve various learning problems. These researchers are mainly interested in showing how initial motivation leads to flow and affects performance. Markku Niemivirta and Lyn Corno wrote the commentary on this manuscript.

The third lead article is by Mary Ainley and Lyn Patrick. They present some new on-line measures to assess self-regulated learning. Through tracking patterns of student interactions with achievement activities they offer a new way to achieve insight and understanding of the mediating processes between student, context and achievement. Anastasia Efklides and Julie Turner wrote the commentary on this manuscript.

Finally, Eduardo Cascallar and Monique Boekaerts discussed the role of assessment in current work on self-regulation. They argue that assessment is central to the conceptualization of self-regulation in the classroom as well as to the operationalizations of the constructs that are used to assess SR as students work on tasks and assignments. They point to some current challenges in the field of SRL and provide some specific suggestions to improve the use of assessments in the field of SRL.

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